



# MARINE OPERATIONS MANUAL

For  
**SEACOR POWER**



WDG 3592

O.N. 1115290

CALL SIGN: ~~WDJU~~

SEMCO HULL 1009

166'-6" x 103'-0" x 13'-0" Liftboat with 265' Legs

Revision 4

October 21, 2014

**REVIEWED**

Details of this review are as indicated in the ABS letter



## 4. DESIGN OPERATING LIMITS

### 4.1 LIGHTSHIP AND VARIABLE LOAD

#### 4.1.1 Drafts and Displacements

Condition	Draft	Displacement
Lightship	7'-11 1/2"	2,295.85 LT (5,142,701 lbs)
Loadline	9'-9"	3,049.916 LT (6,831,812 lbs)

#### 4.1.2 Lightship

##### 4.1.2.1 LIGHTSHIP ITEMS

Lightship means the hull, quarters, and all equipment permanently attached and necessary for normal operations. The lightship weight includes, but is not limited to, the following items: the hull steel; legs and pads; liquid in the piping systems; jack towers; wiring; lighting systems; tank vents; sounding tubes; aids to navigation; cleats; manholes; handrails; watertight doors; cranes; quarters; propulsion gear; foundations; generators; engines; control panels and etc.

##### 4.1.2.2 LIGHTSHIP CHARACTERISTICS

The lightship characteristics for the *Seacor Power* are listed in the table below. The values are with the legs completely raised. Because the legs are raised and lowered during jacking operations, they have an adjustable VCG.

Table 4-1 Lightship Weights and Centers of Gravity

ITEM	WEIGHT (L.T.)	LCG (ft. from bow)	TCG (ft.) - port, + stbd.	VCG (ft.) above BL
Lightship with legs fully raised	2520.50	87.60	1.53	43.78
Hull and fixed equipment (no legs or pads)	1664.52	89.71	2.32	10.86
Three (3) legs and pads	855.98	83.50	0.00	107.80
NOTE: legs may be lowered different distances so the individual leg numbers are given below.				
ITEM	WEIGHT (L.T.)	LCG (ft. from bow)	TCG (ft.) - port, + stbd.	VCG (ft.) fully raised
Port leg and pad	285.53	45.00	-45.50	107.80
Stbd leg and pad	285.53	45.00	+45.50	107.80
Aft leg and pad	285.53	160.50	0.00	107.80

##### 4.1.2.3 LIGHTSHIP CHANGES

The Vessel Master shall keep in mind that alterations or modifications made to the vessel will affect its lightship characteristics. For example, the removal or replacement

## 4.2 OPERATING LIMITATIONS

### 4.2.1 General Operating Information

#### 4.2.1.1 WEATHER MONITORING

The Vessel Master shall monitor the weather every 8 hours for normal operations, and every 4 hours whenever a heavy-weather forecast is pending. For additional information, see ¶6.1 *Heavy Weather*, ¶6.2 *Heavy Fog Operations* and ¶6.3 *Tropical System / Hurricane*.

#### 4.2.1.2 VESSEL PERIOD IN SYNC WITH WAVES

The number of degrees the vessel moves off an even keel when underway is called the “vessel amplitude.” The time in seconds it takes for the vessel to complete one full port-to-starboard or fore-and-aft rotation is called the “vessel period.” Time five (5) periods and use the average for the most accurate results.

When the natural period of the vessel and the natural period of environmental forces correspond or get in sync, the vessel’s roll and/or pitch amplitude will begin to increase without any noticeable change in the sea state. **Correct immediately** by changing course or speed.

