


Calculation Cover Sheet

Calculation Title	Rolling Boat, Inc. PWC Carrier NMMA Load Capacity Test		
Drawing Number	n/a	Date	7/3/2008
Purpose of Calculation	Establish maximum persons and cargo load		
Performed By	Crescere Marine Engineering, Inc. P.O. Box 10766 Portland, OR 97296		
		503-286-1109 (tel)	503-286-3112 (fax)
Engineer	Tullio Celano III P.E.	Signature 	Date 7/3/08
Remarks	Load capacity test conducted IAW ABYC h-35.6.2.3 on 6/7/08 at Rolling Boat's facilities. Pelouze Scale calibration conducted by PSI, Portland, 2/12/08 0-150 lb. Boat recommended for 3250 lb capacity, based on test weight of 3642 lb.		

Revision History

Revision No.	Date Approved	Description of Revision
-	7/3/2008	Initial Issue



EXPIRATION DATE: 12/31/09



2 July, 2008

From: Tullio Celano III P.E.
To: National Marine Manufacturers Association
Via: Philip Kazmierowicz, Rolling Boat, Inc.

Subj: **PWC Capacity Test Details**

TEST CONDITIONS

A capacity test of the completed Rolling Boat PWC Carrier, which measures 20'-6" x 16', was conducted on 6/7/08 in accordance with ABYC h-35.3.2.3. The test was carried out in a freshwater pond at Rolling Boat's facilities. Water temperature and specific gravity were measured at 58° F and 1.00, respectively. The vessel was rigged with a 15 hp outboard motor, a davit crane, and railings. All production floor covering was in place. In all load conditions, precautions were taken to ensure that vessel was not affected by its moorings, or contact with the bottom. The test was observed and directed by a Naval Architect with a current Professional Engineer's license in the State of Oregon.

TEST WEIGHTS

The weights used for testing consisted of standard 5-gallon plastic buckets. The majority of the buckets were filled with cured concrete, with the remainder filled with sand. Each of the buckets was weighed as it was loaded aboard the vessel, utilizing a calibrated 0-150 lb scale, with a resolution of ± 0.2 lb, and a published accuracy of ± 0.5 lb. In practice, the scale has been used for other Coast Guard monitored tests, and has shown repeatability to within the 0.2 lb level.

The weights were supplemented on the longitudinal loading steps (h35.6.2.3.3) with human occupants. However, the transverse loading conditions turned out to be more limiting, and the vessel could not pass the test with additional weight. Figure 1 shows the test condition for the forward load case.



Figure 1 – Forward Load Condition

The weight placement was established for the longitudinal loading steps by locating the main row of weights on an established reference line, then placing buckets equally fore and aft, and stacking them above the main row.

Weight placement for the transverse loading conditions (h35.6.2.3.3) by placing the buckets along the rail, and stacking them two high. The weights were distributed along the length of the craft, meeting the intent of h35.6.2.3.2. The port loading condition is pictured in Figure 2.



Figure 2 – Port Load Condition



The following table provides the actual weight of each test weight used.

Bucket #		Weight (lb)	
1	109.4	A2	71.6
2	110	A3	71.2
3	110.4	A1	71
4	108.4	A5	71
5	111.6	A4	68.4
6	111.4	A6	72.6
7	109.6	A7	70.2
8	113.4	A8	72.8
9	108.4	A9	68.8
10	107.6	A10	71
11	109.6	A11	70
12	104.2	A12	70.8
13	108.4	A13	69.4
14	108.6	A14	71.4
15	112.6	A15	72.2
16	105.8	A16	70.4
17	104.6	A17	70
18	103.4	A18	68
19	106.4		
20	102.4		
21	103.2		
22	102.6		
Grand Total		3642.8 lb	

Figure 3 – Inventory of Test Weights

LOAD CONDITIONS

Each of load conditions utilized all of the buckets listed in Figure 3, placed a distance 12.91’ aft of the forward perpendicular, which corresponds to a point 3/4 aft on the useable deck surface. The available weights did not bring the vessel to a limiting criteria for the forward or aft load conditions, as defined by the end of the deck or top of engine bracket becoming immersed. Three people were used as additional weights, providing an additional 440 lb. The transverse loading conditions were limiting, and were used to determine the recommended capacity. The observed freeboard readings are listed below:

