



Stability calculation according to ISO 6185-3 and ISO 12217-3-2017

By Xiamen DAWN DESIGN

Company: 厦门道恩建筑设计有限公司

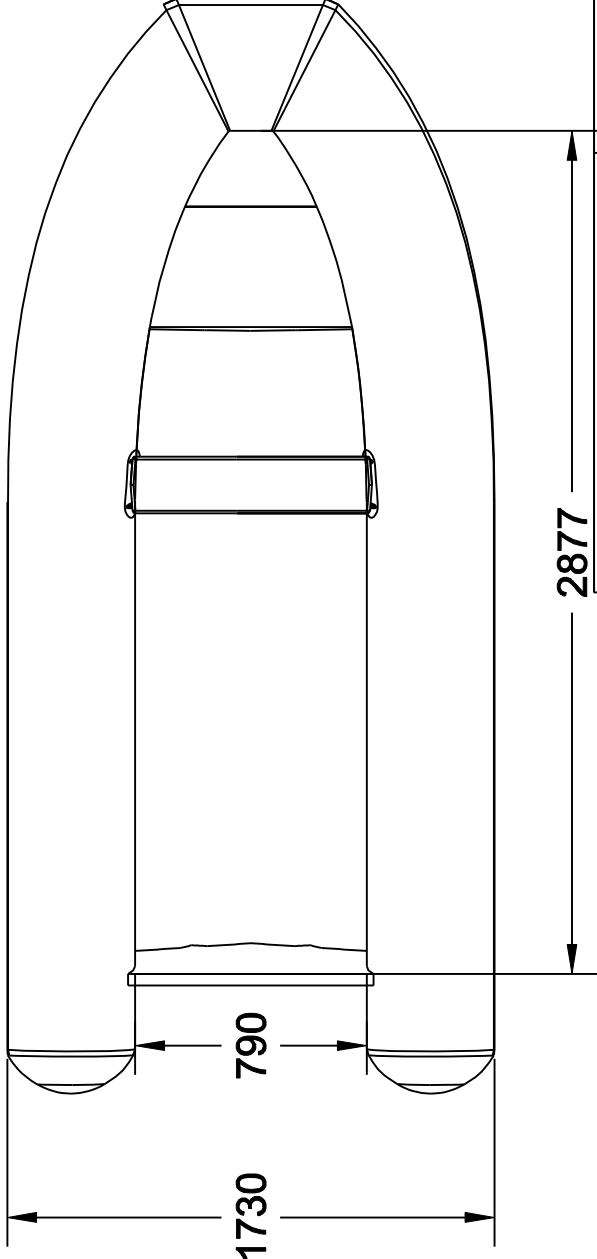
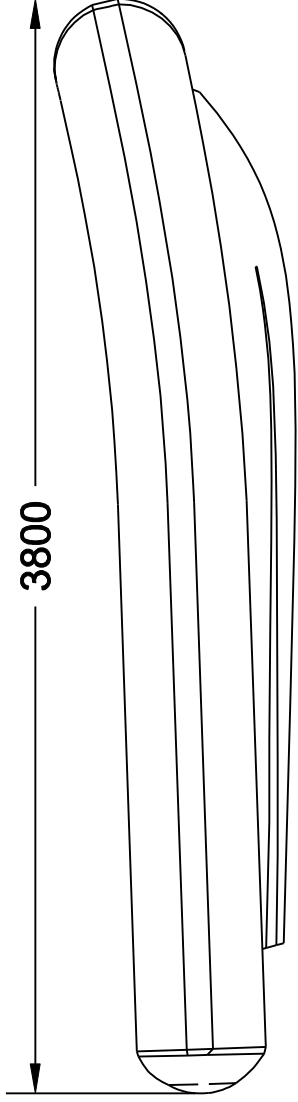
Address: 中国(福建)自由贸易试验区厦门片区翔云一路95号运通中心604B单元之五八八
604B-588 Yuntong Center, No.95 Xiangyunyilu road, Xiamen area of
China(Fujian) Pilot Free Trade Zone

Owner: 王弘涛

 DAWN YACHT DESIGN 厦门道恩建筑设计有限公司	ITEM		PROJECT:	CL 380
	CL 380		Cat.	cat. C
Signature			PAPER	SCALE
Design by 		Stability calculations	A4	
Checked by			sheet	1 of 16
Technic b				
Approved	DATE	2018.07		

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SPECIFICATION

- Loa 3800mm
- Beam 1730mm
- Inside Length 2877mm
- Inside Width 790mm
- Weight 82Kg
- Max Pax 7
- Max Load (incl.motor) 691Kg
- Max HP 30
- Shaft Short
- Tube 44cm
- Airtight Chambers 3

DND DAWN YACHT DESIGN		Signature	
		S.C/L	
Design by			
Checked by			
Technic by			
Approved by		DATE	2018.07.12

Drawing Title General Arrangement	Project Name: CL380	
	Drawing NOcl38-01-01	
	PAPER	SCALE
	A4	1:25
	SHEET	1 of 1

CL 380 Weight estimation CAT.C

Loa(m) = 3.8m

Lh(m) = 3.8m

Bmax (m) = 1.73m

HULL		Weight	XG (m)	YG(m)	ZG(m)	Mx	My	Mz	NOTE
Hull Plates		52.0	1.60	0.00	0.20	83.20	0.00	10.40	
Structures		18.0	1.40	0.00	0.19	25.20	0.00	3.42	
Inflatable tube		12.0	1.41	0.00	0.42	16.92	0.00	5.04	
TOT.	82.0		1.53	0.00	0.23	125.32	0.00	18.86	

