

ISO 12217-3 BOATS OF HULL LENGTH LESS THAN 6m
CALCULATION WORKSHEET - No. 1

 Design: **Mini-Motorboat "New Flamingo"**

Design Category intended: C and D		monohull / multihull: monohull		
Item	Symbol	Units	Value	Ref.
<u>Length of hull</u>	L_H	m	2,6	ISO 8666
Mass:				
<u>Maximum total load:</u>				3.3.2
Desired Crew Limit	CL	persons	2	3.4.2
Mass of:-				
desired Crew Limit at 75 kg each			150,00	
provisions + personal effects			13,30	
fresh water				
fuel			36,385	
other liquids carried aboard				
stores, spare gear and cargo (if any)				
optional equipment and fittings				
not included in basic outfit				
inflatable liferaft		kg		
other small boats carried aboard		kg		
margin for future additions		kg		
<u>Maximum total load</u> = sum of above masses	m_{MTL}	kg	199,685	3.3.2
<u>Light craft condition mass</u>	m_{LCC}	kg	154,766	3.3.1
<u>Loaded displacement mass</u> = $m_{LCC} + m_{MTL}$	m_{LDC}	kg	354,451	3.3.3

<u>Is boat sail or non-sail?</u>			
nominal sail area	A_S	m ²	ISO 8666
sail area / displacement ratio = $A_S / (m_{LDC})^{2/3}$		-	5.2
CLASSIFIED AS (non-sail if $A_S / (m_{LDC})^{2/3} < 0,07$)	SAIL / NON-SAIL ?		NON-SAIL
5.2			
IF NON-SAIL GO TO WORKSHEET No. 2			
IF SAIL GO TO WORKSHEET No. 3			

ISO 12217-3 CALCULATION WORKSHEET - No. 2 NON-SAIL TESTS TO BE APPLIED

Question	Answer	Ref.
Is boat fully decked? (see definition in Ref.) YES / NO?	NO	3.1.5
Is boat partially decked? (see definition in Ref.) YES / NO?	YES	3.1.6

Item	Symbol	Units	Value	Ref.
Length of Hull	LH	m	2,6	ISO 8666
Beam of Hull	BH	m	1,25	ISO 8666

Choose any ONE of the following options, and use all the worksheets indicated for that option.

Option No.	1 a	2	3 a	4	5	6 a
Applicable to length of hull	Up to 6,0 m			From 4,8 m up to 6,0 m		
Design categories possible	C and D	C and D	D	C and D	D only	C and D
Applicable to engine powers of	Any amount	Any amount	< 3 kW	Any amount	Any amount	Any amount
Applicable to the following types of engine installation	Any	Any	Any	Any	Any	Inboard engines only
Decking or covering	Any amount	Fully decked b	Any amount	Partially decked c	Any amount	Any amount
Downflooding height test	4d or 5d	4 or 5	4 or 5	4 or 5	4 or 5	4 or 5
Offset load test	6a, 6b or 6c	6a, 6b or 6c	-	6a, 6b or 6c	6a, 6b or 6c	6a, 6b or 6c
Flotation standard	Level	-	-	-	-	Basic
Flotation test	7	-	-	-	-	7 or 8
Flotation elements	Annex C	-	Annex C	-	-	Annex C
Capsize recovery test	-	-	9	-	-	-
<p>a Boats using options 1, 3 and 6 are considered to be susceptible to swamping when used in their design category.</p> <p>b This term is defined in 3.1.5.</p> <p>c This term is defined in 3.1.6.</p> <p>d This test is not required to be applied if, when swamped during Test 6.4, the boat supports an equivalent dry mass of 133 % of the maximum total load, or if the boat does not take on water when heeled to 90° from the upright in light craft condition</p>						

Option selected	1
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ISO 12217-3 CALCULATION WORKSHEET - No. 4
DOWNFLOODING
Downflooding Openings:

Question	Answer	Ref.
Have all appropriate downflooding openings been identified? YES/NO	YES	6.2.1.1
Do all closing appliances satisfy ISO 12216? YES/NO	YES	6.2.1.2
Opening type appliances are not fitted below 0,2 m above waterline unless comply with ISO 9093 or ISO 9094? YES/NO	YES	6.2.1.3
Categories possible: C or D if all three are YES	C or D	6.2.1

Downflooding Height :

(Alternatively, use Worksheet 5)