Load Case 1 (Weight Aft) Freeboards	Aft: 3.5”	Forward: 20.0”.
Load Case 2 (Weight Forward) Freeboards	Aft: 24.0”	Forward: 7.5”.
Load Case 3 (Weight Port) Freeboards	Aft: 4.5”/24.5” (P/S)	Forward: 7.0”/23.5 (P/S).
Load Case 4 (Weight Stbd) Freeboards	Aft: 24.0”/5.0” (P/S)	Forward: 25.0”/7.0 (P/S).

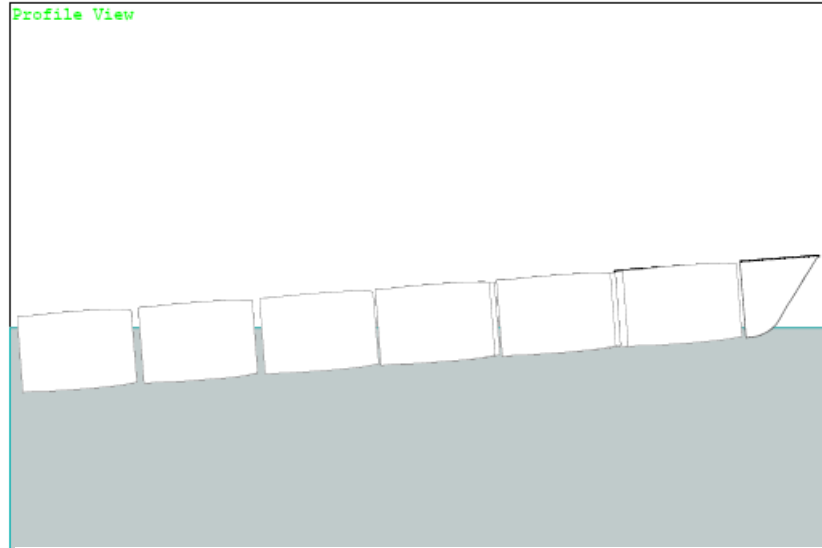
A numerical hydrostatic model of the vessel was subsequently set up to mimic the test conditions. A small amount of discrepancy between the observed and numerically predicted freeboard readings is evident, and is attributable to the small amount of torsional deflection seen in the boat seen at the extreme loading conditions. Despite the small differences, the computer



model predicts the same amount of weight required to reach a condition where the pontoons would become submerged. Figures 4-7 provide the output by load condition.

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LOAD CONDITION 1
3642.8 LB BUCKETS, NO PEOPLE
OBSERVED FREEBOARDS:
FWD PORT: 1.67', FWD STBD: 1.67', AFT PORT: 0.29', AFT STBD: 0.29'
CG - Draft: 0.24 @ 0.00 Trim: aft 4.35 deg. Heel: 0.00 deg.



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WEIGHT and DISPLACEMENT STATUS
Baseline draft: 0.242 @ Origin
Trim: Aft 4.35 deg., Heel: 0.00 deg.

Part	Weight (LB)	LCG	TCG	VCG		
LIGHT SHIP	2,700	7.50a	0.00	1.70		
OUTBOARD1SHP	132	19.50a	0.00	2.10		
FUEL	74	17.50a	0.00	2.50		
TESTWEIGHT	3,643	12.91a	0.00	3.00		
PEOPLE	440	12.00a	0.00	3.00		
Total Weight	6,989	10.94a	0.00	2.48		
	SpGr	Displ (LB)	LCB	TCB	VCB	RefHt
HULL	0.997	6,988	11.08a	0.00	0.61	-0.24
Righting Arms:			0.00	0.00		

HYDROSTATIC PROPERTIES

Trim: Aft 4.35 deg., Heel: 0.00 deg., VCG = 2.48

LCF	Displacement	Buoyancy-Ctr.	Weight/	Moment/				
Draft	Weight (LB)	LCB	VCB	Inch	LCF	Deg trim	GML	GMT
0.890	6,988	11.08a	0.61	778	8.51a	3390.29	27.8	19.36

Distances in FEET.-----Specific Gravity = 0.997.-----Moment in Ft-LB.
Draft is from Baseline.