Fixed MACHINERY									
battery		20.5	0.60	0.00	0.20	12.30	0.00	4.10	
Fuel tank		5.0	0.80	0.00	0.20	4.00	0.00	1.00	
Cables		2.0	1.10	0.00	0.22	2.20	0.00	0.44	
TOT.	27.5		0.67	0.00	0.20	18.50	0.00	5.54	

Tot. Empty Craft		109.5	1.31	0.00	0.22	143.82	0.00	24.40	
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Standard Equipment									
Outboard		124.1	-0.25	0.00	0.50	-31.03	0.00	62.05	30 hp
Dry bag		2.0	2.15	0.00	0.30	4.30	0.00	0.60	
Foot pump		1.0	2.10	0.00	0.25	2.10	0.00	0.25	
Paddles		1.0	1.20	0.00	0.60	1.20	0.00	0.60	
Repair kit		1.0	2.20	0.00	0.50	2.20	0.00	0.50	
TOT.	129.1		-0.16	0.00	0.50	-21.23	0.00	64.00	

Additional eq.									
LIFEJACKETS		4.0	2.20	0.00	0.50	8.80	0.00	2.00	
Others not in standard equipment		5.0	1.50	0.00	0.35	7.50	0.00	1.75	
TOT. Addition	9.0		1.81	0.00	0.42	16.30	0.00	3.75	

Light Craft									
	EmptyCraft	109.5	1.31	0.00	0.22	143.82	0.00	24.40	
	standard eq.	129.1	-0.16	0.00	0.50	-21.23	0.00	64.00	
Light Craft	Tot.	238.6	0.51	0.00	0.37	122.60	0.00	88.40	

Minimum Operating condition									
	Light craft	238.6	0.51	0.00	0.37	122.60	0.00	88.40	
	additonal eq	9.0	1.81	0.00	0.42	16.30	0.00	3.75	
1	passengers+crews	75.0	0.50	0.00	0.70	37.50	0.00	52.50	
Minimum Operating condition	Tot.	322.6	0.55	0.00	0.448	176.40	0.00	144.65	

addit.
0.05
0.50

FULL LOAD									
	light craft	238.6	0.51	0.00	0.37	122.60	0.00	88.40	
24	FUEL	17.1	0.80	0.00	0.20	13.68	0.00	3.42	
7	drinking water	6.7	2.40	0.00	0.50	15.96	0.00	3.33	
	personal prov.	10.0	2.40	0.00	0.50	24.00	0.00	5.00	
	additonal eq	9.0	1.81	0.00	0.42	16.30	0.00	3.75	
7	passengers+crews	525.0	1.25	0.05	0.70	656.25	26.25	367.50	
FULL LOAD	Tot.	806.4	1.05	0.03	0.58	848.79	26.25	471.40	

addit.
0.05
0.63

Loaded Arrival									
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	light craft	238.6	0.51	0.00	0.37	122.60	0.00	88.40	
24	FUEL	1.8	0.80	0.00	0.10	1.44	0.00	0.18	
7	drinking water	0.7	2.40	0.00	0.50	1.68	0.00	0.35	
	personal prov.	10.0	2.40	0.00	0.45	24.00	0.00	4.50	
	additonal eq	9.0	1.81	0.00	0.42	16.30	0.00	3.75	
7	passengers+crews	525.0	1.15	0.05	0.70	603.75	26.25	367.50	
Loaded Arrival	Tot.	785.1	0.98	0.03	0.59	769.77	26.25	464.68	
				addit.	0.05				
					0.64				

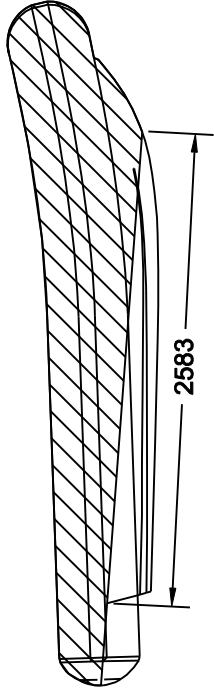
Crews	crew no.								
	1.0	85.0	0.40	-0.38	0.70	34.00	-32.30	59.50	
	2.0	85.0	0.75	-0.39	0.70	63.67	-33.41	59.50	
	3.0	85.0	1.26	-0.38	0.70	106.68	-32.39	59.50	
	4.0	85.0	1.85	-0.37	0.70	157.25	-31.20	59.50	
	5.0	85.0	2.50	-0.08	0.70	212.50	-6.80	59.50	
	6.0	85.0	0.80	0.06	0.70	68.00	4.76	59.50	
	7.0	85.0	1.10	0.05	0.70	93.50	4.34	59.50	
Tot. Crews		595.0	1.24	-0.21	0.70	735.59	-126.99	416.50	

Crew offset test condition									
	light craft	238.6	0.51	0.00	0.37	122.60	0.00	88.40	
24	FUEL	17.1	0.80	0.00	0.20	13.68	0.00	3.42	
7	drinking water	6.7	2.40	0.00	0.50	15.96	0.00	3.33	
	personal prov.	10.0	2.40	0.00	0.45	24.00	0.00	4.50	
	additonal eq	9.0	1.81	0.00	0.42	16.30	0.00	3.75	
7	passengers+crews	595.0	1.24	-0.21	0.70	735.59	-126.99	416.50	
Crew offset test condition	Tot.	876.4	1.06	-0.14	0.59	928.13	-126.99	519.90	
				additona	0.05				
	Tot.	876.4	1.06	-0.14	0.64	928.13	-126.99	519.90	

