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**APPROVED**
This approval covers only ABS requirements and does not include items not required by ABS. Details of this approval are set forth in the ABS letter.

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on behalf of the government of the vessel's registry subject to conditions of ABS letter

ABS

WITH ABS AMENDMENTS ON PAGES 9, 68, & 114

WITH ABS COMMENTS #s N/A

# SEACOR Marine

## FALCON DIAMOND

## Operations Manual

STATE OF LOUISIANA
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SIGNED COPY ON FILE

## 0722-010-005

| Rev | Date | Description | Author | Checked | Appr'd |
|---|---|---|---|---|---|
| C0 | 12/19/2016 | Issued for Approval | WAS | CMT | DMB |
| C1 | 4/17/17 | Revised for 17 gears per leg | CMT | LETM | KFH |
| C2 | 9/5/2017 | Added Section 17.1.4 referencing Ballast Water Management Plan (BWMP) | CMT | CMT | KFH |
| C3 | 10/16/2023 | Updates detailed in Section 3 | LETM | DMB | DMB |
| C4 | 10/24/2023 | Updated Max Penetration | LETM | DMB | DMB |
| C5 | 1/12/2024 | Updates detailed in Section 3 | LETM | DMB | DMB |

# 1 Contents

**APPENDICES**

# Figures & Tables

# 2 Abbreviations & Definitions

- ABL – Above the molded baseline
- AP – Aft Perpendicular (Frame 52)
- BL – Baseline – vertical reference point located on a plane that passes through the deepest molded point on the hull (top of bottom shell plate)
- CL – Longitudinal centerline of the vessel
- cm – centimeter. 1 cm = 1/100 m
- Displacement – Weight of the vessel in a specific condition of loading
- Deadweight – the variable load of the vessel including, but not limited to, liquid loads, deck cargo, personnel, personal effects, stores, and spare parts. The displacement of the vessel minus the lightship weight equals the deadweight.
- FO – Fuel Oil at 0.867 specific gravity
- FP – Forward Perpendicular (Frame 0)
- FSC – Free Surface Correction
- FSM – Free Surface Moment
- ft – feet
- FW – Fresh Water at 1.000 specific gravity
- GAL – Gallon
- HO – Hydraulic Oil at 0.890 specific gravity
- KIPS – Unit of weight, 1 kip equals 1000 lbs
- KG – Vertical Center of Gravity above Baseline (also VCG)
- KMt – Transverse Metacenter above the Molded Baseline
- kN –kilonewton (unit of force), 1 kN = 0.102 tonnes
- L – Liter. 1 L = 0.2642 Gallons
- lbs – pounds
- LCG – Longitudinal Center of Gravity aft of the FP
- LCF – Longitudinal Center of Floatation, measure aft of the FP
- Lightship – the vessel complete in all respects without the variable loads

- LO – Lube Oil at 0.910 specific gravity
- LT – Long Tons. 1 LT = 2,240 lbs.
- m – Meter. 1m = 3.28 feet
- MT – metric ton. 1 MT = 1000 kilograms = 9.81 kN = 1.016 Long Tons
- Molded Draft – draft to the baseline of the hull. All references to draft in this manual refer to the molded draft of the hull unless noted otherwise.
- Navigational Draft – draft measured to the bottom of the azimuthing thruster (0.87 meters below the molded baseline) with the legs fully retracted
- SG – Specific Gravity of a liquid compared to the density of Fresh Water; SG = (Density of Liquid)/(Density of Fresh Water)
- ST – Short Tons. 1 ST = 2000 lbs.
- SW – Salt Water at 1.025 specific gravity
- Ton – Short Ton
- t – tonne, or metric ton. 1 t = 1.016 Long Tons. 1 t = 9.81 kN
- TCG – Transverse Center of Gravity from CL, + Stbd, - Port
- VCG – Vertical Center of Gravity above Baseline (also KG)

# 3 References

[1] MiNO Marine Report 0722-824-001 Motions Study Revision C1

[2] 0722-ABS-011-Anchor Letter

[3] DV1P02C03 GE Dynamic Positioning System Operation Manual

## Detailed Revision History

1. Revision C1
    a. Revised for 17 gears per leg
2. Revision C2
    a. Added Section 17.1.4 referencing Ballast Water Management Plan (BWMP)
3. Revision C3
    a. Added additional loading conditions to the Afloat Operations Section
    b. Update Afloat Stability
    c. Added Leg Strength Cases from the Saudi Aramco VL Guidance Memo
    d. Updated Hydrostatic Properties Table
        i. Convert from Moment to Trim 0.01 deg to MT1mm in Hydrostatic Table
        ii. Convert from Moment to Heel 0.01 deg to MH1mm in Hydrostatic Table
    e. Specify maximum leg penetration, See Section 6.5
    f. Include instructions for when to liberating the pads, See Section 6.3.3
    g. Include helideck operations guidance.
    h. Provide additional trimmed tank tables for ballast tanks, See Appendix P
    i. Update Preload Curve to include 709 MT Variable Load
4. Revision C4
    a. Revised maximum Leg Penetration from 10m to 15m in Section 6.5
5. Revision C5
    a. Updated lightship for Asry Weight Control Report dated 21-10-2022
    b. Included adjustment for additional gear on each leg

# 4 Vessel Characteristics

Principal characteristics and capabilities of the FALCON DIAMOND are provided in Tables 4-1 through 4-21.

**Table 4-1: Vessel Description**

| | |
|---|---|
| Name | FALCON DIAMOND |
| IMO Number | 9769623 |
| Flag | Marshall Islands |
| Type | Mobile Offshore Unit - SEU |
| Builder | Triyards Holdings Limited |
| Designer | MiNO Marine, LLC |
| Keel Lay Date | December 9, 2014 |

**Table 4-2: Principal Dimensions**

| | |
|---|---|
| Length Overall (LOA) with Helideck | 90 m |
| Length Overall (LOA) Hull | 64.3 m |
| Load Line Length (L) | 59.611 m |
| Breadth Overall | 40.2 m |
| Breadth Molded | 39.6 m |
| Depth Molded, Baseline to Main Deck | 4.6 m |
| Leg Length | 92.5 m |
| Pad Length x Width x Depth | 13.6x7.8x1.8 m |

**Table 4-3: Lightship Characteristics Including Legs & Pads**

| | |
|---|---|
| Lightship Displacement | 5870.87 t |
| VCG ABL (Legs Raised) | 20.11 m |
| LCG Aft of FP | 28.00 m |
| TCG from CL (+ STBD / - PORT) | -0.50 m |

*Lightship characteristics assume legs are raised and cranes are in stowed positions.*
*There is no permanent ballast installed onboard the vessel.*

**Table 4-4: Aggregate Mass Properties of Legs and Pads**

| | |
|---|---|
| Weight of Legs and Pads | 2,153.24 t |
| VCG ABL (Legs Raised) 39.54 | ~~39.45~~ m |
| LCG Aft of FP | 30.60 m |
| TCG from CL (+ STBD / - PORT) | 0.00 m |

**Table 4-5: Elevated Lightship Mass Properties***

| | |
|---|---|
| Lightship Weight of Vessel Excluding Legs and Pads | 3717.63 t |
| VCG ABL | 8.86 m |
| LCG Aft of FP 26.49 | ~~26.~~ m |
| TCG from CL (+ STBD / - PORT) -0.78 | ~~-0.75~~ m |

**Elevated weight excludes weight of legs and Pads.*
*Variable load must be added to Elevated Lightship weight to determine total elevated weight.*

**Table 4-6: Load Line Characteristics**

| | |
|---|---|
| Summer Load Line Draft, Molded ABL | 3.576 m ǂ |
| Load Line Displacement (Salt Water) | 7,602 t |
| Deadweight at Load Line Draft (Afloat) | 1,742 t |
| Maximum Variable Load (Elevated) * | 454 t |

** Maximum variable load while elevated is limited to 454 t or less depending on water depth and prevailing wave height. Hook load when making heavy lifts is in addition to this 454 t.*

***Additional variable load with maximum of 709 t is possible with limiting water depth and wave height. See Section 6.3.8 for more information.***

*ǂ Maximum hull draft. Navigational draft is to bottom of stern thrusters (0.87 m below hull baseline).*

**Table 4-7: Jacking System Capacities***

**NOTE: THE JACKING SYSTEM CAPACITY IS THE GOVERNING LIMIT FOR ELEVATED OPERATIONS (SEE SECTION 6.11).**

| | |
|---|---|
| Maximum Jacking Rating | 73.781 t/pinion |
| Maximum Holding Rating | 86.736 t/pinion |
| Maximum Storm Rating | 110.858 t/pinion |
| Number of Gears Installed | 68 (17 per leg) |
| Total Normal Jacking Capacity | 5,017 t ǂ |
| Normal Jacking Capacity Per Leg | 1,254 t (12,297 kN) |
| Total Normal Jacking Capacity with 8% Friction Margin | 4,615 t |
| Total Normal Holding Capacity | 5,898 t |
| Normal Holding Capacity Per Leg | 1,474 t (14,456 kN) |
| Total Storm Capacity | 7,538 t |
| Storm Capacity Per Leg | 1,884 t (18,476 kN) |

** ABS Rules require redundancy in the event of failure of a single jacking system component. Therefore, if a jacking gear fails, elevated loads, whether jacking or holding, must be adjusted, if required, such that the per pinion ratings are not exceeded.*
*ǂ This value is a maximum allowable; the elevated load during jacking is to be less than the jacking capacity with friction.*

**Table 4-8: Crane 1 Characteristics**

| | |
|---|---|
| Crane Model | Nautilus Model 1000B |
| Boom Type | Fixed |
| Capacity | 181.44 t |
| Radius (max) | 42.7 m |
| Certification | API 2C 7th Edition |

**Table 4-9: Crane 2 Characteristics**

| | |
|---|---|
| Crane Model | Nautilus Model 340BT-70/100 |
| Boom Type | Telescoping |
| Capacity | 54.4 t (retracted), 41.2 t (extended) |
| Radius (max) | 21.3 m to 30.4 m |
| Certification | API 2C 7th Edition |

**Table 4-10: Crane 3 Characteristics**

| | |
|---|---|
| Crane Model | Nautilus Model 180B-70 |
| Boom Type | Fixed |
| Capacity | 22.6 t |
| Radius (max) | 21.3 m |
| Certification | API 2C 7th Edition |

**Table 4-11: Personnel Capacities**

| | |
|---|---|
| Maximum Persons Onboard | 150: 30 Crew, 120 PIAC |

*See manning certificates for more information.*

**Table 4-11: Deck Cargo Capacities***

| | |
|---|---|
| Open Deck Area | 1,000 $m^2$ |
| Maximum Cargo Deck Loading (Main Deck, Aft of Frame 25) | 5 $t/m^2$ |
| Maximum Deck Loading (Exposed Main Deck, Fwd of Frame 25) | 2.5 $t/ m^2$ |
| Maximum Deck Loading (Enclosed Main Deck, Fwd of Frame 5) | 2.5 $t/ m^2$ |
| Maximum Deck Loading (Other Enclosed Main Deck, Focsle Dk) | 1.5 $t/ m^2$ |

** Deck cargo should not be stowed directly adjacent to the jacking towers.*

**Table 4-13: Tank Capacities**

| | |
|---|---|
| Fuel Oil | 320,400 L |
| Fresh Water | 278,800 L |
| Zero Discharge Tankage | 245,300 L |
| Ballast | 1,444,440 L |

*See Appendix A for more details*

**Table 4-12: Classification and Regulatory Compliance**

| | |
|---|---|
| American Bureau of Shipping | ✠A1, SEU, ✠AMS, ✠DPS-2, ✠AMS ACCU, Restricted Service |
| Republic of the Marshall Islands | Mobile Offshore Unit – Self-elevating |
| IMO | 2009 MODU 2010 Edition, MARPOL |
| Helideck | CAP 437 7th Edition without refueling capabilities |

**Table 4-15: Tonnage Characteristics**

| | |
|---|---|
| International Gross Tons | 5271 |
| International Net Tons | 1581 |

**Table 4-16: Mooring Loads**

| | |
|---|---|
| Nabrico DF-490 Cast Steel Chock | 25.4 t |
| Nabrico DF-40A Double Bitt w/ Horns | 25.4 t |
| Nabrico DF-489 Cast Steel Open Chock | 25.4 t |
| Fabricated Double Bitt (12” SCH 120, mooring) | 25.4 t |

**Table 4-17: Helideck Characteristics**

| | |
|---|---|
| Maximum D-value | 22.2 m |
| Maximum Takeoff Weight (Elevated) | 12,600 kg |
| Maximum Takeoff Weight (Afloat) | 11,000 kg |

**See Section 20 for additional details about helicopter weight restrictions in the elevated and afloat modes*

Table 4-19: Maximum Leg Tower Reaction Forces*

| Type of Force | Operational (Elevated)ǂ | Transit (Pitch) |
|---|---|---|
| Max Axial Reaction | 18,580 kN | 7,439 kN |
| Max Upper Guide Reaction | 9,433 kN | 4,931 kN |
| Max Lower Guide Reaction | 10,706 kN | 6,575 kN |

** Data extracted from MiNO Marine Leg Strength Analysis report included in full in Appendix I to this manual.*
***ǂ Be advised that jacking system capacity is the governing limit for elevated operations (see Section 6.11).***

Table 4-20: Pad Max Capacities*

| | |
|---|---|
| Vertical Reaction | 19,568 kNǂ |
| Design Moment | 66,023 kN-m |

** Data extracted from MiNO Marine Structural Analysis Technical Report included in full in Appendix J to this manual.*
***ǂ Be advised that jacking system capacity is the governing limit for elevated operations (see Section 6.11).***

Table 4-21: Motion Study Parameters (All Transit Cases)*

| | |
|---|---|
| Analysis Method | Frequency Domain with 3d Diffraction |
| Sea Spectra | JONSWAP |
| Wave Height (Significant) | 2.0 m |
| Mean Wave Periods | 4-16 seconds; 2 second increments |
| Wave Headings | 180-0 Degrees; 45 degree increments |
| Wind Speed | 50 knots |
| Maximum Vessel Displacement | 7,662 t (3.6m draft) |
| Vessel Forward Speed | 0, 4, & 6 knots |
| Leg Position | Fully Retracted (Pad bottom at Baseline) |

** Data extracted from MiNO Marine Motions Study (Reference [1])*

# 5 General

## 5.1 Purpose

5.1.1 (2009 IMO MODU Code, 2010 Edition, Chapter 14) This manual has been prepared to assist the Master in the following areas:

- The evaluation of the vessel loading conditions with respect to the required stability and anticipated environmental conditions. Operating instructions and restrictions must be followed at all times. There are Vessel Loading Forms included in this booklet to be used to determine if the vessel's displacement, center of gravity and draft are adequate to meet the required stability criteria. An Excel workbook has been provided to the vessel as an aid for the completion of these calculations. These ~~forms~~ calculations must be completed and documented using the forms or the approved Excel workbook provided and the stability of the vessel evaluated any time the loading of the vessel changes, such as due to a significant change in liquid loads or deck cargo.
- Provide guidance to the operating personnel related to the following:
    - Deck cargo loading
    - Preparing the vessel for heavy weather
    - Operation when changing modes
    - Determination of flooding of the legs or pads
    - Dewatering
    - Helideck operations
    - Evacuating procedures
- Provide general description of the vessel, including design limits with respect to environmental conditions and mode of operation.
- Provide information and locations of:
    - Access, compartment boundaries, and watertight and weathertight closing devices
    - Emergency shutdowns
    - Flooding and jacking alarm systems
    - Fire detection and alarm systems
    - Compartment and deck access

## 5.2 Supplement to Other Documentation

5.2.1 This manual is intended to supplement existing documentation for the vessel operation, including, but not limited to:

- Vessel and Company Policies, Regulations and Procedures
- Applicable flag state and operating country laws, and international rules and regulations, including MODU and MARPOL requirements
- Vessel Specific approved plans such as Fire Fighting and other required plans
- Responsibilities and Duties associated with required crew licenses

## 5.3 Chain Of Command

5.3.1 The chain of command is detailed in the Seacor Safety Management System (SMS) Manual for the FALCON DIAMOND as follows:

- Ship's Captain/Master - SMS Chapter 5; Master's Responsibility and Authority
- Ship's Marine Crew - SMS Chapter 6; Resources and Personnel
- Liftboat Specific Crew - SMS Chapter 6; Liftboat Specific

# 6 Design and Operational Limits

## 6.1 Draft

6.1.1 The maximum allowable draft of the vessel is the assigned load line draft. The vessel shall not exceed this draft in any condition of loading while underway. In addition, at any loading condition and associated draft encountered during the voyage when the vessel is afloat, the applicable stability requirements, as detailed in this manual, must be met. Note the stern thrusters extend 0.87 m below the baseline of the vessel and are to be considered when determining navigational draft (see Section 6.12).

## 6.2 Air Gap

6.2.1 For normal operations the minimum air gap should be at a distance above the mean water level such that there are no wave encounters (wave slap) on the hull bottom. See Section 6.3.4 of this manual for air gap guidance when heavy weather is anticipated.