CRITICAL POINT STATUS

Baseline draft: 0.242 @ Origin
Trim: Aft 4.35 deg., Heel: 0.00 deg.

Critical Points		LCP	TCP	VCP	Height
(1) STBD FORWARD	FLOOD	1.67f	4.00s	1.95	1.83
(2) PORT FORWARD	FLOOD	1.67f	4.00p	1.95	1.83
(3) STBD OUTBOARD	FLOOD	3.25a	8.00s	1.95	1.46
(4) PORT OUTBOARD	FLOOD	3.25a	8.00p	1.95	1.46
(5) STBD AFT	FLOOD	18.50a	4.00s	1.95	0.30
(6) PORT AFT	FLOOD	18.50a	4.00p	1.95	0.30

Distances in FEET.-----

Figure 4 – Numerical Simulation of Load Case 1

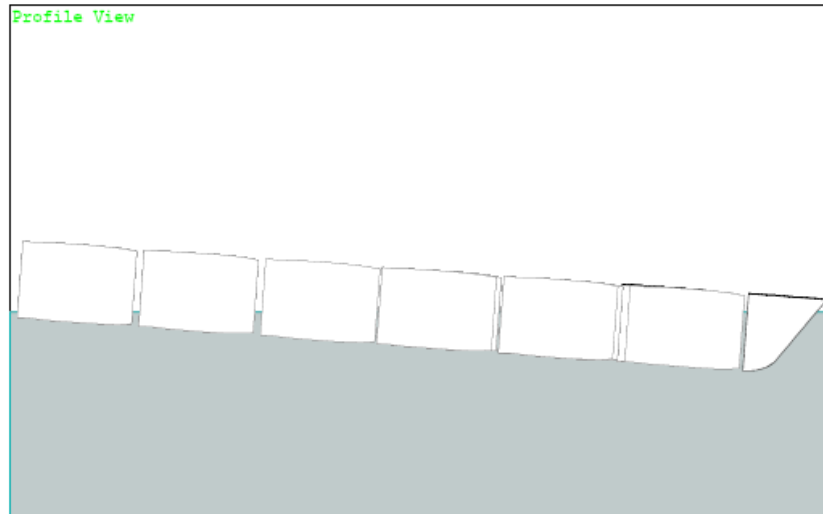


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LOAD CONDITION 2
Note: Weight item "TESTWEIGHT" replaced.
Note: Weight item "PEOPLE" replaced.
3642.8 LB BUCKETS, NO PEOPLE
OBSERVED FREEBOARDS:
FWD PORT: 0.625', FWD STBD: 0.625', AFT PORT: 2.0', AFT STBD: 2.0'
CG - Draft: 1.48 @ 0.00 Trim: fwd 4.19 deg. Heel: 0.00 deg.



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WEIGHT and DISPLACEMENT STATUS
Baseline draft: 1.481 @ Origin
Trim: Fwd 4.19 deg., Heel: 0.00 deg.

Part	Weight (LB)	LCG	TCG	VCG
LIGHT SHIP	2,700	7.50a	0.00	1.70
OUTBOARD15HP	132	19.50a	0.00	2.10
FUEL	74	17.50a	0.00	2.50
TESTWEIGHT	3,643	4.50a	0.00	3.00
PEOPLE	440	4.00a	0.00	3.00
Total Weight	6,989	6.05a	0.00	2.48

HULL	SpGr	Displ (LB)	LCB	TCB	VCB	RefHt
	0.997	6,988	5.91a	0.00	0.60	-1.48

Righting Arms: 0.00 0.00
Distances in FEET.

HYDROSTATIC PROPERTIES
Trim: Fwd 4.19 deg., Heel: 0.00 deg., VCG = 2.48

LCF	Displacement	Buoyancy-Ctr.	Weight/	Moment/
Draft	Weight (LB)	LCB	VCB	Inch
0.916	6,988	5.91a	0.60	816
				7.72a
				3590.00
				29.4
				21.18

Distances in FEET. Specific Gravity = 0.997. Moment in Ft-LB.
Draft is from Baseline.