Weihai Haifei Marine Ltd. CL 380

Design Category intended:	C	Monohull / multihull:	Monohull	Propul. type	OB
Item	Symbol	Unit	Value	Ref.	
Length of hull as in ISO 8666	L_{HLH}	m	3.80	4. Table 1	
Length of waterline in loaded arrival condition	L_{wLwL}	m	2.96	4. Table 1	
<u>Empty Craft condition mass</u>	m_{ECmEC}	kg	109.1	3.3.1	
standard equipment		kg	129.1	3.4.10	
water ballast in tanks which are notified in the owner's manual to be filled when the boat is afloat		kg	0.0	3.3.2	
Light craft condition mass	m_{LCmLC}	kg	238.2	3.3.2	
Mass of:					
Desired crew limit	CL	----	7	3.4.2	
Mass of:					
desired crew limit at 75 kg each		kg	525.0		
provisions + personal effects		kg	10.0	3.3.3	
drinking water		kg	6.7	3.3.3	
fuel		kg	17.1	3.3.3	
lubricating and hydraulic oils		kg	0.0	3.3.3	
black water		kg	0.0	3.3.3	
grey water		kg	0.0	3.3.3	
water ballast		kg	0.0	3.3.3	
any other fluids carried aboard (e.g. bait tanks)		kg	0.0	3.3.3	
stores, spare gear and cargo (if any)		kg	0.0	3.3.3	
optional equipment and fittings not included in basic outfit		kg	9.0	3.3.3	
inflatable life raft(s)		kg	0.0	3.3.3	
other small boats carried aboard		kg	0.0	3.3.3	
margin for future additions		kg	0.0	3.3.3	
Maximum load = sum of above masses	m_L	kg	567.8	3.3.3	
<u>Maximum Load condition mass</u>	m_{LDC}	kg	806.0	3.3.4	
mass to be removed for loaded arrival condition		kg	20.9	3.3.5	
<u>Loaded Arrival condition mass</u>	m_{LA}	kg	785.1	3.3.5	

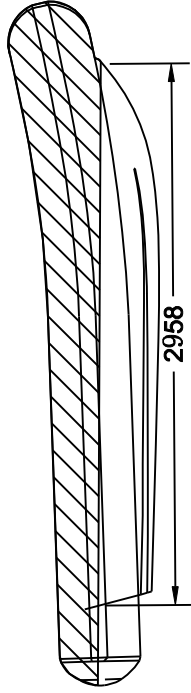
mMo



1. Calculation AT mMo

Item	Symbol	Unit	Value
Windage area	A_{LV}	m ²	1.54
Waterline length of hull	L_{WL}	m	2.58
Beam of hull	B_H	m	1.73
Ratio of $A_{LV}/(0.5L_{WL} * B_H)$	-	-	$\approx 0.69 < 1$

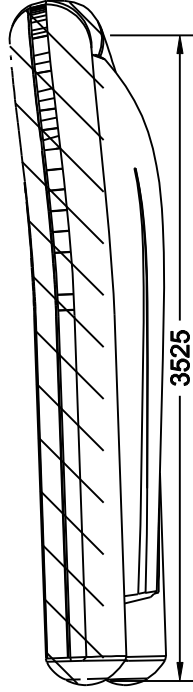
mLA



2. Calculation AT mLA

Item	Symbol	Unit	Value
Windage area	A_{LV}	m ²	1.14
Waterline length of hull	L_{WL}	m	2.96
Beam of hull	B_H	m	1.73
Ratio of $A_{LV}/(0.5L_{WL} * B_H)$	-	-	$\approx 0.45 < 1$

Offset test



3. Calculation AT offset test

Item	Symbol	Unit	Value
Windage area	A_{LV}	m ²	1.43
Waterline length of hull	L_{WL}	m	3.53
Beam of hull	B_H	m	1.73
Ratio of $A_{LV}/(0.5L_{WL} * B_H)$	-	-	$\approx 0.47 < 1$

It is not necessary to perform wind resistance test

<h1>DND</h1> DAWN YACHT DESIGN		Signature	
		Design by	S.C/L
Checked by			
Technic by			
Approved by		DATE	2018.07.12

Drawing Title		Project Name: CL380	
Windage Area		Drawing NOCL38-01-03	
		PAPER	SCALE
		A4	1:40
		SHEET	1 of 1