## 6.3 Wave Height & Wind Limits

6.3.1 Afloat – Seas shall be less than 2 meters (significant wave height) and wind less than 50 knots when the vessel is in the intact condition. The legs should be fully retracted during normal transit moves. While 2 meters is a general guide on maximum wave height for vessel survivability, normal working conditions are 1.8 m seas. The Master must be aware that seas consisting of smaller waves could be worse in terms of vessel responses, particularly leg whipping in roll or pitch. This is because the vessel is sensitive to both the height of waves and their period. The vessel's heading relative to prevailing seas and the vessel's speed also affect the vessel's response. The Master must consider all these factors when operating afloat and deciding whether or not it is prudent to slow down or stop and elevate until more favorable conditions for transit prevail. For this vessel, maximum pitch response, and thus maximum forward/aft leg whipping, will likely occur at wave periods in the range of 3 to 5 seconds. Similarly, maximum roll response, and thus maximum port/starboard leg whipping, will likely occur at wave periods in the range of 7 to 9 seconds. These are approximate period ranges only and depend on other factors previously cited. As a general guide, if the vessel's roll and/or pitch response while operating in any given sea approaches 4 to 6 degrees of pitch or roll, then adverse leg whipping is probably occurring and the Master should alter relative heading, speed, or stop and elevate until the adverse conditions have subsided. It is the Master's primary responsibility to ensure safe navigation of the vessel to safeguard personnel, transported cargo, the vessel and the environment. Stop Work Authority must be used when there is a potential of an adverse effect, regardless of wave height or wind speed.

The MiNO Marine Motions Study report (Reference [1]) showing the maximum allowable transit condition is based on the vessel afloat with legs fully retracted, with a 6 degree maximum roll/pitch angle at the vessel's natural roll/pitch period.

Stability calculations have been performed which demonstrate that if loaded in accordance with Section 10, the vessel will stay afloat with any single watertight compartment flooded or under emergency conditions, provided that seas are minimal and winds are less than or equal to 50 knots.

6.3.2 Changing Modes – Seas shall be 2 meters or less (significant wave height) when changing modes and the same guidance in Section 6.3.1 applies. Moreover, the Master must also consider the potential of the pads slamming on the sea floor when tagging the pads, or lowering the legs into position in preparation for tagging. The Master must also consider sea floor conditions when assessing the potential damaging effects of pad slamming.

6.3.3 Liberating the Pads – The vessel is equipped with a pad jetting system allowing jetting of each pad to assist with pad liberation. Uplift on each pad is required in order to liberate the pads and an uplift force of no more than 1,200 kN is recommended. Jetting may be used along with uplift at the Master's discretion. See Section 7.8 for jetting operation guidance.

6.3.4 Elevated Cases Reviewed by ABS – Refer to the Leg Strength Cases Summary table in Section 6.3.7 which summarizes the design cases reviewed by ABS. Referring to that letter, Cases 1 through 6 represent maximum design conditions where the vessel is elevated in 50-70 kt winds, 2 kts current, and up to 10 meter waves depending on water depth, with the cranes in their stowed positions. Maximum variable load in these cases is 454 t.

Cases 7 and 8 represent maximum design conditions with the primary crane lifting 181 tonnes at the most adverse slew angle, and with an additional 454 tonnes VL onboard. Maximum wave height is 2 meters with 35 kt winds. See Appendix I for more details.

Cases 9 and 10 represent maximum design survival in safe harbor conditions with all cranes stowed, 454 tonnes variable load onboard the vessel, and with the vessel subjected to 100 kt winds with 2 kts current. Safe harbor water depth is 30 meters (including storm surge) or less. The maximum wave height is 10 meters. See Appendix I for more details.

Case 11 represents the maximum preload case which is derived from the loads encountered when the vessel is in 70 m of water, with 454 tonnes of variable load onboard.

Cases 12 and 13 represent conditions with all cranes stowed, 709 tonnes variable load onboard the vessel, and with the vessel subjected to 50 kt winds with 2 kts current. Water depth is 46 meters or less. The maximum wave height is 10 meters.

Cases 14 and 15 represent maximum design survival in safe harbor conditions with all cranes stowed, 709 tonnes variable load onboard the vessel, and with the vessel subjected to 100 kt winds with 2 kts current. Water depth is 30 meters or less. The maximum wave height is 10 meters.

A summary table of the elevated load cases is presented in Section 6.3.8.

In all of the cases described above, the elevated center of gravity (LCG and TCG) must be near the center of the leg rectangle. Weights onboard should be adjusted to achieve an elevated weight TCG near centerline. If the loading condition of the vessel results in an elevated weight LCG forward of the leg center, refer to Section 6.3.6.

6.3.5 Elevated in Survival Condition – In winds up to 100 knots, the vessel should find safe refuge in 30 m of water (including storm surge) or less and elevate to an air gap sufficiently above the wave tops so as to avoid waves slapping the bottom of the vessel, including hull appendages such as the z-drives or skegs. Storm surge should be monitored, and air gap adjusted accordingly. Air gap should not exceed 9 meters above the mean water level. When the LCG of the elevated weight is between 27.m and 30.6m aft of Frame 0 and the TCG is near centerline, the maximum allowable wave height in these conditions is 10 m. Maximum allowable variable load in this condition is 454 t. Refer to Cases 9 and 10 in the ABS Review Letter included in Appendix I.

6.3.6 Crane Operation – Cranes cannot be operated while afloat. Crane manufacturer limits applicable to the type of lift being conducted must be observed. The appropriate load chart given the type of lift and weather conditions must be used. Refer to Sections 6.3.3 and 7.5 of this manual for more requirements governing crane operations. SEACOR Marine management should be consulted prior to engaging in unusual lifting operations.

6.3.7 Elevated LCG – In most loading conditions, the elevated LCG will be forward of the leg center. The elevated weight LCG shall be between 27.2m and 30.6m aft of Frame 0.

In water depths greater than 60m, the location of the LCG may result in a reduced allowable maximum wave height limit from 10m to 7m. See section 7.5 for further details.

For water depths or forecast wave heights not mentioned, consult SEACOR Marine management concerning appropriate operational limits.

### 6.3.8 Leg Strength Cases Summary Chart

| | Elevated Mode - Operating | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Operating - No Crane Use | | | | | | | | Operating with Crane | |
| Design Load Case | Case 1A | Case 1B | Case 1C | Case 2 | Case 3 | Case 4 | Case 5 | Case 6 | Case 7 | Case 8 |
| Water Depth w/ Surge (m) | 70 | 70 | 60 | 70 | 40 | 40 | 70 | 70 | 70 | 70 |
| Maximum Wave Height (m) | 10 | 7 | 10 | 10 | 10 | 10 | 6.25 | 6 | 2 | 2 |
| Associate Wave Period (s) | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 |
| Wind Velocity (knots) | 50 | 50 | 50 | 50 | 50 | 50 | 70 | 70 | 35 | 35 |
| Surface Current (knots) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Bottom Current (knots) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Air Gap (m) | 7.5 | 7.5 | 7.5 | 7.5 | 9 | 9 | 7.5 | 7.5 | 7.5 | 7.5 |
| Leg Penetration (m) | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Variable Load (MT) | 454 | 454 | 454 | 454 | 454 | 454 | 454 | 454 | 454 | 454 |
| Leg & Pad Weight (MT) | 2153 | 2153 | 2153 | 2153 | 2153 | 2153 | 2153 | 2153 | 2153 | 2153 |
| Estimated Lightship minus L&P (MT) | 3698 | 3698 | 3698 | 3698 | 3698 | 3698 | 3698 | 3698 | 3698 | 3698 |
| Total Elevated Load (MT) | 4152 | 4152 | 4152 | 4152 | 4152 | 4152 | 4152 | 4152 | 4333* | 4333* |
| Max Pad Fixity Conditions -(ft-kips/rad x 10^6) | 1.5 | 1.5 | 1.5 | Pinned | 1.5 | Pinned | 1.5 | Pinned | 1.5 | Pinned |
| P-delta | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dynamic Amplification | Yes | Yes | Yes | No | Yes | No | Yes | No | Yes | No |
| Significant Wave Height (m) | 5.56 | 3.89 | 5.56 | --- | --- | --- | 3.47 | --- | --- | --- |
| Modal Wave Period (s) | 7.21 | 7.21 | 7.21 | --- | --- | --- | 6.53 | --- | --- | --- |
| LCG (m aft of F0) | 30.6 | 27.2 | 27.2 | 30.6 | 30.6 | 30.6 | 30.6 | 30.6 | 30.6 | 30.6 |

| | Elevated Mode - Survival/Preload | | | | Additional Variable Load | | | |
|---|---|---|---|---|---|---|---|---|
| | Severe Storm | | | Preload | Operating - No Crane Use | | Severe Storm | |
| Design Load Case | Case 9A | Case 9B | Case 10 | Case 11 | Case 12 | Case 13 | Case 14 | Case 15 |
| Water Depth w/ Surge (m) | 30 | 30 | 30 | 70 | 46 | 46 | 30 | 30 |
| Maximum Wave Height (m) | 10 | 10 | 10 | 0 | 10 | 10 | 10 | 10 |
| Associate Wave Period (s) | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 | 7 to 14 |
| Wind Velocity (knots) | 100 | 100 | 100 | 0 | 50 | 50 | 100 | 100 |
| Surface Current (knots) | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 2 |
| Bottom Current (knots) | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 2 |
| Air Gap (m) | 9 | 9 | 9 | 9 | 7.5 | 7.5 | 7.5 | 7.5 |
| Leg Penetration (m) | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Variable Load (MT) | 454 | 454 | 454 | 454 | 709 | 709 | 709 | 709 |
| Leg & Pad Weight (MT) | 2153 | 2153 | 2153 | 2153 | 2153 | 2153 | 2153 | 2153 |
| Estimated Lightship minus L&P (MT) | 3698 | 3698 | 3698 | 3698 | 3698 | 3698 | 3698 | 3698 |
| Total Elevated Load (MT) | 4152 | 4152 | 4152 | 4152 | 4407 | 4407 | 4407 | 4407 |
| Max Pad Fixity Conditions -(ft-kips/rad x 10^6) | 1.5 | 1.5 | Pinned | Pinned | 1.5 | Pinned | 1.5 | Pinned |
| P-delta | Yes | Yes | Yes | No | Yes | Yes | Yes | Yes |
| Dynamic Amplification | Yes | Yes | No | No | Yes | No | Yes | No |
| Significant Wave Height (m) | --- | --- | --- | --- | --- | --- | --- | --- |
| Modal Wave Period (s) | --- | --- | --- | --- | --- | --- | --- | --- |
| LCG (m aft of F0) | 30.6 | 27.2 | 30.6 | 30.6 | 28.7 | 28.7 | 28.7 | 28.7 |

## 6.4 Current

6.4.1 The maximum current considered while elevated in 50 kts wind is 2 knots. In safe harbor subject to 100 knot winds, the maximum current considered is also 2 knots. These currents are based on the worst-case design conditions. For higher currents, consult with Seacor Marine management.

## 6.5 Leg Penetration

6.5.1 The vessel has been designed to operate in a variety of soil conditions from soft mud to hard sand. Penetration may vary widely depending on the site's geotechnical characteristics. Penetration up to 15m is allowed.

## 6.6 Towing and Anchoring

6.6.1 The vessel is self-propelled; towing is not normally required. If non-emergency towing of the vessel is required, a towing plan shall be developed to suit the requirements of the tow. If an emergency tow is required, refer to Emergency Towing Manual.

6.6.2 An anchor is provided for emergency anchoring purposes. Normal mooring of the vessel will be by lowering legs and elevating or by mooring lines from vessel bitts to shore. Limiting factors on mooring by elevating are same as normal elevated environmental limits. The anchoring system is sized to hold the vessel in current of up to 4.86 knots and simultaneous winds up to 48.6 knots. See also Reference [2] "0722-ABS-011-Anchor Letter."

## 6.7 Temperature

6.7.1 The minimum air and sea water temperature the vessel may operate in is a lowest mean daily average of 0° C. The maximum air temperature the vessel may operate in is 45° C at 100% relative humidity and 54° C at 45% relative humidity. The maximum sea temperature that the vessel may operate in is 35° C.

6.7.2 The vessel is not intended to operate in ice, afloat or elevated.

6.7.3 The vessel is intended to operate primarily in warm climates; as defined by the Republic of the Marshall Islands, warm climates are the zone between 30° North and 30° South latitudes. Immersion or exposure suits need not be carried when operating in warm climates.

## 6.8 Manning Requirements

6.8.1 The vessel's manning requirements are dependent on Route and are detailed in the vessel's Minimum Safe Manning Certificate.

## 6.9 Soil Characteristics

6.9.1 The soil characteristics used in the ABS approved global leg strength analysis are as follows: undrained soil shear strength at soil surface ranged from 80 psf to 120 psf with shear strength rates of increase with penetration ranging from 46 psf/ft to 50 psf/ft.

## 6.10 Cathodic Protection

6.10.1 The vessel is fitted with an Impressed Current Cathodic Protection (ICCP) system which protects the hull from galvanic corrosion. The pads are fitted with anodes to provide similar protection. The ICCP system need not be active when the vessel is elevated as described in this manual.

6.10.2 Cathodic potential readings shall be taken periodically from representative positions and evaluated to confirm that the cathodic protection system is operating within design limits.

6.10.3 Anodes are to be periodically examined for depletion and if excessive depletion of anodes are found they are to be replaced if found necessary.

## 6.11 Inspecting the Legs and Pads

6.11.1 The interior of the leg can be accessed from a watertight hatch at the top. Vertical ladders with platforms at regular intervals provide access throughout the length of the leg. The leg interiors can be inspected during required dry-dockings. Surveying the legs should include a comprehensive visual examination of the structure as well as surface nondestructive examination of critical locations. Special attention should be given to jetting system structures and piping for evidence of cracking or leaks.

6.11.2 The exterior of the pad can be inspected to ensure the watertight integrity of the pad. Examinations of the pads can be carried out in conjunction with the examinations of the vessel's bottom. Hull bottom inspections as well as pad inspections can be performed while the vessel is afloat by an approved underwater inspection in lieu of dry-docking. Surveying the pads should include a comprehensive visual examination of the structure as well as surface nondestructive examination of critical locations. Upon completion of the underwater inspection ABS is to be notified confirming the inspection results (i.e. any damage found, extensive areas of corrosion, areas of substantial corrosion, areas of substantial deterioration, or no damages that may or may not affect classification). The pads are fitted with an effective means of corrosion control. Likewise, internal examination requirements are treated similar to inaccessible voids treated with corrosion-inhibiting coatings (float coat). If pad flooding is suspected, drain plugs can be removed from the pad in dry dock to confirm watertightness or presence of fluids.

## 6.12 Global Elevated Strength

6.12.1 Elevated operations of the vessel are governed by the capacity of the jacking system. The jacking system load monitoring system should be checked regularly to ensure the maximum loads described in Table 4-6 are not exceeded.

6.12.2 The design capacity of the hull, legs, and pads are in excess of the capacity of the jacking system and shall NOT be used as limiting loads for elevated operations.

## 6.13 Navigational Draft and Draft Marks

6.13.1 The stern thrusters (located at Frame 50) extend 0.87 m below the baseline of the hull and shall be considered in determining the navigational draft of the vessel to determine if water depths are acceptable for afloat operations.

6.13.2 Aft draft marks installed on the vessel are referenced to the bottom of the stern thrusters to assist in determining navigational draft (see drawing 0722-602-001 Hull Markings, excerpt provided below). Instructions for afloat operations that describe how the navigational draft in way of the stern thrusters is calculated are provided in Section 10. The aft draft marks provide accurate navigational drafts to the bottom of the thruster when trim and heel are zero (0). It is the Master's responsibility to ensure water depth is sufficient for afloat operation without risk of the stern thrusters striking bottom.

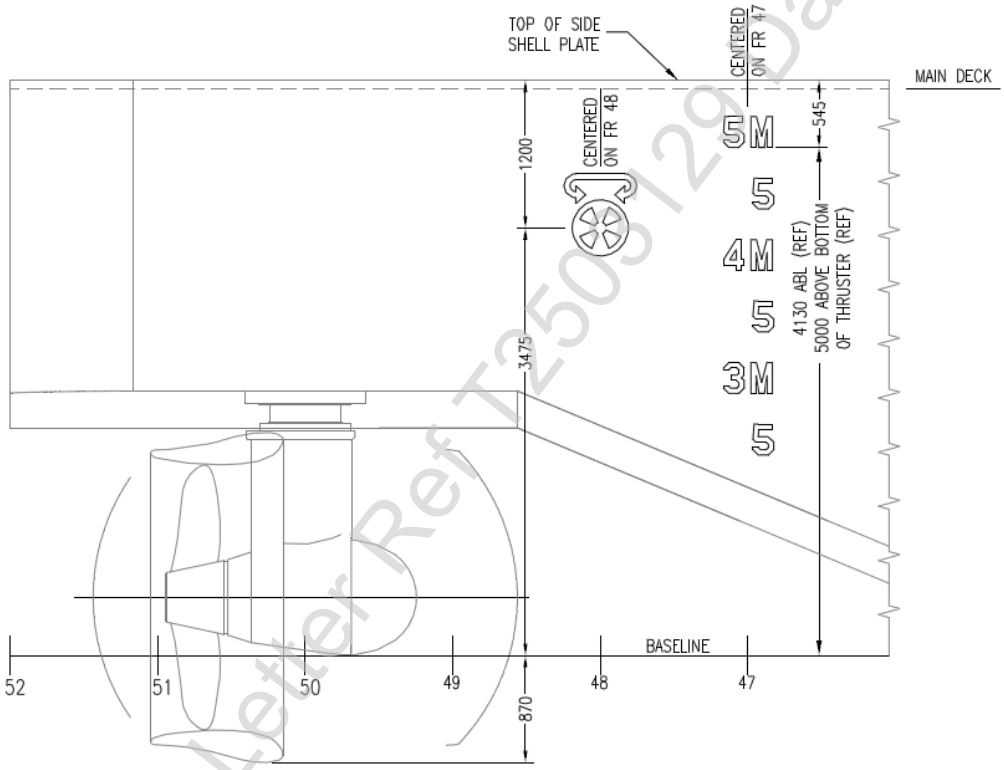


Figure 6-1: Aft Draft Marks Arrangement

6.13.3 Aft draft marks can be converted to molded hull drafts by subtraction 0.87m from the observed draft.

6.13.4 Forward draft marks are located 320mm aft of Frame 4 and are referenced to the baseline of the hull. See drawing 0722-602-001 Hull Markings for further details.