Requirement	Basic requirement	Reduced value for small openings	Reduced value at outboard	Increased value at bow
applicable to	options 1-6, 10, 11	options 1-6, 10, 11 but only if figures are used	options 1, 3	options 1, 3, 5, 6
Ref.	6.2.2.2 a)	6.2.2.2 e)	6.2.2.2 c)	6.2.2.2 b)
Obtained from Fig. 2 or annex A?	Fig.2	= basic x 0,75	= basic x 0,80	= basic x 1,15
Maximum area of small openings ($50L_H^2$) (mm ²) =		0		
Required Downflood Height $h_{D(R)}$ (m)	Fig. 2-annex A Category C	0,3	0,24	
	Fig. 2-annex A Category D	0,2	0,16	
Actual Downflooding Height h_D (m)		0,304	0,304	
Design Category possible	C and D		C and D	
Design Category possible on Downflooding Height = lowest of above				C and D

Downflooding Height: Outboard boats when starting:

Question	Answer	Ref.
Does person forward of engine weigh more than 75 kg? YES/NO	YES	6.2.3
Does mass of engine(s) fitted comply? YES/NO	YES	6.2.3
Is least height from waterline to flood point greater than 0,1 m? YES/NO	YES	6.2.3
NB: All boats fitted with externally mounted outboard engines must achieve YES to all the above.		

ISO 12217-3 CALCULATION WORKSHEET - No. 5
DOWNFLOODING HEIGHT

Calculation using Annex A assuming use of option1.....

Item	Symbol	Units	Opening 1	Opening 2	Opening 3	Opening 4
Position of openings:						
Least longitudinal distance from bow/stern	x	m	0,35			
Least transverse distance from gunwale	y	m	0,0506			
$F_1 = \text{greater of } (1 - x/L_H) \text{ or } (1 - y/B_H) =$	F_1	-	0,960			
Size of openings:						
Combined area of openings to top of any downflooding opening	a	mm ²	0			
Longitudinal distance of opening from tip of bow	$x_{n'}$	m	2,25			
Limiting value of $a = (30L_H)^2$		mm ²	6084			
If $a \geq (30L_H)^2$, $F_2 = 1,0$ If $a < (30L_H)^2$, $F_2 =$ $= 1 - \frac{x_{n'}}{L_H} \left[\frac{\sqrt{a}}{75 L_H} \quad 0,4 \right]$	F_2	-	0,654			
Size of recesses:						
Volume of Recesses which are not self-draining in accordance with ISO 11812	V_R	m ³				
Freeboard amidships (see ISO 8666)	F_M	m	0,423			
$k = V_R / (L_H \cdot B_H \cdot F_M)$	k	-				
If opening is not a recess, $F_3 = 1,0$ If recess is quick-draining, $F_3 = 0,7$ If recess is not quick-draining $F_3 = (0,7 + k^{0,5})$	F_3	-	1,0			
Displacement:						
Loaded displacement volume (= $m_{LD} / 1025$)	V	m ³	0,3458			
$B = B_H$ for monohulls, B_{WL} for multihulls	B	m	1,25			
$F_4 = [(10 \nabla) / (L_H \cdot B^2)]^{1/3}$	F_4	-	0,9477			
Flotation:						
For boats using options 1 or 3, $F_5 = 0,8$ For boats using option 6, $F_5 = 0,9$ For all other boats, $F_5 = 1,0$	F_5	-	0,8			
Required Calc. Height: = $F_1 F_2 F_3 F_4 F_5 L_H / 15$						
Required Downflooding Height with limits applied (see Annex A, Table A.1)	Category C	$h_{D(C)}$	m	0,24		
	Category D	$h_{D(D)}$	m	0,16		
Measured Downflooding Height:		h_D	m	0,304		
Design Category possible:			C and D			
				lowest of above =	C and D	

ISO 12217-3 CALCULATION WORKSHEET- No. 6a OFFSET LOAD TEST
Mass of people used for test