CRITICAL POINT STATUS
Baseline draft: 1.481 @ Origin
Trim: Fwd 4.19 deg., Heel: 0.00 deg.

Critical Points	LCP	TCP	VCP	Height
(1) STBD FORWARD	FLOOD	1.67f	2.40s	2.00
(2) PORT FORWARD	FLOOD	1.67f	2.40p	2.00
(3) STBD OUTBOARD	FLOOD	3.25a	8.00s	2.00
(4) PORT OUTBOARD	FLOOD	3.25a	8.00p	2.00
(5) STBD AFT	FLOOD	18.50a	4.00s	2.00
(6) PORT AFT	FLOOD	18.50a	4.00p	2.00

Distances in FEET.

Figure 5 – Numerical Simulation of Load Case 2



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LOAD CONDITION 3

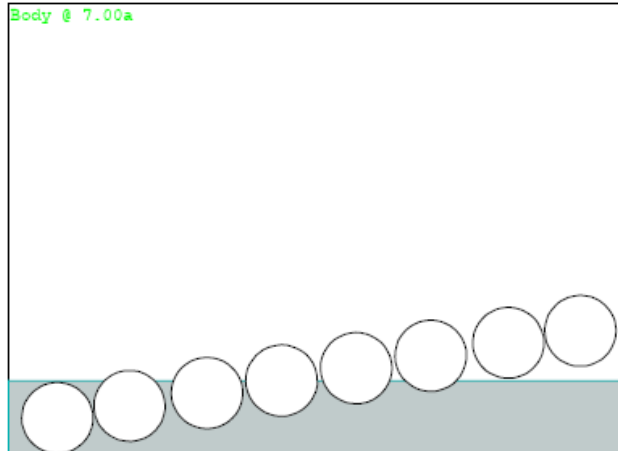
Note: Weight item "TESTWEIGHT" replaced.

3642.8 LB BUCKETS, NO PEOPLE

OBSERVED FREEBOARDS:

FWD PORT: 0.58', FWD STBD: 1.96', AFT PORT: 0.38', AFT STBD: 2.04'

CG - Draft: 0.82 @ 0.00 Trim: fwd 0.30 deg. Heel: port 9.51 deg.



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WEIGHT and DISPLACEMENT STATUS

Baseline draft: 0.821 @ Origin

Trim: Fwd 0.30 deg., Heel: Port 9.51 deg.

Part	Weight (LB)	LCG	TCG	VCG		
LIGHT SHIP	2,700	7.50a	0.00	1.70		
OUTBOARDISHP	132	19.50a	0.00	2.10		
FUEL	74	17.50a	0.00	2.50		
TESTWEIGHT	3,643	8.30a	5.00p	3.00		
Total Weight	6,549	8.30a	2.78p	2.44		
	SpGr	Displ (LB)	LCB	TCB	VCB	RefHt
HULL	0.997	6,549	8.07a	3.07p	0.70	-0.81
Righting Arms:			0.23f	0.00p		

Distances in FEET.

HYDROSTATIC PROPERTIES

Trim: Fwd 0.30 deg., Heel: Port 9.51 deg., VCG = 2.44

LCF	Displacement	Buoyancy-Ctr.	Weight/	Moment/				
Draft	Weight (LB)	LCB	VCB	Inch	LCF	Deg trim	GML	GMT
0.774	6,549	8.07a	0.70	600	8.97a	3444.75	30.1	4.88

Distances in FEET.-----Specific Gravity = 0.997.-----Moment in Ft-LB.
Draft is from Baseline.

CRITICAL POINT STATUS

Baseline draft: 0.821 @ Origin

Trim: Fwd 0.30 deg., Heel: Port 9.51 deg.