# 7 Guidance on Operating the Vessel

## 7.1 Changing Modes

### 7.1.1 General

7.1.1.1 See Section 6.3.2 for wave height guidance while changing modes.

7.1.1.2 All cargo must be secured prior to changing modes. The cranes shall be stowed in their respective cradles when changing modes.

7.1.1.3 When changing modes, the vessel shall be in an acceptable loading and watertight condition as required when the vessel is afloat. Temporary submergence of the load line is permitted while preloading.

7.1.1.4 At the discretion of the Master, personnel not directly involved in the operation of the vessel when changing modes shall muster in a pre-designated muster area assigned by the Master. All personnel shall be briefed on safety procedures associated with the jacking processes and shall have Flag State approved Personal Floatation Devices (PFD) accessible and ready for use when the vessel is changing modes.

7.1.1.5 When moving the vessel, the legs shall be completely raised when practical. The vessel must not be moved until the legs are well clear of the bottom and any obstructions.

7.1.1.6 The legs should never be used to stop or slow the vessel's motion and the pads shall never be dragged on the bottom. When in the elevated position (excluding preloading and evaluation phases of jacking), the minimum air gap from the mean water level to the bottom of the vessel's hull plating shall be sufficient to keep the waves from contacting the hull.

7.1.1.7 If unusual noises are heard from the legs' rack and pinion assemblies during jacking, stop jacking as soon as safely possible. Determine the cause of the noises before corrective action is taken.

7.1.1.8 The Impressed Current Cathodic Protection (ICCP) system should be turned off prior to jacking of the ship.

## 7.2 Jacking/Preloading Criteria

7.2.1 Preloading of the vessel, as described using the preloading guidance contained in this section, is required when elevating the vessel in all cases except when the Master determines preloading is not necessary. The Master may determine that preloading is not required when the location is in harbor and anticipated operations and weather conditions do not suggest preloading is required or when the vessel must make an emergency stop during transit to elevate, for example, to avoid leg whipping during excessive wave action during transit. There may be other unforeseen instances where it would be appropriate to not preload when elevated and when in doubt the Master should consult with SEACOR Marine management for appropriate preloading action.

7.2.2 There may be cases where site specific assessments and preload requirements for the particular site, expected crane operations, and worst-case weather are other than what are described in the preload instructions provided in this Manual. In such cases the Master should consult with SEACOR Marine management to obtain specific preloading instructions.

7.2.3 ABS allowable limits on jacking and holding loads, leg axial reactions, and pad loading should be adhered to when jacking the unit and holding position while elevated. Real-time jacking system loads are reported by the Jacking Control Screen and should be monitored regularly.

7.2.4 Preloading the legs and pads is intended to be performed after the vessel's hull is out of the water and has cleared the wave tops, but before jacking to the final elevation. The Master can take on preload ballast if required prior to elevating the vessel, provided the afloat condition complies with the Stability Operating Instructions and provided that the aggregate load being jacked, when jacking commences, adheres to the LCG and TCG guidance explained in Section 7.5 of this Manual. When the vessel is afloat, the Master shall ensure all Stability Operating Instructions, including those concerning slack tanks, are followed at all times. See also 7.1.1.3.

## 7.3 Preloading Instructions

7.3.1 The preload reaction curve presented in Figure 7-1 is suitable for preloading the vessel when anticipated weather is expected to be up to the maximum design conditions for each water depth as described in Sections 6.3.3 and 6.3.4 of this manual. These design conditions include normal operations (wind speeds up to 50 knots), normal lifting operations (wind speeds up to 35 knots), and weathering of a severe storm (winds up to 100 knots).

7.3.2 Note that the preload reaction curve reports the required axial reaction in the leg at the lower guide level (tower bottom) and no manual adjustments are required to this reaction curve for water depth, leg/pad weight/buoyancy, etc. In most cases the elevated weight of the vessel (excluding variable load) is sufficient to generate the required preload axial reaction at each leg. The maximum allowable preload axial leg reaction in any case is the storm-survival load given in Figure 7-1.

7.3.3 Identify maximum anticipated vessel weight, LCG, and TCG in elevated condition for the load case under investigation. Use the ELEVATED WEIGHT WORKSHEET in Figure 7-2 with the following instructions:

7.3.3.1 Complete the DECK CARGO LOADING FORM in accordance with Section 10.3.1 of the Operations Manual.

7.3.3.2 Complete the TANK LOADING FORM in accordance with Section 10.3.3 of the Operations Manual.

7.3.3.3 The lightship weight and centers of gravity (less legs and pads) are listed in Section 4 of this report. These values have been included in the first row of the VESSEL LOADING FORM along with the appropriate moments.

7.3.3.4 Enter the weight of the Crew, Effects, and Stores for the entire vessel crew in Column 1 on the appropriate row. The appropriate LCG, TCG and VCG have been pre-entered onto the form. Determine the vertical, longitudinal, and transverse moments by multiplying the weight in Column 1 by the LCG, TCG or VCG in Columns 2, 4 or 6, respectively. Enter the resulting moments in the appropriate Columns 3, 5 or 7 for the longitudinal, transverse, and vertical moments, respectively.

7.3.3.5 Determine the weight of the Offshore Workers to be on board the vessel by multiplying the number of workers by 0.173 t (173 kg) per worker. Enter this value in Column 1 on the appropriate row. The associated LCG, TCG or VCG for the Offshore Workers have been pre-entered onto the form. Determine the longitudinal, transverse, and vertical moments by multiplying the weight in Column 1 by the LCG, TCG or VCG and enter the resulting moments in Columns 3, 5 and 7 for the longitudinal, transverse and vertical moments, respectively.

7.3.3.6 Enter the total deck cargo weight from the DECK CARGO LOADING FORM in Column 1 on the appropriate row. Enter the total deck cargo longitudinal and transverse moments from the DECK CARGO LOADING FORM onto the appropriate row in Columns 3 and 5, respectively.

7.3.3.7 Enter the total tank liquids weight from the TANK LOADING FORM in Column 1 on the appropriate row. Enter the total tank loads' longitudinal and transverse moments from the TANK LOADING FORM onto the appropriate row in Columns 3 and 5, respectively.

7.3.3.8 Determine the vessel's total elevated weight by summing Column 1 and entering this value in Column 1 of the TOTALS row and calculation item (3). Determine the total moments by summing the longitudinal and transverse moments and entering these values in the TOTALS row in Columns 3 and 5, respectively.

7.3.3.9 Determine the vessel's elevated LCG and TCG as shown in calculation items (1) and (2), respectively, from the ELEVATED WEIGHT WORKSHEET.

7.3.3.10 Determine the value of half the elevated weight per calculation item (4) in the ELEVATED WEIGHT WORKSHEET.

7.3.3.11 Confirm that required preload can be achieved and that the elevated weight, LCG, and TCG are within allowable limits as described on the ELEVATED WEIGHT WORKSHEET.

7.3.4 The maximum elevated weight is 4407 MT. The required preload should be calculated per the instructions in Section 7.3water . LCG and TCG constraints described in Section 7.5 shall be maintained at all times.

7.3.5 After tagging all four pads, preloading will commence by raising one pair of diagonally opposed legs until the load sensors in the jacking system of the active legs show a load equal to the desired reaction. The remaining two legs are then jacked down until the desired preload reaction is achieved. In the final stage of preloading, the original pair of legs should be lowered

until the elevated weight is evenly spread over all four legs, and the vessel can proceed with jacking up and out of the water. Detailed preloading instructions are as follows:

7.3.5.1 Determine the maximum reaction per leg from Figure 7-1 based on water depth and anticipated environmental condition: Storm Survival or Normal Operating.

7.3.5.2 Given the vessel weight and necessary maximum reactions, determine if the vessel has adequate weight for preloading. (See section 7.3.2)

7.3.5.3 Ballast as necessary to achieve the necessary weight to preload.

7.3.5.4 Initially, legs should be lowered simultaneously and evenly until the pads are tagged. Each leg should be lowered further if needed to ensure tilt is minimized. The jacking system sensors can assist in determining the jacking system loads during tagging.

7.3.5.5 Identify the initial lower guide reactions for each of the forward and aft legs individually from installed Hydraquip sensors.

7.3.5.6 Choose alternating pairs of legs to begin preloading: Forward Port with Aft Starboard or Forward Starboard with Aft Port.

7.3.5.7 Evenly raise one pair of diagonally-opposed legs until the maximum reaction on remaining legs is achieved. Adjustments are to be made to compensate for vessel LCG and TCG. For example if the Forward Port and Aft Starboard legs remain in location while the Forward Starboard and Aft Port leg are raised, one leg may achieve the necessary preload reaction before the other. If the Forward Port leg achieves the maximum reaction ahead of the Aft Starboard leg, the Forward Starboard leg should then remain in place while only the Aft Port leg is raised to achieve the desired preloading.

7.3.5.8 After achieving the necessary reaction on the Forward Port and Aft Starboard legs, lower the Forward Starboard and Aft Port legs until the desired reaction is achieved on these two legs. Again, adjustments are to be made to compensate for vessel LCG and TCG.

7.3.5.9 If ballast was brought onboard to achieve the required preload reaction, it should be discharged before the vessel is fully elevated unless the elevated weight and LCG and TCG constraints are satisfied.

7.3.5.10 Lower the Forward Port and Aft Starboard legs in order to evenly spread the weight over all four legs and proceed with jacking up and out of the water.

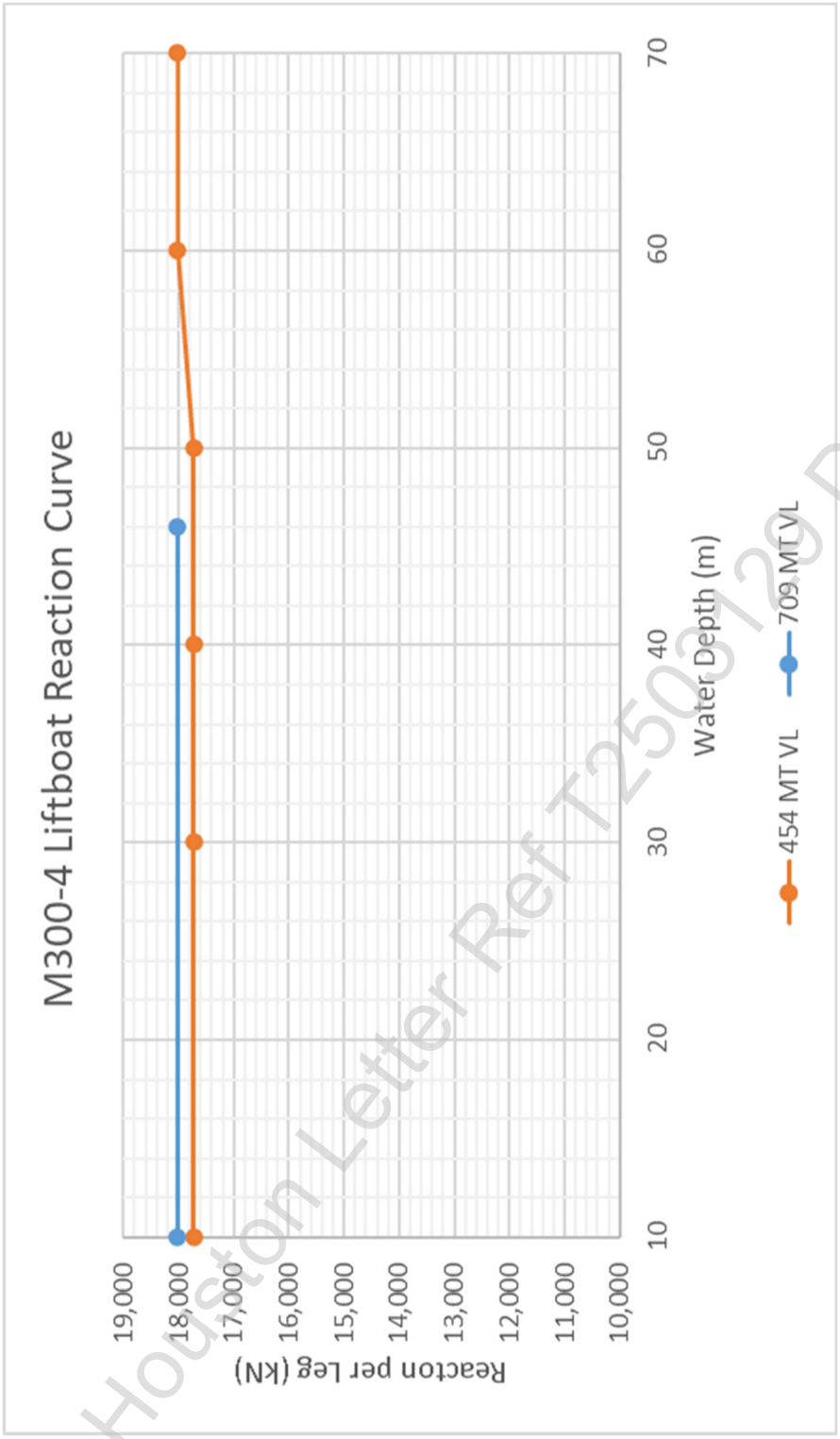


Figure 7-1: Preload Reaction Curve

**ELEVATED WEIGHT WORKSHEET**

| COLUMN → | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) |
| **LIGHTSHIP LESS LEGS & PADS** | 3717.63 | 26.49 | *98,472* | -0.78 | *-2,906* |
| **LIGHTSHIP ADJUSTMENTS** | | | | | |
| **CREW, EFFECTS, AND STORES** | | | | | |
| **OFFSHORE WORKERS, EFFECTS, AND STORES** | | | | | |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | | | | | |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| TOTALS: | | | | | |

Elevated Weight Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = _____ / _____ = _____ m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = _____ / _____ = _____ m from CL (+STBD)

(3) WEIGHT = Total Column 1 = _____ MT

Storm Survival (S) or Normal Operation (N) = _____

Water Depth = _____ m

Required Preload (per leg) from Figure 7-1 kN

(4) Half of Elevated Weight = (3) / 2 * 9.81 = KN

**CHECK ELEVATED WEIGHT CONSTRAINTS:**

**1) Is half of the elevated weight greater than the required preload?**

**YES** _____ **Vessel is ready for preloading**

**NO** _____ **Additional weight is required for preloading**

Add ballast or variable load and check again

**2A) Is the total elevated weight (exlcuding crane hook load) less than 4160 MT?**

**YES** _____ **Elevated weight is permissible. See 2B.**

**NO** _____ **If no, see 3A.**

Decrease variable load to reduce total elevated weight and check elevated weight again

**2B) Is the LCG between 27.2m and 30.6m aft of Frame 0; and is the TCG near centerline?**

**YES** _____ **Elevated LCG and TCG are permissible**

**NO** _____ **Elevated LCG and TCG are NOT permissible**

In water depths greater than 60m, if the LCG is forward of 30.6m aft of Fr. 0, the max wave height is reduced to 7m

Shfit weights as required to achieve required LCG and TCG positions

**3A) Is the total elevated weight (exlcuding crane hook load) less than 4407 MT?**

**YES** _____ **Elevated weight is permissible. See 3B.**

**NO** _____ **Elevated weight is NOT permissible.**

Decrease variable load to reduce total elevated weight and check elevated weight again.

**3B) Is the LCG between 28.7m and 30.6m aft of Frame 0; and is the TCG near centerline?**

**YES** _____ **Elevated LCG and TCG are permissible**

**NO** _____ **Elevated LCG and TCG are NOT permissible**

Shfit weights as required to achieve required LCG and TCG positions

Water depth limit is 46m. See Leg Strength Cases Summary Chart.

**Figure 7-2: Elevated Weight Worksheet**

**ELEVATED WEIGHT WORKSHEET -** 454 MT Variable Load

| COLUMN → | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) |
| **LIGHTSHIP LESS LEGS & PADS** | 3717.63 | 26.49 | *98,472* | -0.78 | *-2,906* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* |
| **CREW, EFFECTS, AND STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* |
| **OFFSHORE WORKERS, EFFECTS, AND STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 222.88 | *51.10* | 11390 | *4.73* | 1055 |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 202.12 | *26.41* | 5337.03 | *4.70* | 950.34 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| TOTALS: | 4,171.63 | | 115,760 | | -901 |

Elevated Weight Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 115,760 / 4,171.63 = 27.75 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = -901 / 4,171.63 = -0.22 m from CL (+STBD)

(3) WEIGHT = Total Column 1 = 4,171.63 MT

Storm Survival (S) or Normal Operation (N) = N

Water Depth = 40 m

Required Preload (per leg) from Figure 7-1 17,725.00 kN

(4) Half of Elevated Weight = (3) / 2 * 9.81 = 20,461.85 KN

**CHECK ELEVATED WEIGHT CONSTRAINTS:**

**1) Is half of the elevated weight greater than the required preload?**

**YES** _____ **Vessel is ready for preloading**

**NO** _____ **Additional weight is required for preloading**

Add ballast or variable load and check again

**2A) Is the total elevated weight (exlcuding crane hook load) less than 4160 MT?**

**YES** _____X_____ **Elevated weight is permissible. See 2B.**

**NO** _____ **If no, see 3A.**

Decrease variable load to reduce total elevated weight and check elevated weight again

**2B) Is the LCG between 27.2m and 30.6m aft of Frame 0; and is the TCG near centerline?**

**YES** _____X_____ **Elevated LCG and TCG are permissible**

**NO** _____ **Elevated LCG and TCG are NOT permissible**

In water depths greater than 60m, if the LCG is forward of 30.6m aft of Fr. 0, the max wave height is reduced to 7m

Shfit weights as required to achieve required LCG and TCG positions

**3A) Is the total elevated weight (exlcuding crane hook load) less than 4407 MT?**

**YES** _____ **Elevated weight is permissible. See 3B.**

**NO** _____ **Elevated weight is NOT permissible.**

Decrease variable load to reduce total elevated weight and check elevated weight again.