Name	Ident.	Mass (kg)
Skipper	A	75
Passenger	B	75
	C	
	D	
	E	
	F	
	G	
	H	

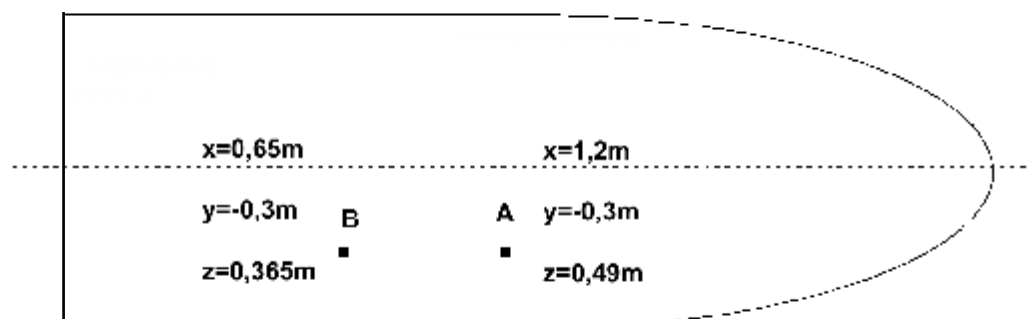
Name	Ident.	Mass (kg)
	I	
	J	
	K	
	L	
	M	
	N	
	O	
	P	

Crew area
Areas included and access limitations (if any):

Area	P/S? ¹⁾	Incl?	Persons limit
main cockpit	S	included	2
aft cockpit			
forward cockpit			
saloon			
cabins			
side decks			
fore decks			

Area	P/S? ¹⁾	Incl?	Persons limit
cuddy top			
coachroof top			
wheelhouse top			
fly bridge			
swim platform			

Sketch: Indicate possible seating locations along the length of the side to be tested using numbers, so that these may later be used to record the positions that people actually occupy. Locations should not be closer than 0,5 m between centres, and not less than 0,2 m from outboard edge unless on side-decks less than 0,4 m wide



1) Note whether it is asymmetric by adding P (port) or S (starboard) to denote the larger side.


ISO 12217-3 CALCULATION WORKSHEET- No. 6b OFFSET LOAD TEST

Stability test

Full procedure

Design: " New Flamingo "

Boat being tested for: <input checked="" type="checkbox"/> stability <input type="checkbox"/> downflooding (use for either, please mark which)						
L_H (m)	Min. permitted freeboard margin (see table 4)	Max. permitted heel angle (°)	Intended crew limit (CL)	Intended design category	Mass test weights per person (kg) (cat D only)	Max. mass of test weights (kg) = (98 x CL)
2,6	0,24	Not permitted for opt.1	2	C		196
Does boat have a list? YES			If YES , to which side? S			
Is crew area asymmetric? NO			If YES , to which side? P / S			
Is downflooding asymmetric? YES / NO			If YES , to which side? P / S			
Boat tested: to P <input type="checkbox"/> to S <input checked="" type="checkbox"/> in both directions <input type="checkbox"/> (please mark)						

Test data:

Mass indent.	Location			Mass (kg)	Total mass (kg)	Lever (m)	Moment (kg · m)	Heel angle (°) P / S	Min. freeboard (m)	
	area	fore & aft							F	A
A	cockpit-	fore		75		-0.3	-22,5			
B	cockpit		aft	75		-0.3	-22,5			
A+B	cockpit	fore	aft		150	-0.3	-45,0	14,337 (S)	0.10	0.135

Max. mass of people allowed per above	150 kg	hence CL = 2	at	75 kg / person
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Design category given: C	Gunwale load test	PASS / FAIL	PASS
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Safety signs required	Figure Amd.1-3 Yes / No	Figure Amd.1-4 Yes / No
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ISO 12217-3 CALCULATION WORKSHEET- No. 7
FLOTATION TESTS
Annexes B and C
assumed Crew Limit (CL) = : 2
Preparation:

Item	Units	Response	Ref.
Mass equal to 25% of dry stores and equipment added?	YES / NO	YES	B.2 a)
Inboard or outboard engine fitted?		outboard	
If inboard fitted, correct engine replacement mass fitted?	YES / NO		B.2 d)
Assumed outboard engine power	kW	18,38	B.2 c)
Mass fitted to represent outboard engine, controls and battery	kg	61,3	Tables B.2 and B.3
Portable fuel tanks removed and/or fixed tanks are filled?	YES / NO	YES	B.2 f)
Cockpit drains open and drain plugs are fitted?	YES / NO		B.2 g)
Void compartments which are not air tanks are opened?	YES / NO		B.2 i)
Number of integral air tanks required to be opened			Table B.1
Type of test weights used: lead, 65/35 brass, steel, cast iron, aluminium		steel	
Material factor d		1,151	Table B.4