#### 4.2.1.3 WATERTIGHT INTEGRITY

Watertight integrity is essential for safety and damage stability. The Vessel Master shall ensure that personnel are familiar with the location of all watertight closures and the following requirements:

1. When afloat, all watertight doors and hatches (on and below the main deck) shall be closed and secured when not in actual use.
2. When afloat, bolted plate closures/manholes on watertight bulkheads and main deck shall be closed and secured.
3. The initial securing of main-deck doors, manholes and hatches for a move shall be noted on *FO 560 Pre-Departure Check*.
4. In the event of flooding, area doors, vents, and vent valves shall be closed and secured to contain the flooding. They shall remain secured until the Master is satisfied that the cause and extent of area flooding has been determined and contained. For additional information, see all under heading ¶7.6 *Damage to a Hull Compartment*.
5. Shore filling connections for fuel oil and potable water shall be kept closed when not in use.
6. Penetrations through bulkheads (ventilation ducts, electrical cableways, piping, etc.) shall be maintained watertight.
7. Hull penetrations below the waterline shall be checked on a regular basis.

8. New penetrations through watertight bulkheads require prior approval from SLMD Management and the Class Society (if the vessel is classed).

**Table 4-4 WT Closure Status Afloat**

Item	Status
Companionway watertight doors	Closed and secured
Hatches to below-deck areas	Closed and secured
Inspection plates and manholes on main deck and in watertight bulkheads	Gasketed and bolted
Below-deck watertight doors	Closed and secured
Ventilation ducts, piping and other penetrations through watertight bulkheads	Maintained watertight.
Preload dump valves	Closed
Bilge control and manifold valves	Closed
Bottom plugs and dump valves	Closed
Shore filling connections, diesel and potable water	Closed
Fill-line stop valves on machinery deck	Closed
Submersible pump hose connections	Disconnected and capped

**Table 4-5 Watertight Door List**

TYPE OF CLOSURE	DESCRIPTION	SIZE	COAMING HEIGHT	LOCATION
not available				

See the drawings in ¶18.3 *Through Hull Openings* for additional information.

**4.2.2 Operating Limits in Afloat Mode**

**4.2.2.1 ENVIRONMENT, LOADING, AND STOWAGE**

The following afloat limits and conditions have been approved by the USCG.

**Table 4-6 Restrictions when Afloat**

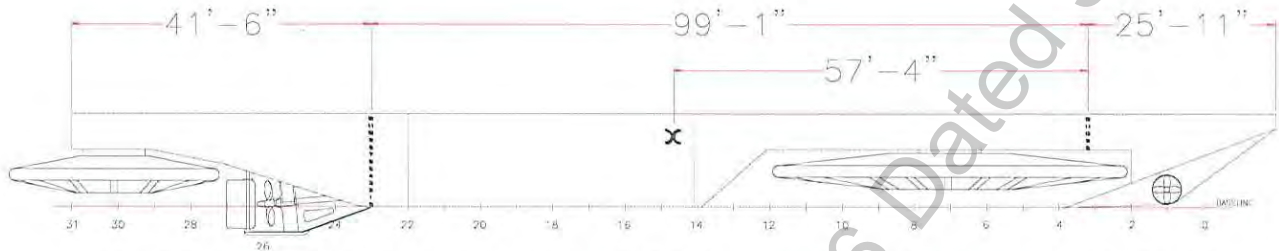
Loadline Draft or Maximum Allowable Draft	9.75 Feet – The loadline draft is not to be exceeded under any circumstances
Maximum Trim	Vessel shall not be trimmed by the bow at any time.
Wind Speed (legs fully raised)	70 Knots
Wave Height	5 Feet
Wave Period	not available
Maximum Deck Load	1,000,000 lbs. (446.43 LT)
Load Line Displacement	3,049.916 LT
Maximum Seas (jacking operations)	5 Feet (trough to crest) – Field moves in excess of 5 feet are prohibited.
Maximum Seas (underway)	Twice the freeboard or 5 Feet (trough to crest) whichever is the most conservative.
Maximum Deck Load Height (average)	26' above main deck
Route	Limited to GOM not more than 12 hours from harbor of safe refuge or location where vessel may elevate to survive 100 knots of wind
Safe Harbor	Maximum water depth 70 ft.
WT Doors, Hatches, and Manholes	Must be closed and dogged or bolted.
Deck Cargo	Must be secured.
Cranes	Booms must be stowed and secured
Bilges	Must be pumped to minimum content at all times

Stability shall be calculated prior to moving the vessel to ensure that the variable load does not exceed the maximum allowable and the KG (VCG) does not exceed the Maximum Allowable VCG Curve.