**3B) Is the LCG between 28.7m and 30.6m aft of Frame 0; and is the TCG near centerline?**

**YES** _____ **Elevated LCG and TCG are permissible**

**NO** _____ **Elevated LCG and TCG are NOT permissible**

Shfit weights as required to achieve required LCG and TCG positions

Water depth limit is 46m. See Leg Strength Cases Summary Chart.

**Figure 7-2: Elevated Weight Sample Calculation – 454 MT VL**

**ELEVATED WEIGHT WORKSHEET -** 709 MT Variable Load

| COLUMN → | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) |
| **LIGHTSHIP LESS LEGS & PADS** | 3717.63 | 26.49 | *98,472* | -0.78 | *-2,906* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* |
| **CREW, EFFECTS, AND STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* |
| **OFFSHORE WORKERS, EFFECTS, AND STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 530.74 | *52.78* | 28,014 | *3.91* | 2,075 |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 149.26 | *26.45* | 3,948 | *4.92* | 735 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| TOTALS: | 4,426.63 | | 130,995 | | -96 |

Elevated Weight Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 130,995 / 4,426.63 = 29.59 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = -96 / 4,426.63 = -0.02 m from CL (+STBD)

(3) WEIGHT = Total Column 1 = 4,426.63 MT

Storm Survival (S) or Normal Operation (N) = N

Water Depth = 40 m

Required Preload (per leg) from Figure 7-1 17,725.00 kN

(4) Half of Elevated Weight = (3) / 2 * 9.81 = 21,712.62 KN

**CHECK ELEVATED WEIGHT CONSTRAINTS:**

**1) Is half of the elevated weight greater than the required preload?**

**YES** _____ **Vessel is ready for preloading**

**NO** _____ **Additional weight is required for preloading**

Add ballast or variable load and check again

**2A) Is the total elevated weight (exlcuding crane hook load) less than 4160 MT?**

**YES** _____ **Elevated weight is permissible. See 2B.**

**NO** ____X____ **If no, see 3A.**

Decrease variable load to reduce total elevated weight and check elevated weight again

**2B) Is the LCG between 27.2m and 30.6m aft of Frame 0; and is the TCG near centerline?**

**YES** _____ **Elevated LCG and TCG are permissible**

**NO** _____ **Elevated LCG and TCG are NOT permissible**

In water depths greater than 60m, if the LCG is forward of 30.6m aft of Fr. 0, the max wave height is reduced to 7m

Shfit weights as required to achieve required LCG and TCG positions

**3A) Is the total elevated weight (exlcuding crane hook load) less than 4407 MT?**

**YES** ____X____ **Elevated weight is permissible. See 3B.**

**NO** _____ **Elevated weight is NOT permissible.**

Decrease variable load to reduce total elevated weight and check elevated weight again.

**3B) Is the LCG between 28.7m and 30.6m aft of Frame 0; and is the TCG near centerline?**

**YES** ____X____ **Elevated LCG and TCG are permissible**

**NO** _____ **Elevated LCG and TCG are NOT permissible**

Shfit weights as required to achieve required LCG and TCG positions

Water depth limit is 46m. See Leg Strength Cases Summary Chart.

**Figure 7-2: Elevated Weight Sample Calculation – 709 MT VL**

## 7.4 Jacking Up

7.4.1 The following shall be used by the Master as guidance for elevating the vessel. ABS allowable limits on jacking and holding loads, leg axial reactions, and pad loading listed in Table 4-7, Table 4-19 and Table 4-20 should be adhered to when jacking the unit and holding position while elevated. **Note that the values given in Table 4-7 represent the capabilities of the jacking system and are the governing values on axial loading.** The jacking system load monitoring interface shall be used to confirm actual values are consistent with allowable limits.

7.4.2 To the Master's satisfaction, the bottom condition with respect to the soil type, levelness, and potential obstructions should be determined before elevating the vessel.

7.4.3 All four legs should be lowered simultaneously.

7.4.4 Once the pads have contacted the bottom and the vessel is supported by the legs, the vessel should be leveled by moving the legs individually. During preloading small tilt angles are acceptable. However, once preloading is complete, the vessel should be leveled again and the vessel should be kept level at all times while jacking.

7.4.5 Deploy the overboard pumps.

7.4.6 Once the vessel's hull has cleared the wave tops, the elevation shall be stopped for preloading, evaluation of the footing, and to allow the pads to settle into the bottom. Preloading shall be performed per the instructions in this manual.

7.4.7 It is recommended that the required preload reaction should be held on each diagonal of 2 legs under preload weight for a period of at least 3 hours without further settling, unless specifically instructed otherwise by SEACOR Marine management. This settling period should be extended at the discretion of the Master when spotting the vessel near underwater or environmental hazards.

7.4.8 If, after the settling period and evaluation of the footing, the bottom conditions are determined inadequate for continued elevation, for example, if a leg continues penetrating or if the vessel cannot be made level, the preloading ballast (if any) shall be discharged and the vessel jacked down. After the preload ballast has been dumped (if any) care should be taken to ensure a stable afloat condition if the vessel will move to a different location. The Master may use the stability and loading forms in Section 10 of this manual for this purpose.

7.4.9 If, after the settling in period and evaluation of the footing, the master determines the bottom conditions are adequate for continued elevating, the preloading ballast (if any) shall be discharged and the vessel may be elevated to the final elevated location. The vessel shall be kept level while elevating. Care should be taken prior to jacking that the elevated load condition is such that ABS leg axial load limits will not be exceeded. The Jacking Load Form contained in Appendix J to this manual may be used by the Master to determine these loads. LCG and TCG limits as described in Section 7.5 should be observed and the Master may choose to reposition variable loads to achieve a suitable elevated loading condition.

7.4.10 If at any time during the jacking or evaluation process, the vessel develops a heel or trim or if one leg has to be moved significantly more than the others to keep the vessel level, the jacking shall be stopped as soon as safely possible and the cause of the heel or trim determined before corrective action is taken. If a cause cannot be determined, or the cause is not correctable (i.e. poor bottom conditions), the vessel shall be jacked down to a safe position with minimal air gap until a corrective plan is developed. Watertight integrity shall be maintained. Personnel not directly involved with assessing the vessel's condition after a rapid settling event has occurred shall muster in a pre-designated area assigned by the Master and shall have Flag State approved Personnel Floatation Devices (PFD) accessible and ready for use. If further danger to personnel exists, evacuation of nonessential personnel and up to abandon ship of all personnel should be considered. The Master should consult with SEACOR Marine management for further instructions regarding vessel inspection and recovery. See

## 7.5 Punch Through Procedure

7.5.1 Stop all activities immediately and conduct an urgent assessment of the situation.

- 7.5.1.1 Verify the watertight integrity. Check the doors and hatches for leaks. Examine the hull and other compartments to prevent further water intrusion.
- 7.5.1.2 Vacate the Engine Room (ER) and seal the doors on the way out.
- 7.5.1.3 Activate "Sliding watertight door system" to isolate port and starboard compartments of the ER.
- 7.5.1.4 If water ingress cannot be contained, the abandon ship procedure should be initiated.

7.5.2 If possible, attempt to measure the air gap on both sides of the barge, to ascertain the depth of a punch through.

7.5.3 Should the punch through be minor, meaning that the hull is either above the water or partially submerged with buoyancy keeping it afloat, the crew should try to re-establish balance and level the hull.

7.5.3.1 This can be accomplished by offloading the ballast (if any) and freshwater from the punch-through side of the barge, thereby reducing the weight on that side.

7.5.3.2 Transferring fuel from one side to another may also be an option to redistribute weight away from the affected area.

7.5.3.3 Elevate the unimpacted legs (those not involved in the punch through) as this action will effectively lower the hull closer to a balanced level. These legs' jacking systems are less likely to have sustained damage.

7.5.3.4 The jacking system operator should avoid attempting to level the hull by lowering the legs involved in the punch through. Such an action could further damage the jacking system and raise the hull, which contradicts the goal of reducing the air gap to a safe level.

7.5.3.5 If the jacking system fails to move the legs, activate the emergency jacking panel.

7.5.4 However, if the punch through is severe, the Master should evacuate the personnel and seek assistance. A severe punch through is characterized by:

7.5.4.1 Partial submergence of the hull and inability to contain water intrusion into machinery spaces.

7.5.4.2 The hull being tilted at an angle that makes leveling impossible.

7.5.4.3 Total loss of power with no viable means of restoration. Inability to move the legs or operate the pumps.

## 7.6 LCG and TCG While Elevated:

7.6.1 In general, while elevated, LCG and TCG of the combined hull and any variable loads should be maintained coincident with the geometric center of the rectangle formed by the legs. The leg rectangle center is located 30.6m aft of the bow (Frame 0), on centerline. While elevated in heavy weather, (wind speeds above 50 knots) or in storm survival mode, the LCG should be 30.6m aft of the bow. The TCG should be on centerline during heavy weather.

7.6.2 The TCG should always be maintained near centerline as described above. In water depths less than 60m, an LCG range of 27.2m to 30.6m aft of Frame 0 is acceptable; (with up to 50 knots winds and a 10 meter maximum wave). In water depths greater than 60m, the maximum wave height is reduced to 7 meters unless then LCG is located near the leg rectangle center. If operating in water depths exceeding 60m and forecasted maximum wave heights exceeds 7 meters, contact SEACOR Marine management for specific guidance.

7.6.3 During heavy lift crane operations (181 tonnes hook load), the LCG of the hull plus any variable load but excluding the influence of the crane and hook load weights and moments, should be located near the leg rectangle center. The TCG of the hull plus any variable load but excluding the influence of the crane and hook load weights and moments should be on centerline. Shifts in the combined LCG and TCG under the influence of the heavy lift are accounted for in leg strength calculations. The master should consult with SEACOR Marine management to plan for maximum lift operations.

7.6.4 These LCG and TCG guidelines are aimed at ensuring that elevated loads do not get so unbalanced as to overload any particular leg while the vessel is experiencing harsh weather (see Sections 6.3.3 and 6.3.4), or when making a maximum 181 t lift in weather suitable for such lifts (see Section 6.3.5).

7.6.5 When in doubt, or when engaging in operations not specifically addressed by this manual, consult with SEACOR Marine management for suitable loading instructions.

## 7.7 Jacking Down

7.7.1 The following shall be used by the Master as guidance for lowering the vessel:

7.7.1.1 Secure watertight and weather tight closures for afloat operation.

7.7.1.2 Secure cranes and deck cargo for afloat operations.

7.7.1.3 If the vessel's loading has changed while elevated, ensure the new loading condition meets the stability requirements in Section 10 of this Manual.

7.7.1.4 Ensure the ballast used for preloading (if any) has been discharged.

7.7.1.5 One submersible pump shall remain deployed while jacking down to charge the firemain.

7.7.1.6 Turn on the Impressed Current Cathodic Protection (ICCP) system.

7.7.1.7 When jacking down and before the vessel is afloat, the vessel should be kept level. Once afloat, the legs should be raised simultaneously.

7.7.1.8 If difficulty is experienced freeing the pads from the sea floor, see Section 7.7

7.7.1.9 Once afloat, the cause of any heel or trim shall be determined and corrective action taken before getting underway. If the corrective action requires moving deck cargo with the vessel's cranes, the vessel must be elevated before the cranes are used.

## 7.8 Jetting System

7.8.1 The following shall be used by the Master as guidance for freeing the pads from the sea floor if unable to lift legs via normal efforts.

7.8.1.1 Submerge vessel hull as needed.

7.8.1.2 Ensure seacocks are open, sea chests are flooded, and there is a supply of water to main fire pump.

7.8.1.3 Deploy both submersible pumps.

7.8.1.4 Isolate both submersible pumps to supply water to the jetting system. Keep fire pump connected to the fire system.

7.8.1.5 Determine which pad is to be jetted and connect the jetting system to the appropriate leg port.

7.8.1.6 Engage jetting system while raising the leg slowly.

## 7.9 Receiving Vessels Alongside

7.9.1 The vessel shall be elevated and preloaded prior to bringing a vessel alongside. Wind speeds shall be less than 30 kts and waves less than 2 meters. Fenders shall be deployed, and vessel made fast to the satisfaction of the master. Use of a DP vessel without the need for mooring lines is preferred.

# 8 Preparing the Vessel for Heavy Weather

## 8.1 Weather Monitoring

8.1.1 When elevated in open water, the weather forecast must be monitored regularly and a heavy weather action plan developed that considers the forecast, current weather conditions, water depth, and vessel limitations. Specific considerations the Master should evaluate in heavy weather action planning include:

8.1.1.1 The maximum wind speed for normal operations is 70 knots with a maximum current of 2 knots. If winds are expected to exceed 70 knots, the vessel should seek safe harbor as described herein.

8.1.1.2 The maximum environmental limits for the storm survival condition include: maximum 100 knots of wind speed, 2 knots current, 10 m maximum seas and maximum 30 m water depth (including storm surge).

8.1.1.3 The maximum wave height limits, as described in Section 6.3, apply.

8.1.1.4 Specific attention should be paid to forecasts that predict sea states higher than 1 to 2 m (significant wave height), as 2 m is the maximum allowable afloat sea state for vessel survivability described in Section 6.3.

8.1.1.5 Estimated time to prepare the vessel for jacking down and getting underway.

8.1.1.6 Estimated time and route to harbor of safe refuge or relocation move. The vessel shall not require more than 12 hours to reach such refuge.

## 8.2 When Heavy Weather is Forecast

8.2.1 The vessel requires no special modifications to meet severe storm conditions except those practices mentioned below. When determining the time required to prepare for heavy weather, the following factors should be considered:

8.2.1.1 Time to jack up or down or change air gap; to be based on a nominal jacking speed of 1.2 meters per minute (4 feet per minute)

8.2.1.2 Time to preload per Section 7.4.7 (if possible)

8.2.1.3 Time to transit to harbor of safe refuge, assuming a conservative average speed against wind and waves (if required)

8.2.1.4 Time to secure cranes, deck cargo, and hatches/doors as required.

8.2.2 If wave height and wind predications do not exceed the elevated environmental limits for normal operations:

8.2.2.1 Determine the timeline for the weather event, including when the seas are anticipated to exceed the limits discussed in Section 6.3.1, when the maximum wind and seas are expected, and when the seas will subside to the limits discussed in Section 6.3.1 and 6.3.2.

8.2.2.1.1 The vessel is to remain elevated once the seas exceed the limits specified in Section 6.3.1 and 6.3.2, or the response of the vessel, when subject to a certain wave height and period combination, is such that serious damage to the legs or towers due to whipping is likely.

8.2.2.2 Determine if the current location will be adequate for the predicted wind and seas. If not adequate, prepare relocation plan.

8.2.2.3 Secure cranes and deck cargo. Secure all watertight and weather tight openings not required for vessel operation.

8.2.2.4 If a relocation move is necessary, it must be accomplished before the seas exceed the limits discussed in Section 6.3.1 and 6.3.2.

8.2.2.5 If staying on location, ensure that the elevated load condition (lightship plus variables loads) is balanced to the same degree as when the vessel was elevated (see Section 7.5 for LCG and TCG limits).

8.2.3 If wave height or wind predications exceed the elevated environmental limits for normal operations:

8.2.3.1 Determine the timeline for the weather event, including when the seas are anticipated to exceed the limits discussed in Section 6.3.1 and 6.3.2, when the maximum wind and seas are expected, and when the seas will subside to the limits discussed in Section 6.3.1 and 6.3.2, or less.

8.2.3.2 Determine route and estimated time to harbor of safe refuge. The vessel shall not require more than 12 hours to reach such refuge.

8.2.3.3 Secure cranes and deck cargo. Secure all watertight and weather tight openings not required for vessel operation.

8.2.3.4 Jack vessel down and proceed to harbor of safe refuge. This entire operation must be completed before the seas reach the limits discussed in Section 6.3.1 and 6.3.2, or the

winds exceed 50 knots. All personnel not essential to the vessel operation during the inclement weather should be removed from the vessel when practicable.

8.2.3.5 In lieu of returning to dock, the liftboat can withstand storm conditions while jacked in 30 m of water including storm surge. See 7.3.5 of this manual for additional requirements when operating in the elevated survival condition.

# 9 Procedures for Discovering the Flooding of a Leg

## 9.1 General Discussion Concerning Excessive List or Heel

9.1.1 When afloat, the heel and trim of the vessel shall be minimized. The Stability Loading Forms presented in Section 10 of this manual may be used to estimate the heel and trim of specific loading conditions. Every effort should be made to determine the causes of unexpected heel or trim before corrective action is taken.

9.1.1.1 Sound all tanks to ensure they are at the anticipated levels. Reevaluate loading conditions if discrepancies are found.