Swamped stability test (for Level Flotation):

Item	Units	Response	Ref.
Dry mass of test weights = $(6 d CL)$ but $> (15 d)$	kg	20	Table B.6
Test weight hung from gunwale each of four positions in turn?	YES / NO	YES	B.3.1
5 min. after swamping, boat floats with less than 45° heel?	PASS / FAIL		B.3.4 + .5

Swamped buoyancy tests (for Level and Basic Flotation):

Item	Units	Response	Ref.
Load Test (for Level and Basic Flotation)			B.4.2
Mass of maximum total load m_{MTL}	kg	199,685	3.3.2 + sheet 1
Design Category assessed		C	
Dry mass of test weights used	kg	110	Table B.5
5 min. after swamping, boat floats approximately level with more than 2/3rds of periphery above water?	PASS / FAIL		B.4.3
One Person Test (for Level Flotation boats where LH < 4,8 m only)			B.4.1
Test weights or actual person used?		Person	B.4.1.1
Mass of test weights/person loaded on inner bottom of boat	kg	82,5	B.4.1.1
5 min. after swamping, boat floats such that it can be pumped or bailed dry?	PASS / FAIL		B.4.1.3

Flotation material and elements:

Item	Response	Ref.
All flotation elements comply with all the requirements?	PASS / FAIL	PASS
Design Category given: NB: boat must obtain PASS in each relevant test above		



ISO 12217-3 CALCULATION WORKSHEET - No. 12

SUMMARY

Design Description: <u>Mini - Motorboat "New Flamingo"</u>					
Design Category intended: <u>C and D</u>		Crew Limit: <u>2</u>		Date: <u>21.01.2014</u>	
	Item	Symbol	Units	Value	
1	Length of hull: (as ISO 8666)	L_H	m	2,6	
	Mass:				
	Maximum total load	m_{MTL}	kg	199,685	
	Light craft condition mass	m_{LCC}	kg	154,766	
	Loaded displacement mass = $m_{LCC} + m_{MTL}$	m_{LDC}	kg	354,451	
1	Is boat sail or non-sail? SAIL / NON-SAIL				NON-SAIL
NB: If boat is sailing but is also equipped for use as a non-sailing boat, both must be examined					
2 & 3	Option selected:				
4	Downflooding openings: are all requirements met?		Units	Rqr'd	Actual
					Pass/Fail
4 or 5	Downflooding height:	Worksheet employed for basic height			Pass
	basic requirement	m	$\geq 0,3$	0,304	Pass
	reduced height for small openings (sheet 4 only)	m	\geq		
	reduced height at outboard (options 1 & 3 only)	m	$> 0,24$	0,304	Pass
	increased height at bow (options 1, 3, 5, 6 only)	m	\geq		
4	Outboard boats when starting: Are all requirements met? YES / NO?				YES
6	Offset load test:				Pass
	Testing for least stability: max. heel angle	degrees	$<$	14,337 (S)	Pass
	Testing for least freeboard: heeled freeboard margin	mm	≥ 100	135	Pass
7	Flotation test: (options 1, 6, 8 and 9 only) all preparations completed? YES / NO?				YES
	For Level Flotation assess items marked ^a , for Basis Flotation those marked ^b				
	Swamped stability ^a : 5 min after swamping, does boat heel less than 45°?				
	Load Test ^b : 5 min after swamping, does boat float level with ² / ₃ rds showing?				
	One Person Test ^a : 5 min after swamping does boat float so that it can be bailed?				
	Flotation elements ^a : do all elements comply with all the requirements?				
8	Basic Flotation by calculation: value of m_{TEST} / V_R			< 930	
9	Capsize Recovery Test: (options 3 & 7 only) are all requirements met?				
	Design Category recommended by the builder				
10	Knockdown Recovery Test: (options 8 & 10 only) PASS / FAIL?				
	Method used = experimental or theoretical?				
11	Wind Stiffness Test: (options 9 & 11 only) Cat C $v_W =$	m/s	≥ 11		
	Was reefed sail area used? (i.e.: are warning labels required?)				
	Cat D $v_W =$	m/s	≥ 6		
	Was reefed sail area used? (i.e.: are warning labels required?)				
NB: Boat must pass all requirements applicable to option to be given intended Design Category.					
Design Category given:		C and D	Assessed by:		Dipl. eng. Razmik Baharyan