CL 380 Hydrostatic tables

Draft m	Displ. kg	LCB m	TCB m	VCB m	Wet Area m ²	Awp m ²	LCF m	TCF m	VCF m	BMT m	BMI m	Cb	Cwp	Cws	Cvp
0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.100	44.820	1.116	0.00	0.072	1.140	1.014	1.076	0.00	0.100	0.370	10.425	0.336	0.781	3.412	0.431
0.110	56.021	1.104	0.00	0.079	1.326	1.184	1.025	0.00	0.110	0.702	10.897	0.125	0.298	3.307	0.419
0.120	69.281	1.082	0.00	0.086	1.567	1.406	0.952	0.00	0.120	1.210	11.540	0.134	0.336	3.491	0.400
0.130	84.972	1.052	0.00	0.093	1.840	1.657	0.896	0.00	0.130	1.663	11.435	0.146	0.380	3.680	0.385
0.140	103.349	1.021	0.00	0.100	2.139	1.929	0.860	0.00	0.140	2.027	10.856	0.160	0.428	3.858	0.373
0.150	124.617	0.992	0.00	0.108	2.461	2.220	0.842	0.00	0.150	2.304	10.098	0.175	0.479	4.023	0.365
0.160	148.945	0.967	0.00	0.116	2.804	2.525	0.839	0.00	0.160	2.506	9.358	0.191	0.531	4.172	0.359
0.170	176.356	0.948	0.00	0.123	3.128	2.810	0.857	0.00	0.170	2.601	8.654	0.208	0.578	4.259	0.360
0.180	206.460	0.936	0.00	0.131	3.413	3.054	0.881	0.00	0.180	2.587	8.039	0.226	0.617	4.278	0.366
0.190	238.923	0.931	0.00	0.138	3.674	3.271	0.905	0.00	0.190	2.522	7.520	0.243	0.648	4.264	0.375
0.200	273.490	0.929	0.00	0.145	3.914	3.465	0.930	0.00	0.200	2.432	7.084	0.260	0.676	4.231	0.385
0.210	309.940	0.930	0.00	0.152	4.136	3.638	0.953	0.00	0.210	2.330	6.713	0.277	0.700	4.185	0.395
0.220	348.064	0.934	0.00	0.159	4.339	3.791	0.976	0.00	0.220	2.224	6.392	0.293	0.720	4.130	0.407
0.230	387.672	0.940	0.00	0.166	4.525	3.928	0.997	0.00	0.230	2.118	6.109	0.308	0.737	4.069	0.418
0.240	428.601	0.946	0.00	0.173	4.700	4.050	1.016	0.00	0.240	2.015	5.855	0.323	0.751	4.008	0.430
0.250	470.724	0.953	0.00	0.179	4.865	4.161	1.034	0.00	0.250	1.918	5.626	0.337	0.764	3.948	0.441
0.260	513.934	0.961	0.00	0.185	5.022	4.262	1.051	0.00	0.260	1.826	5.417	0.351	0.776	3.892	0.452
0.270	558.148	0.968	0.00	0.192	5.175	4.356	1.068	0.00	0.270	1.740	5.228	0.364	0.787	3.839	0.463
0.280	603.291	0.977	0.00	0.198	5.324	4.444	1.084	0.00	0.280	1.659	5.054	0.377	0.797	3.790	0.473
0.290	649.301	0.985	0.00	0.204	5.469	4.525	1.100	0.00	0.290	1.584	4.895	0.390	0.808	3.745	0.482
0.300	696.112	0.993	0.00	0.210	5.612	4.600	1.116	0.00	0.300	1.511	4.747	0.402	0.818	3.704	0.492
0.310	743.668	1.001	0.00	0.216	5.754	4.670	1.132	0.00	0.310	1.442	4.610	0.414	0.827	3.667	0.501
0.320	791.915	1.010	0.00	0.222	5.894	4.735	1.149	0.00	0.320	1.377	4.485	0.426	0.836	3.634	0.509
0.330	840.808	1.018	0.00	0.228	6.033	4.796	1.165	0.00	0.330	1.314	4.371	0.437	0.844	3.605	0.518
0.340	889.482	1.028	0.00	0.234	6.173	4.661	1.228	0.00	0.340	1.245	3.971	0.448	0.820	3.584	0.547
0.350	936.407	1.040	0.00	0.240	6.319	4.486	1.292	0.00	0.350	1.181	3.659	0.458	0.788	3.574	0.581

CL380 Offset load test -cat. C

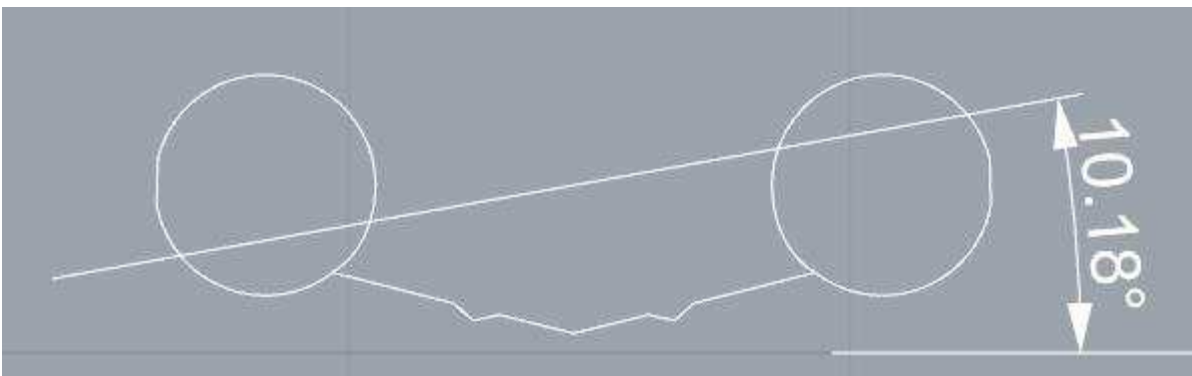
1.General

Length Overall, LOA	3.800	m
$L_H =$	3.800	m
Beam Overall, Boa	1.730	m
Depth Overall, D	0.816	m
Waterline Length, Lwl	3.524	m
Waterline Beam, Bwl	1.633	m
Navigational Draft, T	0.342	m
Displacement Weight	876.400	kgf
Volume	0.854	m ³
LCG	1.060	m
TCG	0.140	m
VCG	0.640	m
Fluid Density	1025.000	kg/m ³
LCB	1.060	m
TCB	0.210	m
VCB	0.251	m
Wetted Surface Area	6.541	m ²
Waterplane Area, Awp	4.074	m ²
LCF	1.245	m
TCF	0.033	m
Weight To Immerse	41.790	kgf/cm
Cb	0.434	
Cvp	0.614	
Cwp	0.708	
Cws	3.770	
I(transverse)	0.888	m ⁴
I(longitudinal)	3.142	m ⁴
BMt	1.040	m
BMI	3.678	m
GMt	0.644	m
GMI	3.282	m
Mt	0.920	m
MI	3.557	m