#### 4.2.2.2 DRAFT MARKS

Four sets of draft marks are located on the sides of the vessel. The numerals are 6 inches high.

Figure 4-1 Draft Mark Locations



Draft is indicated in feet at the bottom of the numeral. To determine the draft of the vessel amidships on the port or stbd side:

$$\Delta_{\text{draft}} = \text{Aft}_{\text{draft}} - \text{Fwd}_{\text{draft}}$$

$$\text{Midship}_{\text{draft}} = 0.58 \times \Delta_{\text{draft}} + \text{Fwd}_{\text{draft}}$$

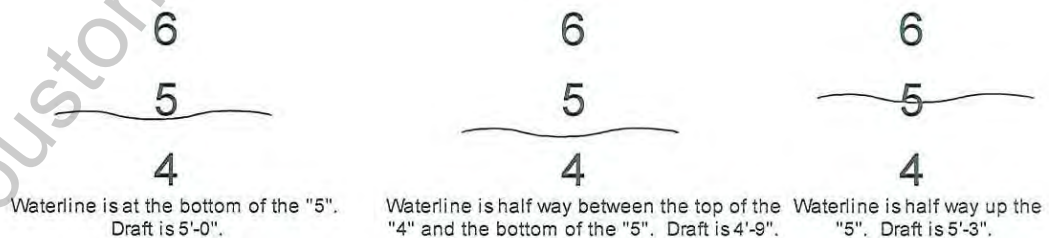
Average the port and stbd drafts at amidships to obtain the actual draft of the vessel.

Table 4-7 Sample Draft Calculation

	Draft Readings	$\Delta_{\text{draft}}$	Midship <sub>draft</sub>	Vessel Draft
Port Fwd	7'-9" (7.75')			
Port Aft	9'-3 (9.25')	1'-6" (1.5')	$(0.58 \times 1.5) + 7.75 = 8.62'$	
Stbd Fwd	7'-3" (7.25')			
Stbd Aft	9'-3" (9.25')	2'-0" (2.0')	$(0.58 \times 2.0) + 7.25 = 8.41'$	$(8.62 + 8.41)/2 = 8.52'$

Figure 4-2 How to read Draft Marks demonstrates the proper way to take draft readings.

Figure 4-2 How to read Draft Marks



### 5.6.3 Underway Precautionary Measures

1. Applicable guidelines set forth in *DOG 015 Vessel Afloat/Elevated Stability* shall be adhered to.
2. Applicable guidelines set forth in *DOG 016 Vessel Maneuvering/Positioning* shall be adhered to.
3. Maintain watertight integrity. For additional information, see ¶4.2.1.3 *Watertight Integrity*.
4. When running the vessel under certain wind and wave conditions, the legs may tend to whip in the support towers. This condition can fatigue and crack the steel supports, and the Vessel Master should consider changing course and/or speed.
5. If possible, moves should always be conducted when good weather and calm seas are predicted for the duration of the move. Each watch shall receive and record at least one adequate weather report for the course and location of the vessel.
6. Vessel Master shall:
  - (a) Ensure that the vessel remains in a seaworthy condition with deck cargo properly distributed (trim and heel approximately level) and secured (chained down or welded).
  - (b) Ensure that watchstanding requirements are maintained as stipulated under ¶11.2 *Vessel Manning/Watchstanding Procedure*.
  - (c) Notify destination at least 30 minutes in advance of arrival. Verify that there are no obstructions (lines, flow-lines, platform decks, etc.) above or below the legs.
  - (d) Never use the cranes or shift deck cargo while the vessel is afloat and underway.
  - (e) Monitor the movement of passengers throughout the vessel for safety. See ¶5.2.1 *Underway* and ¶5.2.2 *Jacking Operations* for additional information in regard to passenger safety.
  - (f) Abide by the rules of good seamanship at all times.
  - (g) Except when pumping bilges or stripping tanks, keep the valves at the end of bilge branch sections and stripping lines closed to prevent the possibility of progressive flooding.