9.1.1.2 Check all compartments and voids for water, and de-water if required. Determine cause of flooding before proceeding. If the cause is indeterminate, the compartment or void shall be frequently monitored while underway.

9.1.1.3 Verify deck cargo arrangements and weights. If deck cargo requires relocation utilizing the vessel's cranes, the vessel must be elevated before the cranes are used.

9.1.2 If the cause of the excessive list or heel cannot be determined by the above, it may be due to a flooded leg or pad. Whether verified or not, the vessel shall be assumed to be in a damaged condition due to the flooded leg or pad, and an emergency action plan shall be developed and implemented. The following shall be considered by the Master when developing an emergency action plan:

9.1.2.1 All personnel shall don approved Personnel Floatation Devices for the duration of the emergency. At the Master's discretion, personnel not required for the operation of the vessel shall muster at their predetermined muster locations.

9.1.2.2 If possible, elevate the vessel immediately while an emergency action plan is developed. If elevation is not possible, the vessel shall be moved to a location where elevation is possible, and the vessel jacked up to a position above the wave tops.

9.1.2.3 If when afloat in the damaged condition, the average port and starboard draft amidships (at the load line marks) is less than or equal to the required load line draft, the vessel may proceed to a harbor of safe refuge or other protected waters where the damage can be evaluated. During the voyage, tanks, voids, and hull compartments shall be frequently monitored for leaks. If uncontrolled flooding is noted, the vessel shall be elevated as soon as safely possible and the cause of the flooding determined before proceeding.

9.1.2.4 If when afloat in the damaged condition, the average port and starboard draft amidships (at the load line marks) is greater than required load line draft, the vessel is not in compliance with its stability requirements for operation afloat and cannot operate afloat, except to execute emergency maneuvering. The vessel should be elevated immediately, consistent with safe jacking procedures, and the proper emergency authorities notified. Afloat operations are not allowed until an accepted plan is developed for vessel movement. The requirements of this plan, and the involvement of outside regulatory agencies or private interests, is dependent on the specifics of the casualty and is outside the scope of this manual.

# 10 Stability Information

10.1.1 The vessel shall be loaded according to the instructions below and on the Stability Loading Forms or Excel workbook included in this manual.

10.1.2 Compliance with the stability criteria does not ensure immunity against capsizing regardless of the circumstances, nor absolve the Master from his responsibilities. The Master should therefore exercise prudence and good seamanship having regard to the season of the year, weather forecasts and the navigational zone. The Master should take the appropriate action, speed and course warranted by the prevailing circumstances. In addition to the instructions included in this operations manual, the Master must also comply with the latest revision of SEACOR Marine's Safety Management System requirements for safe navigation. Care should be taken that the cargo allocated to the ship is capable of being stowed so that compliance with the criteria can be achieved. Before a voyage commences care should be taken to ensure that the cargo and sizable pieces of equipment have been properly stowed or lashed as per the vessel-specific cargo securing manual to minimize the possibility of both longitudinal and lateral shifting while at sea, under the effect of acceleration caused by rolling and pitching. (Regulatory cite – IMO Resolution A.739 2.3.1)

10.1.3 After loading and prior to departure and at other times necessary to assure the safety of the vessel, the Master shall determine that the vessel complies with all applicable stability requirements and enter a statement of verification in the log book. The vessel may not depart until it is in compliance with these requirements. Any stability calculations made in support of the determination must be retained on board the vessel for the duration of the voyage.

10.1.4 Vessel route is restricted. Operation on exposed waters is permitted only when operating not more than twelve hours from a harbor of safe refuge or a location where the vessel may elevate to survive 100 knots wind. Since the vessel's route is based on other considerations in addition to stability, the Master is cautioned that the route may be further limited.

10.1.5 The maximum summer salt water load line average molded draft is 3.576m ABL. This corresponds to a displacement of 7,602 t. The Master shall, upon departure on an ocean or coastwise voyage, enter in the vessel's logbook a statement of the position of the load line markings, port and starboard, relative to the surface of the water in which the vessel is floating. If the density of the water in which the vessel is floating is compensated for, this density shall also be noted in the vessel's logbook.

10.1.6 Main deck hatches and weather doors to the deckhouse and machinery spaces shall be kept closed and fully secured at all times when underway, except when actually used for transit under safe conditions.

10.1.7 The trim and list of the vessel shall be kept to a minimum at all times.

10.1.8 Cross connections between all port and starboard tanks shall be closed at all times when the vessel is underway, including applicable valves in the ballast manifold.

10.1.9 The vessel is designed to meet a one compartment standard of flooding as detailed in 0722-851-001 “Seacor Marine” “, LLC M300-4 Liftboat Stability Support Calculations” Watertight transverse bulkheads, required in association with the flooding stability criterion, are located at Frames 5, 11, 17, 30, 34, 40 and 46. In addition, the longitudinal engine room bulkhead between Frames 17 and 30 is required as part of the flooding stability standard. Changes to these bulkheads, or to the tank, void, and compartment boundary bulkheads below the main deck that would affect their watertight integrity, require the authorization and supervision of ABS and the flag state authority.

10.1.10 When afloat, deck cargo must be positively secured against shifting prior to leaving protected waters.

10.1.11 Freeing ports must be kept unobstructed at all times.

10.1.12 The vessel is equipped with cranes not for operation while afloat. While afloat, the cranes shall be stowed in their respective cradles.

10.1.13 The vessel’s bilges and voids shall be kept pumped to minimum content at all times.

10.1.14 The Master shall make every effort to determine the cause of any list of the vessel before taking corrective action.

10.1.15 Any changes made to the vessel after the Inclining Experiment that could alter the lightship characteristics needs to be recorded in Section 24 of this manual. All changes should be reported to SEACOR Marine, LLC management. No fixed ballast or other such weights shall be added, removed, altered, and/or relocated without the authorization and supervision of ABS and the flag state authority.

10.1.16 The stability of the vessel should be checked periodically throughout a voyage as fuel is consumed and ballast added, or at any time the loading of the vessel is modified.

10.1.17 Nominal maximum cargo height above main deck has been assumed at 9 m. Consult SEACOR Marine, LLC management if unusually tall cargo will be carried.

## 10.2 General Stability Discussion

10.2.1 Stability must be evaluated prior to departure and at any time during the voyage where the vessel's loading is changed.

10.2.2 To determine the stability for a specific loading condition, the three (3) stability loading forms must be completed. These forms can be completed using the provided Excel workbook as an aid to the Master's calculations. The Excel workbook's calculations are to be verified by manual calculations periodically. These forms are:

10.2.2.1 DECK CARGO LOADING FORM – This form is used to record the weight, LCG, TCG, and VCG of the deck cargo. The total weight and longitudinal, transverse, and vertical moments of the deck cargo are calculated on this form and transferred to the VESSEL LOADING FORM. This form is also used to record and sum the liquid weight and FSM of any temporary deck tanks carried on the cargo deck.

10.2.2.2 TANK LOADING –This form is used to record tank soundings and the corresponding weight, LCG, TCG, VCG, and FSM of the liquid carried in the vessel's tanks. The longitudinal, transverse, and vertical moments are determined in this form. The moments, summed weight, and summed FSMs are to be transferred to the VESSEL LOADING FORM.

10.2.2.3 VESSEL LOADING FORM – This form is used to calculate the vessel's total weight (displacement), VCG, LCG, and TCG for the particular loading condition. Mean Draft is determined, and the draft and VCG are checked against the Allowable VCG versus Draft curve included in this manual. This form may also be used to calculate the vessel's list, trim, and the drafts at the BOW and TRANSOM. Draft can also be calculated at the location of the stern thrusters, which extend 0.87 m below the baseline. **When using these loading forms be sure to include any alterations/corrections to lightship. See Section 24 of this manual for further instructions.**

10.2.3 A Curve of Allowable VCG versus Draft is included to be used for evaluating the stability of a particular loading condition. The Master must verify that the vessel's condition falls within the allowable operating range of this plot before beginning a voyage or changing the vessels loading condition during a voyage (See Stability Operating Instructions, Section 10).

## 10.3 Stability Loading Form Instructions

10.3.1 Instructions for determining the weight, and the vertical, longitudinal, and transverse moments of the deck cargo using the DECK CARGO LOADING FORM:

10.3.1.1 Verify the weight of each item of deck cargo as it is loaded. Enter the weight in Column 1, the LCG aft of the headlog (Frame 0) in Column 2, the TCG from the vessel CL in Column 4, and the VCG above the Main Deck in Column 6

10.3.1.2 Temporary deck tanks require two entries on the DECK CARGO LOADING FORM, one for the weight, VCG, LCG, and TCG of the empty tank and a separate line item for the liquid weight, VCG, LCG, and TCG. Enter the free surface moment (FSM) of the liquid in Column 10. See section 10.2.2 for a discussion of determining the FSM for temporary deck tanks.

10.3.1.3 Sum the weights in Column 1 to obtain the total weight of the deck cargo. Enter this total on the DECK CARGO LOADING FORM and the VESSEL LOADING FORM.

10.3.1.4 The VCG entered on the DECK CARGO LOADING FORM is the distance above the Main Deck plating. To convert the VCG to the distance above BL, 4.6m (Column 6 + Column 7 on the DECK CARGO LOADING FORM). Multiply each weight in Column 1 by its corresponding VCG above BL (Column 8) to determine the vertical moment. Enter this moment on the corresponding line in Column 9. Sum the vertical moments in Column 9 to obtain the total vertical moment for all deck cargo. Enter this value on the DECK CARGO LOADING FORM and the VESSEL LOADING FORM.

10.3.1.5 Multiply each weight in Column 1 by its corresponding LCG in Column 2 to obtain the longitudinal moment and enter this value in Column 3. Sum the longitudinal moments in Column 3 to obtain the total longitudinal moment for all deck cargo. Enter this value on the DECK CARGO LOADING FORM and the VESSEL LOADING FORM.

10.3.1.6 Multiply each weight in Column 1 by its corresponding TCG in Column 4 to obtain the transverse moment and enter this value in Column 5. Note the starboard moments are positive and the port moments are negative. Sum the transverse moments in Column 5 to obtain the total transverse moment for all deck cargo. Enter this value on the DECK CARGO LOADING FORM and the VESSEL LOADING FORM.

10.3.1.7 Sum the deck tanks' FSM moments in Column 10 to obtain the total deck cargo FSM. Enter this value on the DECK CARGO LOADING FORM and the VESSEL LOADING FORM.

10.3.2 Instructions for determining the FSM of Temporary Deck Tanks:

10.3.2.1 Liquids may be carried on the cargo deck in temporary deck tanks consistent with the vessel's stability requirements, statutory restrictions, and applicable hazardous material, noxious liquid substance, and pollution regulations.

10.3.2.2 The maximum free surface moment (FSM) for each temporary deck tank anticipated to carry liquids at any time during the voyage must be determined. This maximum FSM value must be included on the DECK CARGO LOADING and VESSEL LOADING forms. The maximum FSM is specific to the tank and liquid carried and may be determined by independent calculation, provided by the tank supplier, or, for specific tank geometries, can be calculated using the DECK TANK FSM CALCULATION WORKSHEET included in this manual.

10.3.2.2.1 The DECK TANK FSM CALCULATION WORKSHEET can be used to determine the maximum FSM for rectangular or cylindrical tanks oriented as shown on the worksheet. Instructions for determining the maximum FSM are included with the worksheet.

10.3.3 Instructions for completing the TANK LOADING FORM:

10.3.3.1 The instructions required for completing the TANK LOADING FORM are included with the form.

10.3.4 Instructions for determining the vessel's total weight (displacement) LCG, TCG and VCG and using the VESSEL LOADING FORM:

10.3.4.1 The lightship weight and centers of gravity are listed in Section 4 of this report. These values have been included in the first row of the VESSEL LOADING FORM along with the appropriate moments.

10.3.4.2 Enter the weight of the Crew, Effects, and Stores for the entire vessel crew in Column 1 on the appropriate row. The appropriate LCG, TCG and VCG have been pre-entered onto the form. Determine the vertical, longitudinal, and transverse moments by multiplying the weight in Column 1 by the LCG, TCG or VCG in Columns 2, 4 or 6, respectively. Enter the resulting moments in the appropriate Columns 3, 5 or 7 for the longitudinal, transverse, and vertical moments, respectively.

10.3.4.3 Determine the weight of the Offshore Workers to be on board the vessel by multiplying the number of workers by 0.173 t (173 kg) per worker. Enter this value in Column 1 on the appropriate row. The associated LCG, TCG or VCG for the Offshore Workers have been pre-entered onto the form. Determine the longitudinal, transverse, and vertical moments by multiplying the weight in Column 1 by the LCG, TCG or VCG and enter the resulting moments in Columns 3, 5 and 7 for the longitudinal, transverse and vertical moments, respectively.

10.3.4.4 Enter the total deck cargo weight from the DECK CARGO LOADING FORM in Column 1 on the appropriate row. Enter the total deck cargo longitudinal, transverse, and vertical moments from the DECK CARGO LOADING FORM onto the appropriate row in Columns 3, 5 and 7, respectively.

10.3.4.5 Enter the sum of the total temporary deck tanks FSM from the DECK CARGO LOADING FORM and the total FSM from the TANK LOADING FORM in the appropriate row in Column 7.

10.3.4.6 Enter the total tank liquids weight from the TANK LOADING FORM in Column 1 on the appropriate row. Enter the total tank loads' longitudinal, transverse, and vertical moments from the TANK LOADING FORM onto the appropriate row in Columns 3, 5 and 7, respectively.

10.3.4.7 Determine the vessel's total weight by summing Column 1 and entering this value in Column 1 of the TOTALS row. Determine the total moments by summing the longitudinal, transverse, and vertical moments and entering these values in the TOTALS row in Columns 3, 5 and 7 respectively.

10.3.4.8 Determine the vessel's LCG, TCG or VCG as shown in calculation items (1), (2) and (3), respectively, from the Vessel Loading Form.

10.3.4.9 Determine the mean draft of the vessel, calculation item (5), using the Hydrostatic Properties table, Table 11-1. When the vessel's displacement (total weight) falls between two lines on the Hydrostatic Table, the draft may be determined by linear interpolation or, alternately, by using the value that corresponds to the next highest displacement in the table. For example, a displacement of 7164 t has a corresponding draft (saltwater) of 3.4 m ABL.

10.3.4.10 Using the mean draft value determined above, plot the loading condition's draft, and VCG on the Allowable VCG versus Draft curve. This plotting is accomplished by drawing a vertical line up from the mean draft value and a horizontal line over from the VCG value. The plotted point is the intersection of these lines. This point must fall below the curve, indicating the loading condition meets the applicable stability requirements. If the plotted point falls **above the curve**, the loading condition **does not meet** the applicable stability requirements and the loading condition must be revised by removing deck cargo from the boat, moving heavy items closer to the deck, or increasing below deck tonnage, so long as the load line draft is not exceeded. The new loading condition must be re-evaluated, and the new point plotted and checked on the Allowable VCG versus Draft curve. The stability criteria must be met before the vessel can sail. Any changes to the vessel's loading condition made during a voyage must be checked using the above procedures before they are implemented.

10.3.4.11 Included on the VESSEL LOADING FORM are optional calculations to be used for determining the trim and heel of the loading condition as well as the drafts at the FP and AP. The hydrostatic values used for these calculations are from the Hydrostatic Properties table using the same method as was used to determine the mean draft.

10.3.4.12 The VESSEL LOADING FORM also includes calculations for determining the navigational draft at the stern thruster units.