2.Heel angle requirement

During the test , the heel angle Φ_o shall be not greater than

$$11.5 + \frac{(24 - L_H)^3}{520} \quad 27.35^\circ$$



As shown from the graph , the real heel angle $\Phi_o =$

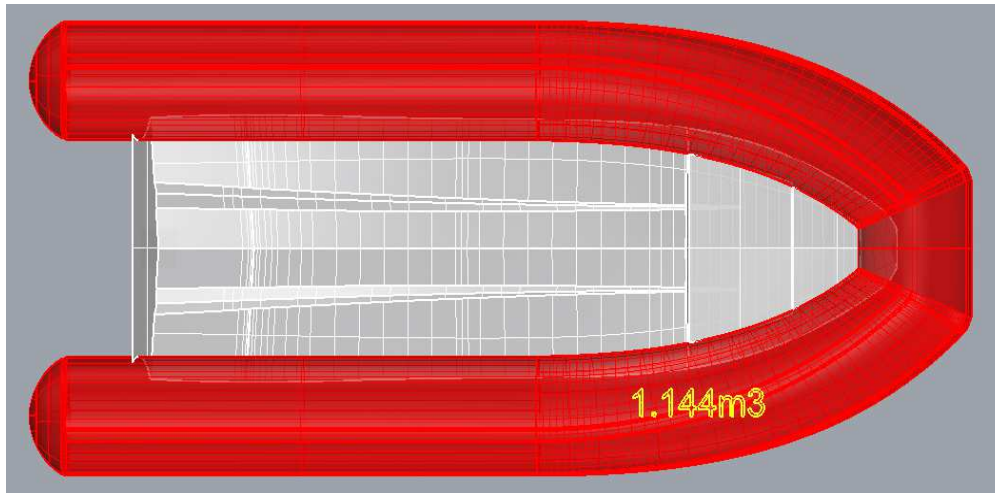
$$10.18^\circ < 27.35^\circ$$

Result:

PASS

CL 380 Buoyancy

Inflatable Buoyancy tube: 1.144 m³ (3.5)
 Permanent sealed buoyancy: 0 m³ (3.8)



Inherent buoyancy of the rigid parts of the boat:

0.030 m³
 0.041 m³
 0.072 m³

Alluminium mass: 82 Kg
 outboard engine mass 124.1 Kg

Table 4 — Material densities

Material	Density kg/m ³
Aluminium alloys	2 700

$v = \frac{m}{\rho}$
 v is the volume of an element, expressed in m³;
 m is the mass of that element, expressed in kg;
 ρ is the density of that element, expressed in kg/m³, as given in [Table 4](#).

TOTAL BUOYANCY: 1.216 m³

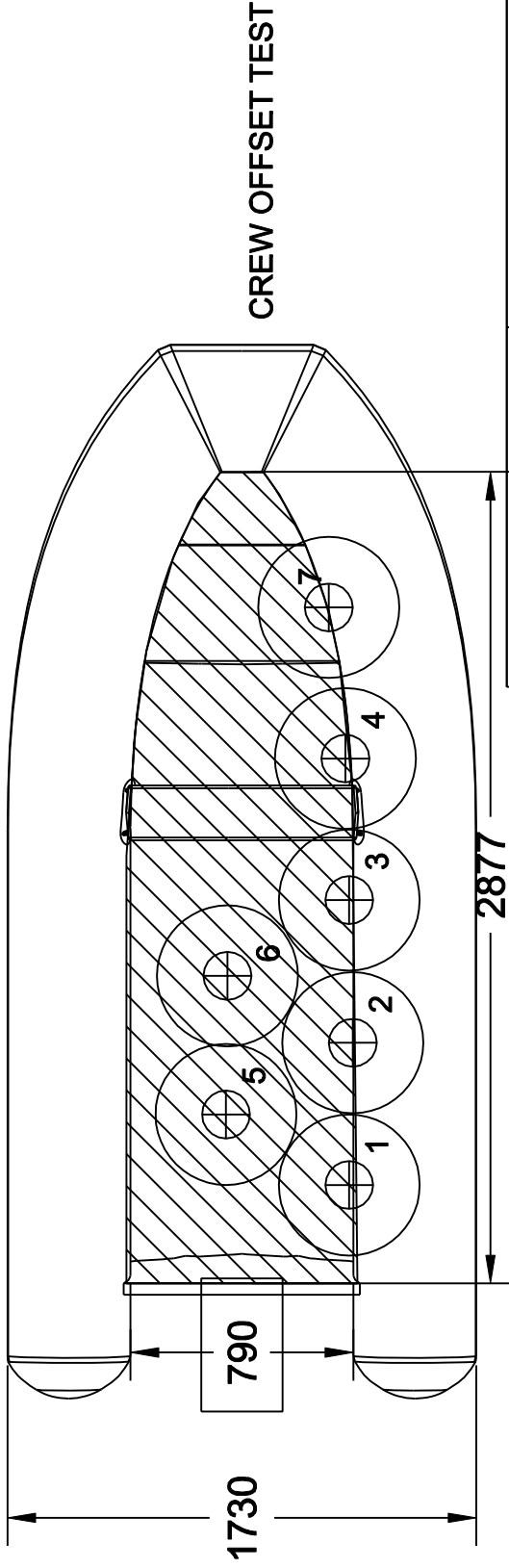
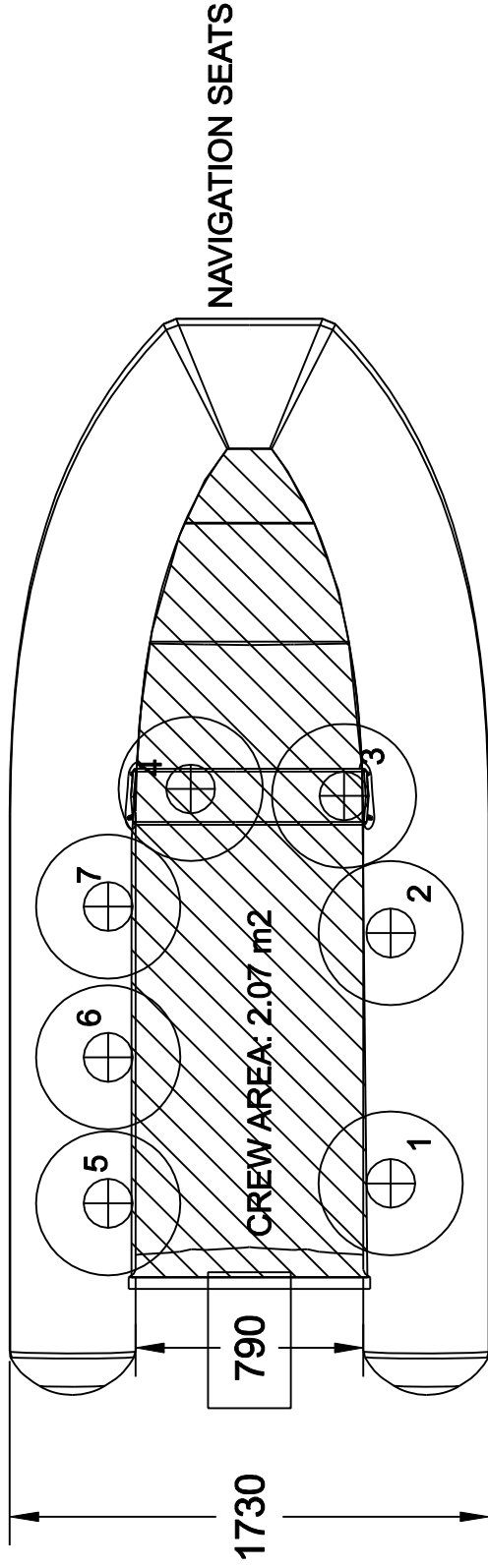
The total buoyant volume in m³ (V) shall be as follows:

$$V > \frac{k \times m_{LDC}}{1000}$$

Where k is:

- 1,33 for boats assessed to design category B;
- 1,2 for boats assessed to design category C;

cat C mLDC= 806.4 Kg 1,2xmLDC/1000= 0.968 < 1.216
 OK



SPECIFICATION

Crew Area 2.07m²
 Max Pax 7

DND		DAWN YACHT DESIGN	
Signature			
Design by	S.C/L		
Checked by			
Technic by			
Approved by			
		DATE	2017.04.19

Drawing Title	Project Name: CL380		
	Drawing NOcl38-01-02		
Crew Area	PAPER	SCALE	
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	SHEET	1	of 1

CL380 Righting Arm (Minimum operating)-cat. C

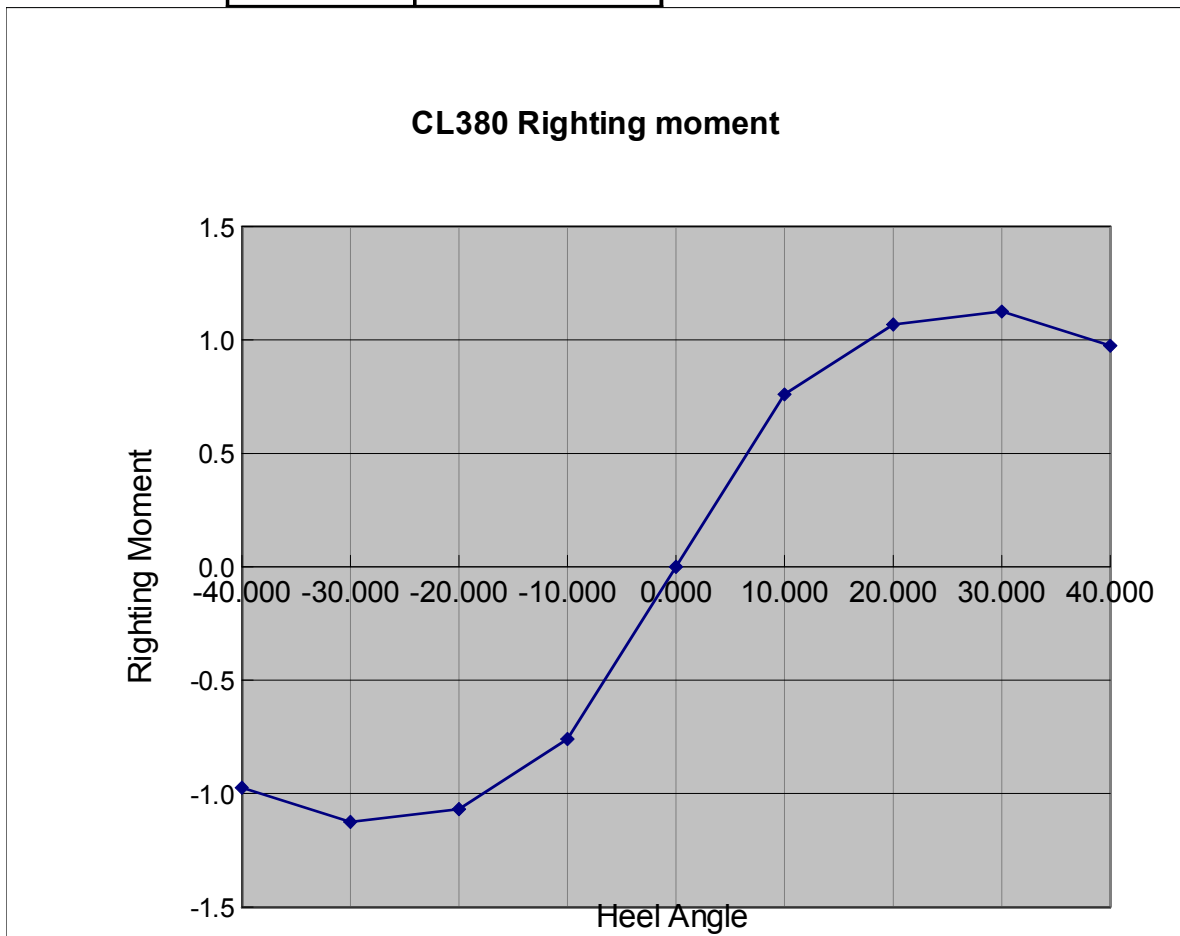
1. General

L_{oA} =	3.8 m
L_H =	3.8 m
Displacement=	322.6 Kg
Design Category	C
Condition	Minimum Operating