### 5.6.4 Close Quarter Maneuvering

#### 5.6.4.1 VISIBLE HAZARDS

Incident free vessel movement in close quarters with adjacent vessels, docks, structures and/or other visible hazards is dependent upon a variety of critical factors. Adverse wind and current conditions, coupled with the need for close quarter maneuvering, can make for "risky" vessel operations.

In the event that wind and current, in conjunction with visible hazards, have created a potential for "loss of control" of the vessel, the Vessel Master shall:

## 6. ABNORMAL OPERATIONS – ENVIRONMENTAL CONDITIONS

### 6.1 HEAVY WEATHER

Heavy weather (tropical system or high winds, seas, and swells forecast) and heavy fog are hazardous situations. Heavy weather can curtail elevated operations and cause excessive motion when the vessel is underway.

Severe storms sometimes disrupt offshore activities. The best defense against storms is an alert crew (knowledge of changing weather patterns) and advance preparation. The Vessel Master shall ensure that crewmembers understand the duties they must perform should an evacuation become necessary.

#### 6.1.1 Weather Monitoring

When a heavy-weather forecast is received, the Vessel Master shall follow this procedure:

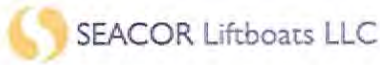
1. Continue to monitor weather closely. Obtain forecasts by any means possible, from the client, office, USCG, insurance surveyors, etc.
2. Inasmuch as weather data obtained from different sources often varies, consider the most conservative values.
3. Plan to move the vessel in case the weather continues to deteriorate.
4. Plan to suspend operations before the weather reaches the vessel. Allow ample time to secure the vessel and ensure the safety of personnel.
5. Use the table below for guidance only. Remember, total preparation time is not the sum of all times given. Actions can be carried out simultaneously.

**Table 6-1 Estimated Preparation Times**

ITEM	APPROXIMATE TIME (HOURS)
Check lifesaving equipment	2.0
Close all hatches, vents, WT doors, and manholes	1.0
Secure all loose materials on deck	4.0
Secure crane booms and hooks	1.0
Jettison or reposition variable load	6.5
Brief crew	1.0
Shut down all systems and check navigation lights	1.0

**Vessel Master shall ensure that the vessel is secured before heavy weather arrives. It is much better to work with a margin of safety than risk an accident.**





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**8.8 AFLOAT CALCULATION FORM**

Hull and fixed equipment	1664.52	149,322	3,856	18,069
Legs	855.98	71,474	0	92,279
Crew, PACs, supplies				
Consumables in tanks				
Seawater				
Deck Cargo				
<b>TOTAL AFLOAT</b>				
<b>TOTAL JACKING LOAD = Total Afloat - Legs =</b>				
<b>TOTAL VARIABLE LOAD = Total Afloat - Hull - Legs =</b>				

NOTES:

- All weights are in Long Tons (2240 pounds); all dimensions are in feet.
- The VCG's are measured above keel (+)
- The LCG's are measured from the bow (+ aft). Midships = 83.25 aft of bow.
- The TCG's are measured from centerline (- port / stbd +)