Critical Points		LCP	TCP	VCP	Height
(1) STBD FORWARD	FLOOD	1.67f	4.00s	1.95	1.77
(2) PORT FORWARD	FLOOD	1.67f	4.00p	1.95	0.44
(3) STBD OUTBOARD	FLOOD	3.25a	8.00s	1.95	2.45
(4) PORT OUTBOARD	FLOOD	3.25a	8.00p	1.95	-0.19
(5) STBD AFT	FLOOD	18.50a	4.00s	1.95	1.87
(6) PORT AFT	FLOOD	18.50a	4.00p	1.95	0.55

Distances in FEET.

Figure 6 – Numerical Simulation of Load Case 3



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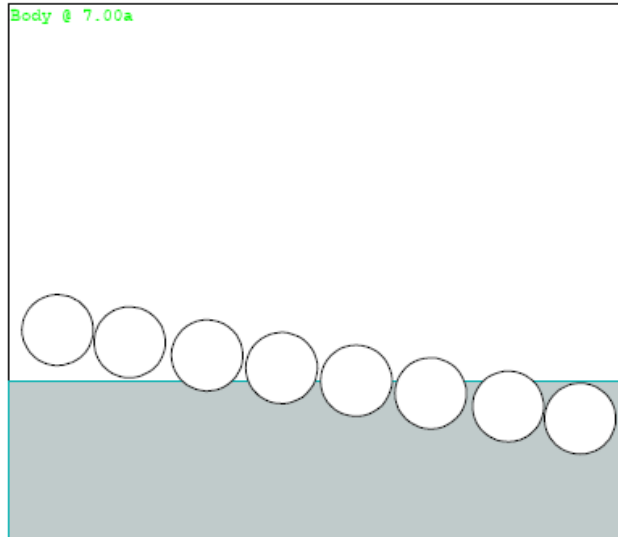
LOAD CONDITION 4

Note: Weight item "TESTWEIGHT" replaced.
3642.8 LB BUCKETS, NO PEOPLE

OBSERVED FREEBOARDS:

FWD PORT: 2.0', FWD STBD: 0.42', AFT PORT: 2.08', AFT STBD: 0.58'

CG - Draft: 0.75 @ 0.00 Trim: aft 0.13 deg. Heel: stbd 9.67 deg.



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WEIGHT and DISPLACEMENT STATUS

Baseline draft: 0.750 @ Origin

Trim: Aft 0.13 deg., Heel: Stbd 9.67 deg.

Part	Weight (LB)	LCG	TCG	VCG		
LIGHT SHIP	2,700	7.50a	0.00	1.70		
OUTBOARD15HP	132	19.50a	0.00	2.10		
FUEL	74	17.50a	0.00	2.50		
TESTWEIGHT	3,643	8.30a	5.00s	3.00		
Total Weight	6,549	8.30a	2.78s	2.44		
HULL	SpGr 0.997	Displ (LB) 6,549	LCB 8.30a	TCB 3.08s	VCB 0.70	RefHt -0.74
Righting Arms:		0.00f	0.00s			

Distances in FEET.

HYDROSTATIC PROPERTIES

Trim: Aft 0.13 deg., Heel: Stbd 9.67 deg., VCG = 2.44

LCF	Displacement	Buoyancy-Ctr.	Weight/	Moment/
Draft	Weight (LB)	LCB	VCB	Inch
0.771	6,549	8.30a	0.70	600
				9.03a
				3446.74
				30.2
				4.97

Distances in FEET. Specific Gravity = 0.997. Moment in Ft-LB.
Draft is from Baseline.

CRITICAL POINT STATUS

Baseline draft: 0.750 @ Origin

Trim: Aft 0.13 deg., Heel: Stbd 9.67 deg.

Critical Points	LCF	TCP	VCP	Height
(1) STBD FORWARD	FLOOD 1.67f	4.00s	1.95	0.51
(2) PORT FORWARD	FLOOD 1.67f	4.00p	1.95	1.86
(3) STBD OUTBOARD	FLOOD 3.25a	8.00s	1.95	-0.17
(4) PORT OUTBOARD	FLOOD 3.25a	8.00p	1.95	2.52
(5) STBD AFT	FLOOD 18.50a	4.00s	1.95	0.47
(6) PORT AFT	FLOOD 18.50a	4.00p	1.95	1.81

Distances in FEET.

Figure 7 – Numerical Simulation of Load Case 3