2. Righting arm

The righting moment curve and Heeling moment curve plot on the same graph , as below:

Heel(deg)	Trim(deg)	Righting Arm (m)	Righting Moment (N*m)
-40.000	-9.42	-0.31	-1.0
-30.000	-6.12	-0.36	-1.1
-20.000	-5.26	-0.34	-1.1
-10.000	-4.91	-0.24	-0.8
0.000	-4.26	0.00	0.0
10.000	-4.91	0.24	0.8
20.000	-5.26	0.34	1.1
30.000	-6.12	0.36	1.1
40.000	-9.42	0.31	1.0



CL380 Righting Arm (Loaded Arrival)-cat. C

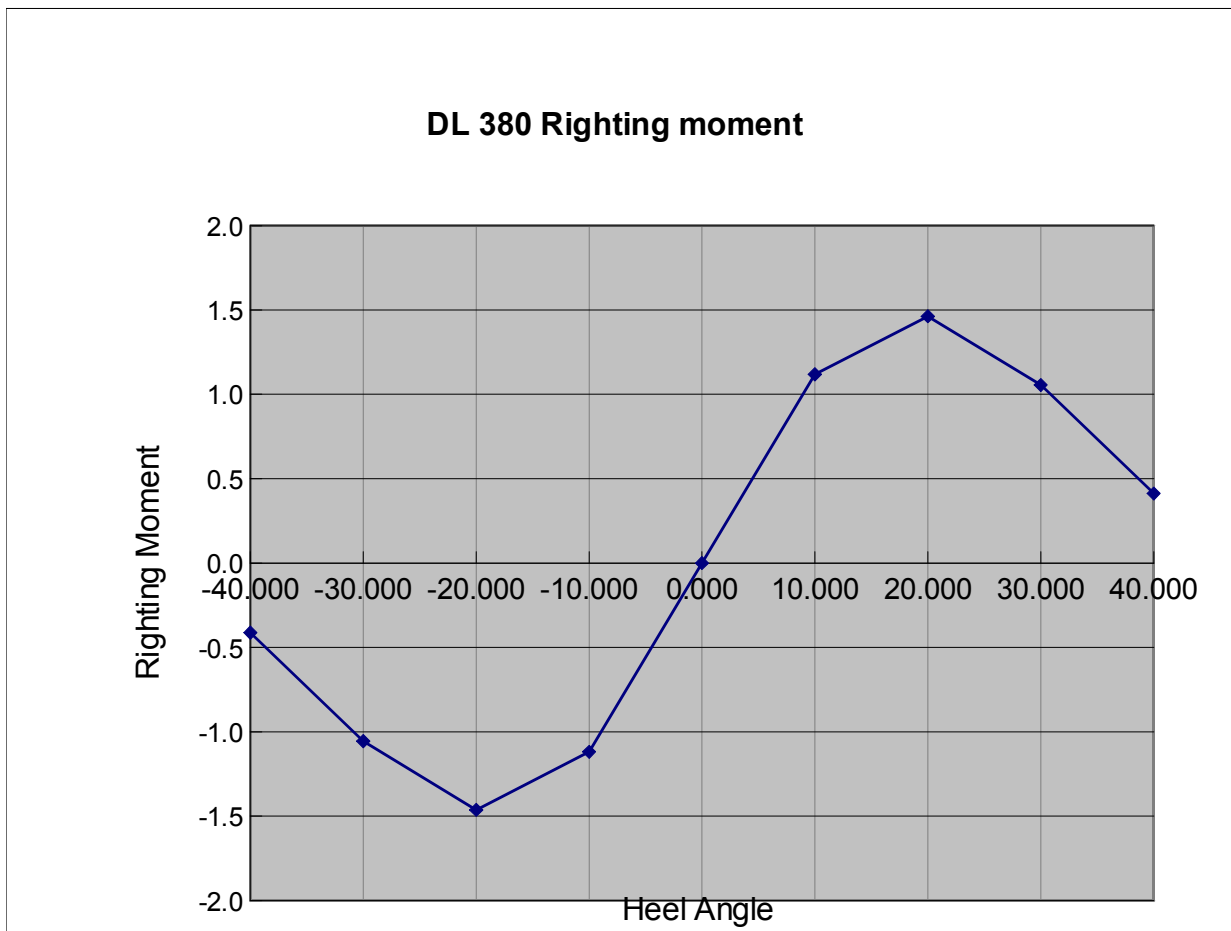
1.General

L_{oA} =	3.8 m
L_H =	3.8 m
Displacement=	785.1 Kg
Design Category	C
Condition	Loaded Arrival

2.Righting arm

The righting moment curve and Heeling moment curve plot on the same graph , as below:

Heel(deg)	Trim(deg)	Righting Arm (m)	Righting Moment (N*m)	
-40.000	-11.75	-0.05	-0.4	
-30.000	-7.08	-0.14	-1.1	
-20.000	-3.05	-0.19	-1.5	
-10.000	-1.03	-0.15	-1.1	
0.000	-0.41	0.00	0.0	
10.000	-1.03	0.15	1.1	
20.000	-3.05	0.19	1.5	
30.000	-7.08	0.14	1.1	
40.000	-11.75	0.05	0.4	