MAXIMUM ALLOWABLE DRAFT =  
MAXIMUM VARIABLE =

**INSTRUCTIONS FOR AFLOAT CALCULATIONS:**

- Enter the weight, LCG, TCG, and VCG of each item. Enter the number of gallons, sounding, and Free Surface Moment (FSM) of each tank.
- For each item, multiply the weight x LCG to obtain the longitudinal moment. Write it in the appropriate box.
- For each item, multiply the weight x TCG to obtain the transverse moment. Write it in the appropriate box.
- For each item, multiply the weight x VCG to obtain the vertical moment. Write it in the appropriate box.
- Subtotal the weights and moments.
- Transfer the weights and moments to page 2 and add the columns to obtain the Total Afloat. Use the formulas above to obtain Total Jacking Load and Total Variable Load.
- Divide the Total Afloat moments by the Total Afloat weight to obtain the CG's.
 

LCG = Total Longitudinal Moment / Total Weight =	<input type="text"/>	÷	<input type="text"/>	=	<input type="text"/>
TCG = Total Transverse Moment / Total Weight =	<input type="text"/>	÷	<input type="text"/>	=	<input type="text"/>
VCG = Total Vertical Moment / Total Weight =	<input type="text"/>	÷	<input type="text"/>	=	<input type="text"/>

8 The following values, corresponding to the Displacement (Total Weight), can be obtained from the Hydrostatic Tables or Curves.

Mean Draft =   
LCB =   
KML =   
KMT =

- Free Surface Correction = Total Free Surface Moment / Total Afloat Weight =  ÷  =
- Actual KG = VCG + Free Surface Correction =  +  =

Allowable KG from curve =

**11 TRIM CALCULATION:**

Trim Lever = LCG - LCB =  -  =   
 GML = KML - Actual KG =  -  =   
 Trim = Trim Lever x L / GML =  x  ÷  =  feet

Positive trim indicates down by the stern. Negative trim indicates down by the bow. The vessel afloat should have no more than 6" of trim by the stern.

**12 HEEL CALCULATION:**

GMT = KMT - Actual KG =  -  =   
 Heel = TCG x B / GMT =  x  ÷  =  feet

Positive heel indicates down on the starboard side. Negative heel indicates down on the port side. The vessel afloat should be as close to level heel as possible.



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**8.15 TABLE OF HYDROSTATIC PROPERTIES**