## 10.4 Hydrostatic Properties

**Table 10-1: Hydrostatic Properties**

Note: 1) Distances are measured from Frame 0 & baseline. 2) Submerged portions of the legs & pads are buoyant and included in hydrostatics.

| Draft | Disp | LCB | VCB | WPA | LCF | KMT | KML | BMT | BML | WSA | TP1mm | MH .01 deg | MH 1 deg | MH1mm | MT .01 deg | MT 1 deg | MT1mm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| m | MT | m | m | $m^2$ | m | m | m | m | m | $m^2$ | MT | MT-m | MT-m | MT-m | MT-m | MT-m | MT-m |
| 2.00 | 3725 | 29.8 | 1.1 | 2300.5 | 31.4 | 80.9 | 180.6 | 79.9 | 179.5 | 3549.5 | 2.36 | 51.91 | 5191 | 7.51 | 116.68 | 11668 | 10.71 |
| 2.10 | 3963 | 29.9 | 1.1 | 2357.2 | 32.0 | 79.1 | 181.8 | 77.9 | 180.6 | 3629.1 | 2.42 | 53.89 | 5389 | 7.80 | 124.94 | 12494 | 11.47 |
| 2.20 | 4207 | 30.0 | 1.2 | 2384.4 | 32.3 | 76.6 | 176.7 | 75.4 | 175.6 | 3680.4 | 2.44 | 55.39 | 5539 | 8.01 | 128.89 | 12889 | 11.83 |
| 2.30 | 4451 | 30.1 | 1.3 | 2387.9 | 32.2 | 72.7 | 167.9 | 71.4 | 166.7 | 3708.7 | 2.45 | 55.47 | 5547 | 8.02 | 129.47 | 12947 | 11.89 |
| 2.40 | 4696 | 30.2 | 1.3 | 2391.5 | 32.2 | 69.1 | 160.0 | 67.8 | 158.7 | 3736.9 | 2.45 | 55.55 | 5555 | 8.04 | 130.04 | 13004 | 11.94 |
| 2.50 | 4941 | 30.3 | 1.4 | 2395.0 | 32.1 | 65.9 | 152.8 | 64.5 | 151.5 | 3765.1 | 2.45 | 55.62 | 5562 | 8.05 | 130.62 | 13062 | 11.99 |
| 2.60 | 5187 | 30.4 | 1.4 | 2398.3 | 32.1 | 62.9 | 146.3 | 61.5 | 144.9 | 3793.2 | 2.46 | 55.70 | 5570 | 8.06 | 131.17 | 13117 | 12.04 |
| 2.70 | 5433 | 30.5 | 1.5 | 2401.4 | 32.1 | 60.3 | 140.3 | 58.8 | 138.9 | 3821.3 | 2.46 | 55.75 | 5575 | 8.07 | 131.67 | 13167 | 12.09 |
| 2.80 | 5679 | 30.6 | 1.5 | 2404.5 | 32.0 | 57.8 | 134.9 | 56.3 | 133.4 | 3849.4 | 2.46 | 55.80 | 5580 | 8.07 | 132.19 | 13219 | 12.14 |
| 2.90 | 5926 | 30.6 | 1.6 | 2408.3 | 32.0 | 57.8 | 130.0 | 54.0 | 128.4 | 3877.8 | 2.47 | 55.89 | 5589 | 8.09 | 132.82 | 13282 | 12.19 |
| 3.00 | 6173 | 30.7 | 1.6 | 2412.1 | 31.9 | 53.6 | 125.5 | 52.0 | 123.9 | 3906.3 | 2.47 | 55.98 | 5598 | 8.10 | 133.45 | 13345 | 12.25 |
| 3.10 | 6420 | 30.7 | 1.7 | 2415.7 | 31.9 | 51.7 | 121.3 | 50.0 | 119.6 | 3934.4 | 2.48 | 56.06 | 5606 | 8.11 | 134.05 | 13405 | 12.31 |
| 3.20 | 6668 | 30.8 | 1.8 | 2419.2 | 31.8 | 50.0 | 117.4 | 48.2 | 115.7 | 3962.6 | 2.48 | 56.13 | 5613 | 8.12 | 134.64 | 13464 | 12.36 |
| 3.30 | 6916 | 30.8 | 1.8 | 2422.7 | 31.8 | 48.4 | 113.8 | 46.6 | 112.0 | 3990.8 | 2.48 | 56.20 | 5620 | 8.13 | 135.23 | 13523 | 12.42 |
| 3.40 | 7164 | 30.8 | 1.9 | 2426.1 | 31.8 | 46.9 | 110.5 | 45.0 | 108.6 | 4019.0 | 2.49 | 56.28 | 5628 | 8.14 | 135.80 | 13580 | 12.47 |
| 3.50 | 7413 | 30.9 | 1.9 | 2429.5 | 31.7 | 45.5 | 107.3 | 43.6 | 105.4 | 4047.2 | 2.49 | 56.35 | 5635 | 8.15 | 136.36 | 13636 | 12.52 |
| 3.60 | 7662 | 30.9 | 2.0 | 2432.8 | 31.7 | 44.2 | 104.4 | 42.2 | 102.4 | 4075.3 | 2.49 | 56.43 | 5643 | 8.16 | 136.93 | 13693 | 12.57 |
| 3.70 | 7912 | 30.9 | 2.0 | 2435.0 | 31.6 | 42.9 | 101.5 | 40.9 | 99.4 | 4102.7 | 2.50 | 56.46 | 5646 | 8.17 | 137.30 | 13730 | 12.61 |
| 3.80 | 8161 | 30.9 | 2.1 | 2437.1 | 31.6 | 41.7 | 98.7 | 39.7 | 96.6 | 4129.9 | 2.50 | 56.49 | 5649 | 8.17 | 137.66 | 13766 | 12.64 |
| 3.90 | 8411 | 31.0 | 2.1 | 2439.3 | 31.6 | 40.6 | 96.2 | 38.5 | 94.0 | 4157.2 | 2.50 | 56.53 | 5653 | 8.18 | 138.04 | 13804 | 12.67 |
| 4.00 | 8661 | 31.0 | 2.2 | 2441.3 | 31.6 | 39.6 | 93.7 | 37.4 | 91.5 | 4184.3 | 2.50 | 56.57 | 5657 | 8.18 | 138.38 | 13838 | 12.70 |
| 4.10 | 8912 | 31.0 | 2.2 | 2443.0 | 31.5 | 38.6 | 91.4 | 36.4 | 89.2 | 4211.3 | 2.50 | 56.61 | 5661 | 8.19 | 138.67 | 13867 | 12.73 |
| 4.20 | 9162 | 31.0 | 2.3 | 2444.7 | 31.5 | 37.7 | 89.2 | 35.4 | 86.9 | 4238.3 | 2.51 | 56.65 | 5665 | 8.20 | 138.96 | 13896 | 12.76 |
| 4.30 | 9413 | 31.0 | 2.3 | 2446.3 | 31.5 | 36.8 | 87.1 | 34.5 | 84.8 | 4265.3 | 2.51 | 56.68 | 5668 | 8.20 | 139.24 | 13924 | 12.78 |
| 4.40 | 9663 | 31.0 | 2.4 | 2447.9 | 31.5 | 36.0 | 85.1 | 33.6 | 82.7 | 4292.3 | 2.51 | 56.72 | 5672 | 8.21 | 139.52 | 13952 | 12.81 |
| 4.50 | 9914 | 31.0 | 2.4 | 2449.5 | 31.5 | 35.2 | 83.2 | 32.8 | 80.8 | 4319.3 | 2.51 | 56.75 | 5675 | 8.21 | 139.80 | 13980 | 12.84 |
| 4.60 | 10165 | 31.1 | 2.5 | 654.6 | 13.6 | 6.5 | 8.7 | 4.0 | 6.2 | 6142.8 | 0.67 | 7.12 | 712 | 1.03 | 10.98 | 1098 | 1.01 |

## 10.5 Tank and Void Capacity Tables (see also Appendix J)

| M300-4 LIFTBOAT TANK CAPACITY SUMMARY | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Permeability | Spec. Grav. | Weight | Volume | LCG | TCG | VCG | FSMT | FSML |
| | | | MT | m^3 | m (+ AFT of FP) | m (+ Stbd OCL) | m (+ABL) | m*M-tons | m*M-tons |
| Ballast 1P | 0.98 | 1.025 | 178.772 | 174.412 | 3.756 | -4.721 | 2.737 | 435 | 166 |
| Ballast 1S | 0.98 | 1.025 | 178.772 | 174.411 | 3.756 | 4.721 | 2.737 | 435 | 166 |
| Ballast 2P | 0.98 | 1.025 | 164.170 | 160.166 | 38.401 | -15.881 | 2.417 | 191 | 72 |
| Ballast 2S | 0.98 | 1.025 | 164.170 | 160.166 | 38.401 | 15.881 | 2.417 | 191 | 72 |
| Ballast 3P | 0.98 | 1.025 | 311.745 | 304.141 | 51.563 | -4.774 | 2.353 | 533 | 300 |
| Ballast 3S | 0.98 | 1.025 | 311.745 | 304.141 | 51.563 | 4.774 | 2.353 | 533 | 300 |
| Ballast 4P | 0.98 | 1.025 | 69.830 | 68.127 | 58.595 | -14.462 | 3.135 | 28 | 112 |
| Ballast 4S | 0.98 | 1.025 | 81.020 | 79.044 | 58.604 | 14.184 | 3.162 | 40 | 128 |
| Fuel Day Tank Port | 0.98 | 0.867 | 10.767 | 12.419 | 24.000 | -13.200 | 3.500 | 2 | 2 |
| Fuel Day Tank Stbd | 0.98 | 0.867 | 10.767 | 12.419 | 24.000 | 13.200 | 3.500 | 2 | 2 |
| Dirty Oil Tank | 0.98 | 0.867 | 13.209 | 15.235 | 29.400 | 0.000 | 0.600 | 12 | 12 |
| Fuel Oil Port | 0.98 | 0.867 | 128.071 | 147.717 | 22.700 | -16.106 | 2.327 | 161 | 61 |
| Fuel Oil Stbd | 0.98 | 0.867 | 128.071 | 147.717 | 22.700 | 16.106 | 2.327 | 161 | 61 |
| Fresh Water Port | 0.98 | 1.000 | 139.421 | 139.421 | 30.000 | -17.168 | 2.069 | 279 | 238 |
| Fresh Water Stbd | 0.98 | 1.000 | 139.421 | 139.421 | 30.000 | 17.168 | 2.069 | 279 | 238 |
| Grey Water Stbd | 0.98 | 1.000 | 9.541 | 9.541 | 21.600 | 5.984 | 0.637 | 9 | 4 |
| Lube Oil Stbd | 0.98 | 0.910 | 6.932 | 7.618 | 25.800 | 0.900 | 0.601 | 2 | 6 |
| Oily Water Port | 0.98 | 1.000 | 7.618 | 7.618 | 25.800 | -0.900 | 0.601 | 2 | 7 |
| Zero Discharge 1P | 0.98 | 1.000 | 48.419 | 48.419 | 4.207 | -17.848 | 2.801 | 14 | 33 |
| Zero Discharge 1S | 0.98 | 1.000 | 48.419 | 48.419 | 4.207 | 17.848 | 2.801 | 14 | 33 |
| Zero Discharge 2P | 0.98 | 1.000 | 69.331 | 69.331 | 58.508 | -17.979 | 3.192 | 27 | 107 |
| Zero Discharge 2S | 0.98 | 1.000 | 69.331 | 69.331 | 58.508 | 17.979 | 3.192 | 27 | 107 |

Table 10-2: Tank Capacity Table

| M300-4 VOID SPACE CAPACITY SUMMARY | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Permeability | Spec. Grav. | Weight | Volume | LCG | TCG | VCG | FSMT | FSML |
| | | | MT | m^3 | m (+ AFT of FP) | m (+ Stbd OCL) | m (+ABL) | m*M-tons | m*M-tons |
| Void 1P | 0.98 | 1.025 | 48.155 | 46.981 | 3.977 | -14.687 | 2.825 | 12 | 39 |
| Void 1S | 0.98 | 1.025 | 48.155 | 46.981 | 3.977 | 14.687 | 2.825 | 12 | 39 |
| Void 2P | 0.98 | 1.025 | 158.868 | 154.993 | 13.200 | -4.698 | 0.628 | 1066 | 2400 |
| Void 2S | 0.98 | 1.025 | 158.868 | 154.993 | 13.200 | 4.698 | 0.628 | 1066 | 2400 |
| Void 3P | 0.98 | 1.025 | 154.405 | 150.639 | 13.200 | -10.798 | 2.376 | 17 | 600 |
| Void 3S | 0.98 | 1.025 | 154.405 | 150.639 | 13.200 | 10.798 | 2.376 | 17 | 600 |
| Void 4P | 0.98 | 1.025 | 155.145 | 151.361 | 13.199 | -14.001 | 3.258 | 82 | 1048 |
| Void 4S | 0.98 | 1.025 | 155.145 | 151.361 | 13.199 | 14.001 | 3.258 | 82 | 1048 |
| Void 5P | 0.98 | 1.025 | 130.283 | 127.105 | 13.199 | -18.072 | 3.275 | 51 | 898 |
| Void 5S | 0.98 | 1.025 | 130.283 | 127.105 | 13.199 | 18.072 | 3.275 | 51 | 898 |
| Void 6P | 0.98 | 1.025 | 202.770 | 197.825 | 28.578 | 6.886 | 0.629 | 2926 | 4333 |
| Void 6S | 0.98 | 1.025 | 193.000 | 188.293 | 28.931 | 6.932 | 0.628 | 2906 | 3865 |
| Void 7P | 0.98 | 1.025 | 23.818 | 23.237 | 25.800 | -17.168 | 2.069 | 48 | 1 |
| Void 7S | 0.98 | 1.025 | 23.818 | 23.237 | 25.800 | 17.168 | 2.069 | 48 | 1 |
| Void 8P | 0.98 | 1.025 | 18.722 | 18.266 | 34.800 | -18.899 | 2.443 | 1 | 2 |
| Void 8S | 0.98 | 1.025 | 18.722 | 18.266 | 34.800 | 18.899 | 2.443 | 1 | 2 |
| Void 9P | 0.98 | 1.025 | 210.349 | 205.218 | 38.400 | -4.774 | 2.328 | 355 | 89 |
| Void 9S | 0.98 | 1.025 | 210.349 | 205.218 | 38.400 | 4.774 | 2.328 | 355 | 89 |
| Void 10P | 0.98 | 1.025 | 315.468 | 307.773 | 44.400 | -4.774 | 2.328 | 533 | 300 |
| Void 10S | 0.98 | 1.025 | 315.468 | 307.774 | 44.400 | 4.774 | 2.328 | 533 | 300 |
| Void 11P | 0.98 | 1.025 | 205.148 | 200.145 | 45.560 | -10.797 | 2.386 | 22 | 1425 |
| Void 12P | 0.98 | 1.025 | 156.734 | 152.911 | 47.976 | -14.004 | 3.243 | 82 | 1049 |
| Void 12S | 0.98 | 1.025 | 156.734 | 152.911 | 47.976 | 14.004 | 3.243 | 82 | 1049 |
| Void 13P | 0.98 | 1.025 | 131.268 | 128.066 | 47.968 | -18.075 | 3.259 | 51 | 894 |
| Void 13S | 0.98 | 1.025 | 131.268 | 128.066 | 47.968 | 18.075 | 3.259 | 51 | 894 |
| Void 14S | 0.98 | 1.025 | 47.562 | 46.403 | 45.417 | 10.792 | 0.683 | 22 | 1422 |

Table 10-3: Void Capacity Table

## 10.6 KG Allowable versus Mean Draft Curve

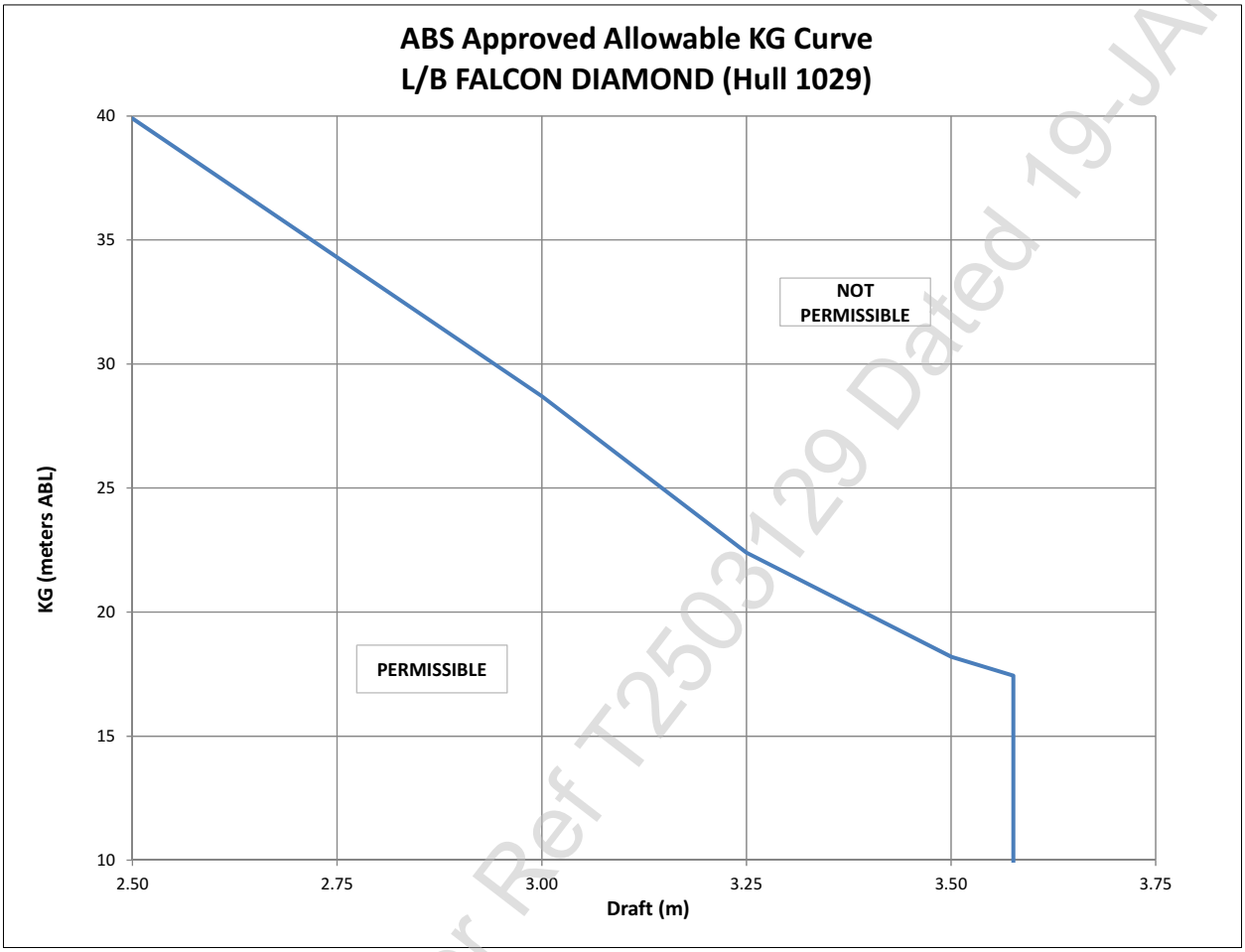


Figure 10-1: ABS Allowable KG Curves

| ALLOWABLE KG CURVE | | |
|---|---|---|
| **Displacement** | **DRAFT** | **$KG_A$** |
| **(MT)** | **(m)** | **(m)** |
| 4941 | 2.50 | 39.9 |
| 6173 | 3.00 | 28.7 |
| 6792 | 3.25 | 22.4 |
| 7413 | 3.50 | 18.2 |
| 7602 | 3.576 | 17.44 |

Table 10-4: ABS Allowable KG Values

*See Stability Support Calculations.*

## 10.7 Sample Afloat Loading Conditions

10.7.1 The following sample loading conditions have been developed as examples of typical afloat conditions: (Note: Elevated conditions must comply with the requirements and limits discussed in Sections 6, 7, and 8 of this Manual.)