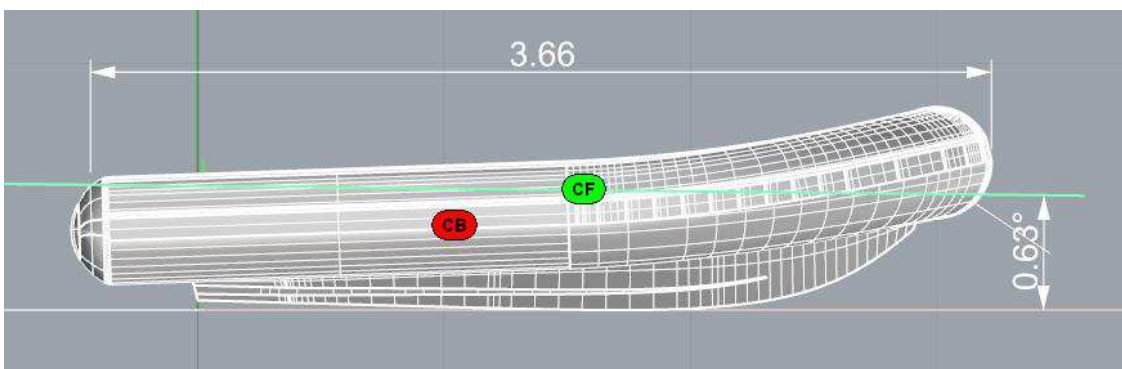
CL380 Swamped stability

1.General

Length Overall, LOA	3.800	m
$L_H =$	3.800	m
Beam Overall, Boa	1.730	m
Depth Overall, D	0.820	m
Waterline Length, Lwl	3.612	m
Waterline Beam, Bwl	1.625	m
Navigational Draft, T	0.406	m
Displacement Weight	806.400	kgf
Volume	0.786	m ³
LCG	1.050	m
TCG	0.000	m
VCG	0.630	m
Fluid Density	1025.000	kg/m ³
LCB	1.047	m
TCB	0.000	m
VCB	0.345	m
Wetted Surface Area	6.600	m ²
Waterplane Area, Awp	2.724	m ²
LCF	1.564	m
TCF	0.000	m
Weight To Immerse	27.947	kgf/cm
Cb	0.330	
Cvp	0.711	
Cwp	0.464	
Cws	3.917	
I(transverse)	0.853	m ⁴
I(longitudinal)	2.714	m ⁴
BMt	1.086	m
BMI	3.453	m
GMt	0.800	m
GMI	3.168	m
Mt	0.938	m
MI	3.305	m
Design Category	C	

2.Trim angle requirement

When the boat in the fully loaded condition is filled to overflowing with water , it shall float with not more than 10° from the unswamped fully loaded waterline

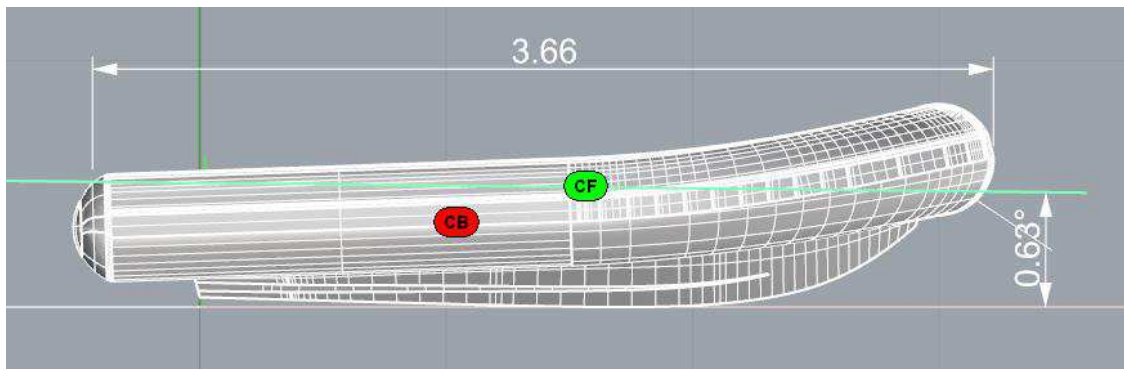


As shown from above , the trim angle $\Phi = 0.63^\circ < 10^\circ$

Result: PASS

3. L_H requirement

When the boat in the fully loaded condition is filled to overflowing with water, it shall be more than $2/3$ of L_H above the water



As shown from above, $L_H' =$

$$L_H' / L_H =$$

3.660 m

$$0.963 > 2/3 L_H =$$

0.667

Result:

PASS

CL 380 Maximum power for initial testing

The maximum power for initial testing of outboard powered craft is determined based on the following:

- factor λ , calculated as follows:

$$\lambda = L_H \times B_T$$

where

L_H is the length of hull, in metres, as defined in ISO 8666;

B_T is the transom width, in metres, at or below the sheer, as defined in ISO 8666;

For craft with a factor λ greater than 5,1, the value of the maximum power for initial testing, expressed in kilowatts, is taken as the following (see Figure C.3):

- without remote wheel steering, deadrise angle $\alpha < 5$: $4,2\lambda - 11$;
- without remote wheel steering, deadrise angle $\alpha \geq 5$: $6,4\lambda - 19$;
- with remote wheel steering: $16\lambda - 67$.

cl380

Lh 3.8 m
 Bt 1.73 m
 λ 6.574 $\lambda > 5$

Deadrise >5 deg.

Without steering wheel

23.0736

With steering wheel

38.184 KW 51.16656 HP

$7\sqrt{L_H}$ 13.64551 Kn

Vmax > $7\sqrt{L_H}$

The test has to be performed with the maximum power.