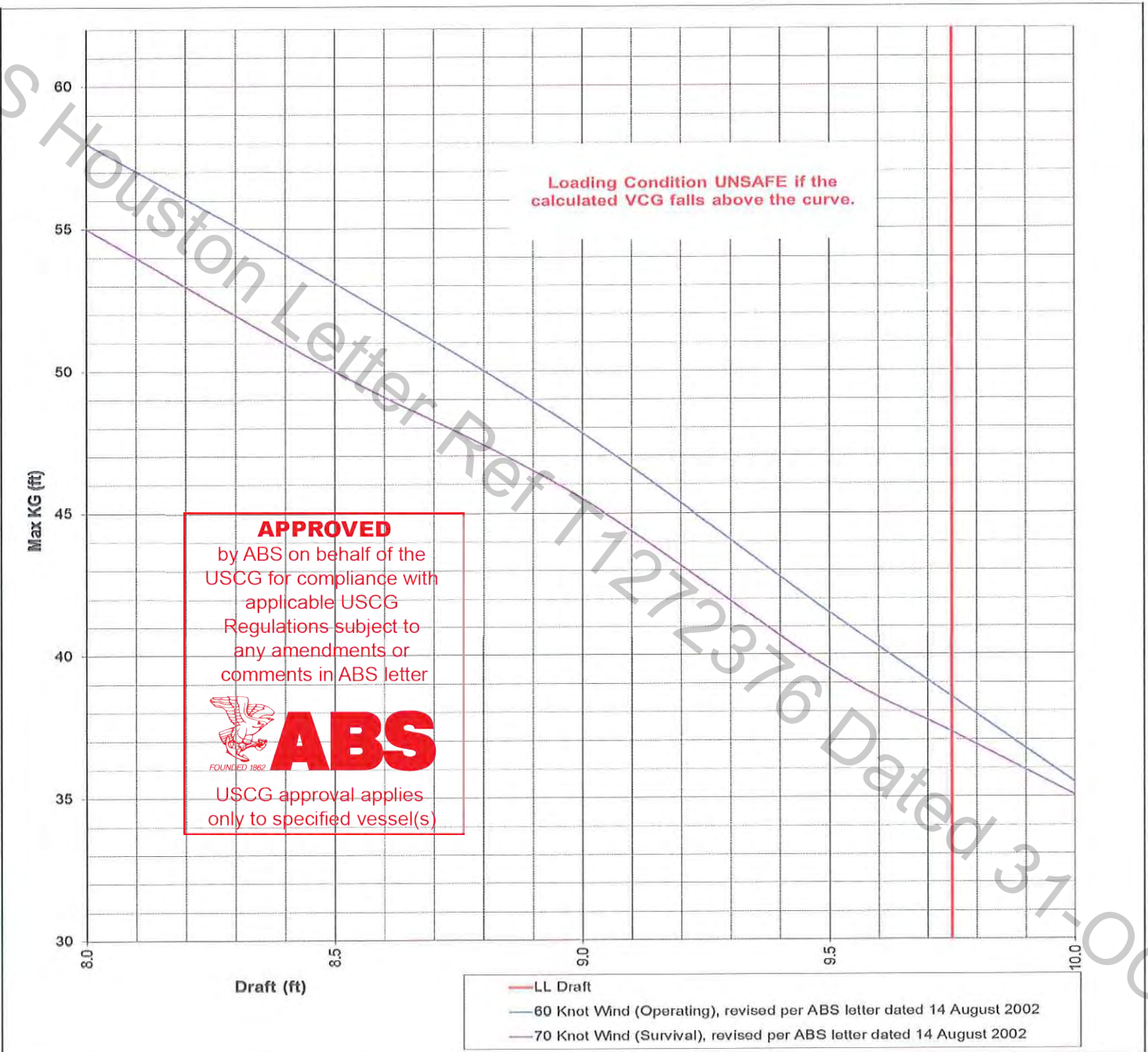
LCF draft (feet)	Weight				LCB (ft) measured		KML (feet)	KMT (feet)
	Fresh Water		Salt Water		from Fr.0	Bow		
	(kips)	(LT)	(kips)	(LT)				
5.00	2,815.319	1,256.839	2,887.507	1,289.065	72.519	82.519	391.908	182.738
5.25	2,994.815	1,336.971	3,071.605	1,371.252	72.509	82.509	376.619	172.473
5.50	3,175.138	1,417.472	3,256.552	1,453.818	72.494	82.494	357.968	160.950
5.75	3,354.568	1,497.575	3,440.583	1,535.974	72.474	82.474	332.894	146.453
6.00	3,530.248	1,576.004	3,620.767	1,616.414	72.447	82.447	307.192	133.939
6.25	3,707.026	1,654.922	3,802.078	1,697.356	72.415	82.415	301.869	129.253
6.50	3,886.681	1,735.125	3,986.339	1,779.616	72.382	82.382	303.119	126.873
6.75	4,071.591	1,817.675	4,175.991	1,864.282	72.339	82.339	305.461	126.410
7.00	4,262.023	1,902.689	4,371.306	1,951.476	72.286	82.286	307.369	124.911
7.25	4,456.584	1,989.546	4,570.855	2,040.560	72.226	82.226	301.513	120.036
7.50	4,651.946	2,076.762	4,771.227	2,130.012	72.157	82.157	271.380	104.648
7.75	4,845.209	2,163.040	4,969.445	2,218.502	72.081	82.081	281.740	108.509
8.00	5,043.589	2,251.602	5,172.912	2,309.336	72.000	82.000	303.773	138.959
8.25	5,271.487	2,353.342	5,406.653	2,413.685	71.952	81.952	345.638	134.102
8.50	5,500.446	2,455.556	5,641.483	2,518.519	71.895	81.895	335.779	129.548
8.75	5,730.461	2,558.242	5,877.396	2,623.837	71.828	81.828	326.676	125.340
9.00	5,961.531	2,661.398	6,114.391	2,729.639	71.753	81.753	318.260	121.442
9.25	6,193.652	2,765.023	6,352.464	2,835.921	71.670	81.670	310.432	117.816
9.50	6,426.815	2,869.114	6,591.605	2,942.681	71.581	81.581	303.153	114.435
9.75	6,661.017	2,973.668	6,831.812	3,049.916	71.486	81.486	296.339	111.270
10.00	6,896.247	3,078.682	7,073.074	3,157.622	71.386	81.386	289.951	108.299
10.25	7,132.490	3,184.147	7,315.374	3,265.792	71.281	81.281	283.955	105.505
10.50	7,369.740	3,290.063	7,558.708	3,374.423	71.173	81.173	278.282	102.861
10.75	7,607.973	3,396.417	7,803.049	3,483.504	71.060	81.060	272.908	100.356
11.00	7,847.167	3,503.200	8,048.376	3,593.025	70.945	80.945	267.768	97.965
11.25	8,086.818	3,610.187	8,294.172	3,702.755	70.832	80.832	260.123	95.378
11.50	8,326.466	3,717.172	8,539.965	3,812.484	70.725	80.725	252.964	92.961
11.75	8,566.115	3,824.158	8,785.759	3,922.214	70.625	80.625	246.212	90.685
12.00	8,805.764	3,931.145	9,031.553	4,031.943	70.503	80.503	239.835	88.540