1. Minimum Operating Condition (MOC) – Lightship (The weight of the ship including hull, machinery, outfit, equipment, and liquids in machinery), 10% fuel & fresh water, ballasted to minimize trim and heel
2. Light Deck Cargo (LDC) – Light Deck Cargo (100 MT); approximately 35% fuel & fresh water, deck cargo
3. Loaded Condition Afloat (LCA)
    - LCA_454 – 454 MT variable load; approximately 35% fuel & fresh water, deck cargo
    - LCA_709 – 709 MT variable load; approximately 35% fuel & fresh water, deck cargo
4. Load Line Condition (LL) – Maximum operating draft
5. Helideck Operations (HDO)
    - HDO_454 – 454 MT variable load; approximately 35% fuel & fresh water, deck cargo, and helicopter
    - HDO_709 – 709 MT variable load; approximately 35% fuel & fresh water, deck cargo, and helicopter

Allowable VCG vs. Draft Curve with the loading conditions are plotted on the following page.

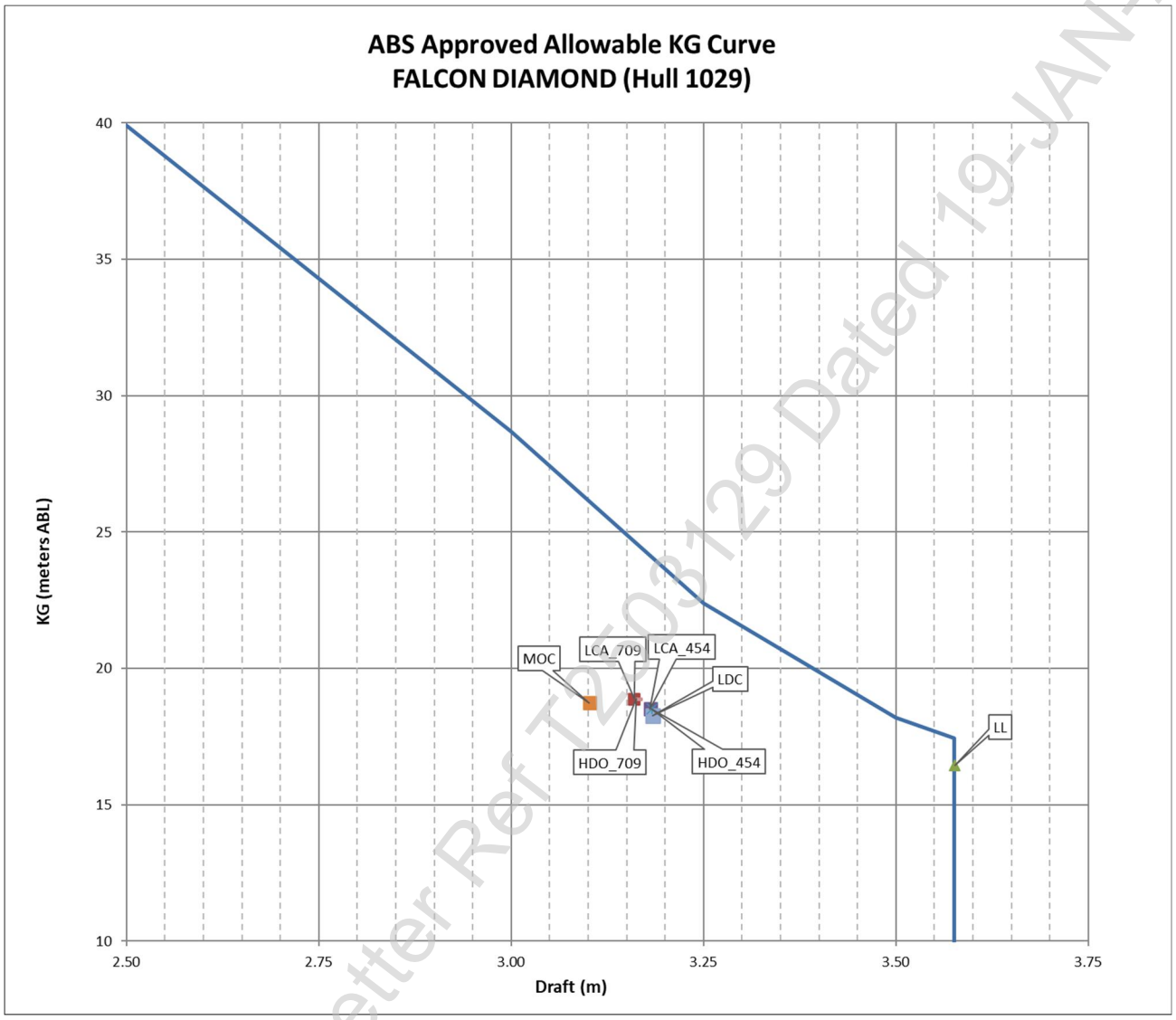


Figure 10-2: ABS Allowable KG Curves with Loading Conditions

# CONDITION 1: Minimum Operating Condition

**VESSEL LOADING FORM**

Condition: FALCON DIAMOND - (1) MINIMUM OPERATING CONDITION

| COLUMN → | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) | VCG (m ABL) | V-MOM (MT-m) |
| **LIGHTSHIP** | 5870.87 | 28.00 | *164,361* | -0.50 | *-2,906* | 20.11 | *118086.7* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* | 8.15 | *33* |
| **CREW, EFFECTS, & STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* | 13.60 | *68* |
| **OFFSHORE WORKERS, EFFECTS, & STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* | 13.60 | *272* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 0.00 | 0.00 | *0* | 0.00 | *0* | 0.00 | *0* |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 525.59 | | *26,571* | | *1,642* | | *1,236* |
| **TOTAL FSM OF ALL SLACK TANKS (from TANK LOADING FORM and DECK CARGO LOADING FORM)** | | | | | | | *909* |
| TOTALS: | 6,425.46 | | 191,492 | | -1,264 | | 120,605 |

Vessel Loading Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 191,492 / 6,425.46 = 29.80 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = -1,264 / 6,425.46 = -0.20 m from CL (+STBD)

(3) KG = VCG = (Total Col. 7 / Total Col. 1) = 120,605 / 6,425.46 = 18.77 m ABL **NOTE: INCLUDES FSE**

(4) DISPLACEMENT = Total Column 1 = 6,425.46 MT

(5) MEAN SW WATER DRAFT (from Hydrostatic Properties) = 3.10 m ABL

**CHECK STABILITY:**

**Does the loading condition's KG fall below the curves of "Allowable KG -vs- Displacement?"**

**YES ____x_____ Loading condition meets the stability requirements**

**NO _____ Loading condition DOES NOT meet the stability criteria.**

Increase ballast and/or decrease deck cargo or take other corrective action.
Correct Loading forms and check KG again.

THE FOLLOWING OPTIONAL CALCULATIONS DETERMINE THE TRIM, HEEL, AND DRAFTS AT THE BOW AND TRANSOM.

(6) LOA = 62.40 m

(7) LCB (from Hydrostatics) = 30.73 m aft of FR0

(8) MOMENT TO TRIM 1mm, MTmm (from Hydrostatics) = 12.31 MT-m

(9) KML (from Hydrostatics) = 121.25 m ABL

(10) MT1mm CORRECTED = MT1mm = (8) X [(9) - (3)] / (9) = 10.40 MT-m

(11) LCF (from Hydrostatics) = 31.88 m aft of FR0

(12) TRIM LEVER = (1) - (7) = -0.93 m

(13) TRIM = [(4) X (12)] / [(10) X 1000 ] = -0.57 m (+Aft/-Fwd)

(14) MEAN DRAFT @ BOW = (5) - $\frac{(13) \times [(6) - (11)]}{(6)}$ = 3.38 m ABL

(15) MEAN DRAFT @ TRANSOM = (13) + (14) = 2.81 m ABL

**(15A)* MEAN NAV. DRAFT @ FR 50 = (13) X [ 60 / 62.4 ] + (14) + 0.9 = 3.73 m ABL**

Calculate Average Drafts @ BOW and TRANSOM

(16) BEAM = 39.60 m

(17) MOMENT TO HEEL 1mm, MH1mm (from Hydrostatics) = 8.11 MT-m

(18) KMT (from Hydrostatics) = 51.68 m ABL

(19) MH1mm CORRECTED = MH1mm = (17) X [(18) - (3)] / (18) = 5.16 MT-m

(20) HEEL LEVER = TCG (2) = -0.20 m from CL (+Stbd)

(21) HEEL = [(4) X (20)]/[(19) X 1000] = -0.24 m (+Stbd)

(22) DRAFT @ BOW = (14) +/- (21) / 2: STBD = 3.26 Port = 3.51 m ABL

(22) DRAFT @ TRANSOM = (15) +/- (21) / 2: STBD = 2.69 Port = 2.93 m ABL

**(24) NAV. DRAFT @ FR 50 = (16) +/- (22) / 2: STBD = 3.61 PORT = 3.85 m ABL**

Calculate Port & Stbd Drafts @ BOW and TRANSOM

*** STERN THRUSTER EXTENDS 0.87 m BELOW BASELINE, USE 0.9 m TO ACCOUNT FOR TRIM AND SWING OF NOZZLE**

**TANK LOADING FORM**

Condition: FALCON DIAMOND - (1) Minimum Operating Condition

| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANK | FILL | WEIGHT | LCG m aft of FR 0 | | TCG (m +/- from CL) | | VCG (m above BASELINE) | | TRANS FSM | LONG'L FSM |
| | (%) | (MT) | LCG | L-MOM | TCG (+Stbd) | T-MOM | VCG | V-MOM | (MT-m) | (MT-m) |
| | Enter Value | Enter Value | Enter Value | Col 1 X Col 4 | Enter Value | Col 1 X Col 6 | Enter Value | Col 1 X Col 2 | Enter Value | Enter Value |
| Ballast #1 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #1 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #2 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #2 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #3 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #3 Stbd | 100 | 311.75 | 51.56 | *16,074.51* | 4.77 | *1,488.27* | 2.35 | *733.54* | 0.00 | 0.00 |
| Ballast #4 Port | 100 | 69.83 | 58.60 | *4,091.69* | -14.46 | *-1,009.88* | 3.14 | *218.92* | 0.00 | 0.00 |
| Ballast #4 Stbd | 100 | 81.02 | 58.60 | *4,748.10* | 14.18 | *1,149.19* | 3.16 | *256.19* | 0.00 | 0.00 |
| Zero Discharge #1 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #1 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #2 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #2 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Day Tank Port | 10 | 1.08 | 24.00 | *25.84* | -13.20 | *-14.21* | 2.51 | *2.70* | 2.00 | 2.00 |
| Day Tank Stbd | 10 | 1.08 | 24.00 | *25.84* | 13.20 | *14.21* | 2.51 | *2.70* | 2.00 | 2.00 |
| Fuel Oil Port | 10 | 12.81 | 22.80 | *292.01* | -15.69 | *-200.97* | 0.44 | *5.57* | 161.00 | 61.00 |
| Fuel Oil Stbd | 10 | 12.81 | 22.80 | *292.01* | 15.69 | *200.97* | 0.44 | *5.57* | 161.00 | 61.00 |
| Fresh Water Port | 10 | 13.94 | 30.00 | *418.26* | -15.57 | *-217.06* | 0.36 | *5.02* | 279.00 | 238.00 |
| Fresh Water Stbd | 10 | 13.94 | 30.00 | *418.26* | 15.57 | *217.06* | 0.36 | *5.02* | 279.00 | 238.00 |
| Greywater | 25 | 2.39 | 21.60 | *51.52* | 5.94 | *14.16* | 0.21 | *0.51* | 9.00 | 4.00 |
| Dirty Oil | 10 | 1.32 | 29.40 | *38.83* | 0.00 | *0.00* | 0.06 | *0.08* | 12.00 | 12.00 |
| Lube Oil | 25 | 1.73 | 25.80 | *44.71* | 0.90 | *1.56* | 0.15 | *0.26* | 2.00 | 6.00 |
| Oily Water | 25 | 1.90 | 25.80 | *49.14* | -0.90 | *-1.71* | 0.15 | *0.29* | 2.00 | 7.00 |
| TOTAL (Record here and on Vessel Loading Form) | 0 | 525.59 | | 26570.73 | | 1641.58 | | 1236.37 | 909.00 | 631.00 |

**INSTRUCTIONS FOR THE TANK LOADING FORM**

For each of the vessel's tanks that contain liquid, determined and enter the following on the Tank Loading Form:

1. Take soundings of each tank and enter the liquid level in each tank in column 0 of the TANK LOADING FORM.
2. Consult the TANK CAPACITY TABLES and enter the weight of the liquid in column 1, the LCG of the liquid in column 2, the TCG of the liquid in column 4, and the VCG of the liquid in column 6 corresponding to the sounding. Enter the transverse and longitudinal free surface moments into columns 8 and 9, respectively. If the actual sounding falls between two soundings listed the TANK CAPACITY TABLES, enter the values associated with the higher of the two soundings on the TANK LOADING FORM.
3. Sum the weights in column 1 to obtain the total weight of the liquids in the tanks. Enter this TOTAL on the TANK LOADING FORM and the VESSEL LOADING FORM.
4. Multiply each weight in column 1 by its corresponding LCG in column 2 to obtain the longitudinal moment of the weight and enter this value in column 3. Sum the longitudinal moments in column 3 to obtain the total longitudinal moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
5. Multiply each weight in column 1 by its corresponding TCG in column 4 to obtain the transverse moment of the weight and enter this value in column 5. Sum the transverse moments in column 5 to obtain the total transverse moment of the liquids in the tanks. Note the starboard moments are positive and the port moments are negative. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
6. Multiply each weight in column 1 by its corresponding VCG in column 6 to obtain the vertical moment of the weight and enter this value in column 7. Sum the vertical moments in column 7 to obtain the total vertical moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
7. Individually sum the free surface moments in columns 8 and 9 to obtain the total transverse and longitudinal free surface moments of the internal tanks. Enter the maximum of these two TOTALS on the TANK LOADING FORM. Add this value to the DECK TANKS MAX FSM TOTAL from the DECK CARGO LOADING FORM and enter this value into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

# CONDITION 2: 100 MT Load on Deck

**VESSEL LOADING FORM**

Condition: FALCON DIAMOND - (2) 100 MT on Deck

| COLUMN → | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) | VCG (m ABL) | V-MOM (MT-m) |
| **LIGHTSHIP** | 5870.87 | 28.00 | *164,361* | -0.50 | *-2,906* | 20.11 | *118086.7* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* | 8.15 | *33* |
| **CREW, EFFECTS, & STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* | 13.60 | *68* |
| **OFFSHORE WORKERS, EFFECTS, & STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* | 13.60 | *272* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 100.00 | 55.20 | *5,520* | 6.00 | *600* | 6.60 | *660* |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 628.89 | | *29,324* | | *2,349* | | *1,344* |
| **TOTAL FSM OF ALL SLACK TANKS (from TANK LOADING FORM and DECK CARGO LOADING FORM)** | | | | | | | *909* |
| TOTALS: | 6,628.76 | | 199,766 | | 43 | | 121,372 |

Vessel Loading Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 199,766 / 6,628.76 = 30.14 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = 43 / 6,628.76 = 0.01 m from CL (+STBD)

(3) KG = VCG = (Total Col. 7 / Total Col. 1) = 121,372 / 6,628.76 = 18.31 m ABL **NOTE: INCLUDES FSE**

(4) DISPLACEMENT = Total Column 1 = 6,628.76 MT

(5) MEAN SW WATER DRAFT (from Hydrostatic Properties) = 3.18 m ABL

**CHECK STABILITY:**

**Does the loading condition's KG fall below the curves of "Allowable KG -vs- Displacement?"**

**YES ____x_____ Loading condition meets the stability requirements**

**NO _____ Loading condition DOES NOT meet the stability criteria.**

Increase ballast and/or decrease deck cargo or take other corrective action.
Correct Loading forms and check KG again.

THE FOLLOWING OPTIONAL CALCULATIONS DETERMINE THE TRIM, HEEL, AND DRAFTS AT THE BOW AND TRANSOM.