**NOTES:**

- 1) Draft is from Baseline, LCB is from the bow.
- 2) Specific Gravity = 1.0256 for salt water and 1.0 for fresh water
- 3) No Trim, No heel,
- 4) VCG = 0.00

No part of a report of a marine casualty investigation shall be admissible as evidence in any civil or administrative proceeding, other than an administrative proceeding initiated by the United States, 46 U.S.C. §6308.

8.16 AVCG CURVE



See ABS Houston Letter Ref T1272376

37-OCT-2014

- (d) Leave the controls while a load is suspended from the crane.
- (e) Elevate a load unnecessarily high. Only elevate to the height needed to clear the deck, ground or barrier.

### 9.3.6 **Securing Crane**

Crane operators shall follow this procedure:

1. Land any attached load or device.
2. Lower boom into cradle.
3. Secure load blocks.
4. Set boom snubbers or secure boom by taking tension on load line with load block secured.
5. Put all controls in neutral position.
6. Stop prime mover.
7. Secure the cab (if equipped).

## 9.4 **RIGGING EQUIPMENT**

### 9.4.1 **Rigging Reference Documents**

For further information regarding the use, maintenance and inspection of onboard rigging equipment, see:

- *HSE Manual, Section 6.92, USE AND MAINTENANCE OF RIGGING*
- *OS 010-00 Crane Inspections, Part III, Item D, Bi-Weekly Rigging Inventory & Inspection Report*
- *Employee Safety & Environmental Compliance Manual, Section XI, USE AND MAINTENANCE OF RIGGING*
- *Crane Inspection & Maintenance Standard, Second Edition, Section B, Item 7, Bi-Weekly Rigging Inventory and Inspection Report*

### 9.4.2 **Use and Maintenance of Rigging**

Crewmembers (including Vessel Master) shall understand and follow these instructions in regard to the use and maintenance of onboard rigging equipment.

1. Vessel Master:
  - (a) Crew members whose duties include attaching or detaching loads to a lifting device must first undergo Rigger Training.
  - (b) Transport all out-of-service rigging equipment to the respective Marine Division Facility at the first opportunity.
  - (c) Maintain a vessel file of certification documents that correspond to sling certifications.

**18.6.8 Leg High Water Alarms**