(6) LOA = 62.40 m

(7) LCB (from Hydrostatics) = 30.76 m aft of FR0

(8) MOMENT TO TRIM 1mm, MTmm (from Hydrostatics) = 12.35 MT-m

(9) KML (from Hydrostatics) = 118.05 m ABL

(10) MT1mm CORRECTED = MT1mm = (8) X [(9) - (3)] / (9) = 10.44 MT-m

(11) LCF (from Hydrostatics) = 31.85 m aft of FR0

(12) TRIM LEVER = (1) - (7) = -0.63 m

(13) TRIM = [(4) X (12)] / [(10) X 1000 ] = -0.40 m (+Aft/-Fwd)

(14) MEAN DRAFT @ BOW = (5) - $\frac{(13) \times [(6) - (11)]}{(6)}$ = 3.38 m ABL

(15) MEAN DRAFT @ TRANSOM = (13) + (14) = 2.98 m ABL

**(15A)* MEAN NAV. DRAFT @ FR 50 = (13) X [ 60 / 62.4 ] + (14) + 0.9 = 3.90 m ABL**

Calculate Average Drafts @ BOW and TRANSOM

(16) BEAM = 39.60 m

(17) MOMENT TO HEEL 1mm, MH1mm (from Hydrostatics) = 8.12 MT-m

(18) KMT (from Hydrostatics) = 50.25 m ABL

(19) MH1mm CORRECTED = MH1mm = (17) X [(18) - (3)] / (18) = 5.16 MT-m

(20) HEEL LEVER = TCG (2) = 0.01 m from CL (+Stbd)

(21) HEEL = [(4) X (20)]/[(19) X 1000] = 0.01 m (+Stbd)

(22) DRAFT @ BOW = (14) +/- (21) / 2: STBD = 3.38 Port = 3.38 m ABL

(22) DRAFT @ TRANSOM = (15) +/- (21) / 2: STBD = 2.98 Port = 2.98 m ABL

**(24) NAV. DRAFT @ FR 50 = (16) +/- (22) / 2: STBD = 3.90 PORT = 3.89 m ABL**

Calculate Port & Stbd Drafts @ BOW and TRANSOM

*** STERN THRUSTER EXTENDS 0.87 m BELOW BASELINE, USE 0.9 m TO ACCOUNT FOR TRIM AND SWING OF NOZZLE**

**TANK LOADING FORM**

Condition: FALCON DIAMOND - (2) 100 MT on Deck

| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANK | FILL (%) | WEIGHT (MT) | LCG m aft of FR 0 LCG | L-MOM | TCG (m +/- from CL) TCG (+Stbd) | T-MOM | VCG (m above BASELINE) VCG | V-MOM | TRANS FSM (MT-m) | LONG'L FSM (MT-m) |
| | Enter Value | Enter Value | Enter Value | Col 1 X Col 4 | Enter Value | Col 1 X Col 6 | Enter Value | Col 1 X Col 2 | Enter Value | Enter Value |
| Ballast #1 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #1 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #2 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #2 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #3 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #3 Stbd | 100 | 311.75 | 51.56 | 16,074.51 | 4.77 | 1,488.27 | 2.35 | 733.54 | 0.00 | 0.00 |
| Ballast #4 Port | 100 | 69.83 | 58.60 | 4,091.69 | -14.46 | -1,009.88 | 3.14 | 218.92 | 0.00 | 0.00 |
| Ballast #4 Stbd | 100 | 81.02 | 58.60 | 4,748.10 | 14.18 | 1,149.19 | 3.16 | 256.19 | 0.00 | 0.00 |
| Zero Discharge #1 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #1 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #2 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #2 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Day Tank Port | 35 | 3.77 | 24.00 | 90.44 | -13.20 | -49.74 | 2.78 | 10.50 | 2.00 | 2.00 |
| Day Tank Stbd | 35 | 3.77 | 24.00 | 90.44 | 13.20 | 49.74 | 2.78 | 10.50 | 2.00 | 2.00 |
| Fuel Oil Port | 27 | 34.58 | 22.80 | 788.44 | -15.82 | -547.15 | 0.78 | 26.92 | 161.00 | 61.00 |
| Fuel Oil Stbd | 27 | 34.58 | 22.80 | 788.44 | 15.82 | 547.15 | 0.78 | 26.92 | 161.00 | 61.00 |
| Fresh Water Port | 14 | 19.52 | 30.00 | 585.57 | -15.66 | -305.74 | 0.41 | 8.03 | 279.00 | 238.00 |
| Fresh Water Stbd | 45 | 62.74 | 30.00 | 1,882.18 | 16.15 | 1,013.29 | 0.82 | 51.51 | 279.00 | 238.00 |
| Greywater | 25 | 2.39 | 21.60 | 51.52 | 5.94 | 14.16 | 0.21 | 0.51 | 9.00 | 4.00 |
| Dirty Oil | 10 | 1.32 | 29.40 | 38.83 | 0.00 | 0.00 | 0.06 | 0.08 | 12.00 | 12.00 |
| Lube Oil | 25 | 1.73 | 25.80 | 44.71 | 0.90 | 1.56 | 0.15 | 0.26 | 2.00 | 6.00 |
| Oily Water | 25 | 1.90 | 25.80 | 49.14 | -0.90 | -1.71 | 0.15 | 0.29 | 2.00 | 7.00 |
| TOTAL (Record here and on Vessel Loading Form) | 0 | 628.89 | | 29324.01 | | 2349.13 | | 1344.14 | 909.00 | 631.00 |

**INSTRUCTIONS FOR THE TANK LOADING FORM**

For each of the vessel's tanks that contain liquid, determined and enter the following on the Tank Loading Form:

1. Take soundings of each tank and enter the liquid level in each tank in column 0 of the TANK LOADING FORM.
2. Consult the TANK CAPACITY TABLES and enter the weight of the liquid in column 1, the LCG of the liquid in column 2, the TCG of the liquid in column 4, and the VCG of the liquid in column 6 corresponding to the sounding. Enter the transverse and longitudinal free surface moments into columns 8 and 9, respectively. If the actual sounding falls between two soundings listed the TANK CAPACITY TABLES, enter the values associated with the higher of the two soundings on the TANK LOADING FORM.
3. Sum the weights in column 1 to obtain the total weight of the liquids in the tanks. Enter this TOTAL on the TANK LOADING FORM and the VESSEL LOADING FORM.
4. Multiply each weight in column 1 by its corresponding LCG in column 2 to obtain the longitudinal moment of the weight and enter this value in column 3. Sum the longitudinal moments in column 3 to obtain the total longitudinal moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
5. Multiply each weight in column 1 by its corresponding TCG in column 4 to obtain the transverse moment of the weight and enter this value in column 5. Sum the transverse moments in column 5 to obtain the total transverse moment of the liquids in the tanks. Note the starboard moments are positive and the port moments are negative. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
6. Multiply each weight in column 1 by its corresponding VCG in column 6 to obtain the vertical moment of the weight and enter this value in column 7. Sum the vertical moments in column 7 to obtain the total vertical moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
7. Individually sum the free surface moments in columns 8 and 9 to obtain the total transverse and longitudinal free surface moments of the internal tanks. Enter the maximum of these two TOTALS on the TANK LOADING FORM. Add this value to the DECK TANKS MAX FSM TOTAL from the DECK CARGO LOADING FORM and enter this value into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

**DECK CARGO LOADING FORM**

Condition: FALCON DIAMOND - (2) 100 MT on Deck

| COLUMN --> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ITEM (Include deck tanks & contents as separate line items) | WEIGHT (MT) | LCG (m aft of FR 0 ) LCG | L-MOM | TCG (m +/- from CL) TCG (+ STBD) | T-MOM | VCG above MAIN DECK | MAIN DK to BL | VCG (m above BL) VCG | V-MOM | DECK TANKS MAX FSM |
| | Enter Value | Enter Value | Col 1 x Col 2 | Enter Value | Col 1 x Col 4 | Enter Value | | Col 6 + Col 7 | | (MT-m) |
| Deck Cargo | 100.00 | 55.20 | 5520.00 | 6.00 | 600.00 | 2.00 | + 4.6= | 6.60 | 660.00 | |
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| TOTAL (Record here and on Vessel Loading Form) | 100.00 | | 5520.00 | | 600.00 | | | | 660.00 | 0.00 |

**INSTRUCTIONS FOR THE DECK CARGO LOADING FORM**

For each of material carried by the vessel the following shall be determined and entered on the Deck Cargo Loading Form:
1. A complete list of non-tank cargoes is to be entered above with weight, LCG, TCG, and VCG for each item in columns 1, 2, 4 and 6.
2. Calculate the longitudinal moment for each cargo item by multiplying columns 1 and 2 for each item. Calculate the transverse moment for each cargo item by multiplying columns 1 and 4 for each item. Calculate the vertical moment for each cargo item by multiplying columns 1 and 8 for each item.
3. Sum columns 1, 3, 5, and 9 and enter the values in the TOTAL row. These totals are to be entered in the Deck Cargo Loading row of the VESSEL LOADING FORM.
4. Sum column 10 and enter the value in the TOTAL row. This total is to be be added to the TANK LOADING FORM FSC MOM TOTAL and entered into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

# CONDITION 3A: 454 MT Variable Load

**VESSEL LOADING FORM**

Condition: FALCON DIAMOND - (3A) LOADED CONDITION AFLOAT, 454 MT VL

| COLUMN → | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) | VCG (m ABL) | V-MOM (MT-m) |
| **LIGHTSHIP** | 5870.87 | 28.00 | *164,361* | -0.50 | *-2,906* | 20.11 | *118086.7* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* | 8.15 | *33* |
| **CREW, EFFECTS, & STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* | 13.60 | *68* |
| **OFFSHORE WORKERS, EFFECTS, & STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* | 13.60 | *272* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 222.88 | 54.00 | *12,036* | 5.00 | *1,114* | 9.16 | *2,042* |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 508.85 | | *22,208* | | *1,830* | | *859* |
| **TOTAL FSM OF ALL SLACK TANKS (from TANK LOADING FORM and DECK CARGO LOADING FORM)** | | | | | | | *1,442* |
| TOTALS: | 6,631.60 | | 199,165 | | 38 | | 122,802 |

Vessel Loading Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 199,165 / 6,631.60 = 30.03 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = 38 / 6,631.60 = 0.01 m from CL (+STBD)

(3) KG = VCG = (Total Col. 7 / Total Col. 1) = 122,802 / 6,631.60 = 18.52 m ABL **NOTE: INCLUDES FSE**

(4) DISPLACEMENT = Total Column 1 = 6,631.60 MT

(5) MEAN SW WATER DRAFT (from Hydrostatic Properties) = 3.19 m ABL

**CHECK STABILITY:**

**Does the loading condition's KG fall below the curves of "Allowable KG -vs- Displacement?"**

**YES ____x_____ Loading condition meets the stability requirements**

**NO _____ Loading condition DOES NOT meet the stability criteria.**

Increase ballast and/or decrease deck cargo or take other corrective action.
Correct Loading forms and check KG again.

THE FOLLOWING OPTIONAL CALCULATIONS DETERMINE THE TRIM, HEEL, AND DRAFTS AT THE BOW AND TRANSOM.

(6) LOA = 62.40 m

(7) LCB (from Hydrostatics) = 30.76 m aft of FR0

(8) MOMENT TO TRIM 1mm, MTmm (from Hydrostatics) = 12.35 MT-m

(9) KML (from Hydrostatics) = 118.01 m ABL

(10) MT1mm CORRECTED = MT1mm = (8) X [(9) - (3)] / (9) = 10.42 MT-m

(11) LCF (from Hydrostatics) = 31.85 m aft of FR0

(12) TRIM LEVER = (1) - (7) = -0.73 m

(13) TRIM = [(4) X (12)] / [(10) X 1000 ] = -0.47 m (+Aft/-Fwd)

(14) MEAN DRAFT @ BOW = (5) - $\frac{(13) \times [(6) - (11)]}{(6)}$ = 3.41 m ABL

(15) MEAN DRAFT @ TRANSOM = (13) + (14) = 2.95 m ABL

**(16)* MEAN NAV. DRAFT @ FR 50 = (13) X [ 60 / 62.4 ] + (14) + 0.9 = 3.87 m ABL**

Calculate Average Drafts @ BOW and TRANSOM

(16) BEAM = 39.60 m

(17) MOMENT TO HEEL 1mm, MH1mm (from Hydrostatics) = 8.12 MT-m

(18) KMT (from Hydrostatics) = 50.23 m ABL

(19) MH1mm CORRECTED = MH1mm = (17) X [(18) - (3)] / (18) = 5.13 MT-m

(20) HEEL LEVER = TCG (2) = 0.01 m from CL (+Stbd)

(21) HEEL = [(4) X (20)]/[(19) X 1000] = 0.01 m (+Stbd)

(22) DRAFT @ BOW = (14) +/- (21) / 2: STBD = 3.42 Port = 3.41 m ABL

(22) DRAFT @ TRANSOM = (15) +/- (21) / 2: STBD = 2.95 Port = 2.94 m ABL

**(24) NAV. DRAFT @ FR 50 = (16) +/- (22) / 2: STBD = 3.87 PORT = 3.86 m ABL**

Calculate Port & Stbd Drafts @ BOW and TRANSOM

*** STERN THRUSTER EXTENDS 0.87 m BELOW BASELINE, USE 0.9 m TO ACCOUNT FOR TRIM AND SWING OF NOZZLE**

**TANK LOADING FORM**

Condition: FALCON DIAMOND - (3A) LOADED CONDITION AFLOAT, 454 MT VL

| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANK | FILL (%) | WEIGHT (MT) | LCG m aft of FR 0 LCG | L-MOM | TCG (m +/- from CL) TCG (+Stbd) | T-MOM | VCG (m above BASELINE) VCG | V-MOM | TRANS FSM (MT-m) | LONG'L FSM (MT-m) |
| | Enter Value | Enter Value | Enter Value | Col 1 X Col 4 | Enter Value | Col 1 X Col 6 | Enter Value | Col 1 X Col 2 | Enter Value | Enter Value |
| Ballast #1 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #1 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #2 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #2 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #3 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #3 Stbd | 50 | 155.87 | 51.53 | 8,031.50 | 4.75 | 739.96 | 1.23 | 191.49 | 533.00 | 300.00 |
| Ballast #4 Port | 100 | 69.83 | 58.60 | 4,091.69 | -14.46 | -1,009.88 | 3.14 | 218.92 | 0.00 | 0.00 |
| Ballast #4 Stbd | 100 | 81.02 | 58.60 | 4,748.10 | 14.18 | 1,149.19 | 3.16 | 256.19 | 0.00 | 0.00 |
| Zero Discharge #1 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #1 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #2 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #2 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Day Tank Port | 35 | 3.77 | 24.00 | 90.44 | -13.20 | -49.74 | 2.78 | 10.50 | 2.00 | 2.00 |
| Day Tank Stbd | 35 | 3.77 | 24.00 | 90.44 | 13.20 | 49.74 | 2.78 | 10.50 | 2.00 | 2.00 |
| Fuel Oil Port | 35 | 44.82 | 22.80 | 1,022.05 | -15.84 | -710.07 | 0.94 | 42.16 | 161.00 | 61.00 |
| Fuel Oil Stbd | 35 | 44.82 | 22.80 | 1,022.05 | 15.84 | 710.07 | 0.94 | 42.16 | 161.00 | 61.00 |
| Fresh Water Port | 15 | 20.91 | 30.00 | 627.39 | -15.68 | -327.92 | 0.42 | 8.87 | 279.00 | 238.00 |
| Fresh Water Stbd | 55 | 76.68 | 30.00 | 2,300.45 | 16.49 | 1,264.25 | 1.01 | 77.38 | 279.00 | 238.00 |
| Greywater | 25 | 2.39 | 21.60 | 51.52 | 5.94 | 14.16 | 0.21 | 0.51 | 9.00 | 4.00 |
| Dirty Oil | 10 | 1.32 | 29.40 | 38.83 | 0.00 | 0.00 | 0.06 | 0.08 | 12.00 | 12.00 |
| Lube Oil | 25 | 1.73 | 25.80 | 44.71 | 0.90 | 1.56 | 0.15 | 0.26 | 2.00 | 6.00 |
| Oily Water | 25 | 1.90 | 25.80 | 49.14 | -0.90 | -1.71 | 0.15 | 0.29 | 2.00 | 7.00 |
| TOTAL (Record here and on Vessel Loading Form) | | 508.85 | | 22208.32 | | 1829.60 | | 859.29 | 1442.00 | 931.00 |

**INSTRUCTIONS FOR THE TANK LOADING FORM**

For each of the vessel's tanks that contain liquid, determined and enter the following on the Tank Loading Form:

1. Take soundings of each tank and enter the liquid level in each tank in column 0 of the TANK LOADING FORM.
2. Consult the TANK CAPACITY TABLES and enter the weight of the liquid in column 1, the LCG of the liquid in column 2, the TCG of the liquid in column 4, and the VCG of the liquid in column 6 corresponding to the sounding. Enter the transverse and longitudinal free surface moments into columns 8 and 9, respectively. If the actual sounding falls between two soundings listed the TANK CAPACITY TABLES, enter the values associated with the higher of the two soundings on the TANK LOADING FORM.
3. Sum the weights in column 1 to obtain the total weight of the liquids in the tanks. Enter this TOTAL on the TANK LOADING FORM and the VESSEL LOADING FORM.
4. Multiply each weight in column 1 by its corresponding LCG in column 2 to obtain the longitudinal moment of the weight and enter this value in column 3. Sum the longitudinal moments in column 3 to obtain the total longitudinal moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
5. Multiply each weight in column 1 by its corresponding TCG in column 4 to obtain the transverse moment of the weight and enter this value in column 5. Sum the transverse moments in column 5 to obtain the total transverse moment of the liquids in the tanks. Note the starboard moments are positive and the port moments are negative. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
6. Multiply each weight in column 1 by its corresponding VCG in column 6 to obtain the vertical moment of the weight and enter this value in column 7. Sum the vertical moments in column 7 to obtain the total vertical moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
7. Individually sum the free surface moments in columns 8 and 9 to obtain the total transverse and longitudinal free surface moments of the internal tanks. Enter the maximum of these two TOTALS on the TANK LOADING FORM. Add this value to the DECK TANKS MAX FSM TOTAL from the DECK CARGO LOADING FORM and enter this value into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

**DECK CARGO LOADING FORM**

CONDITION: FALCON DIAMOND - (3A) LOADED CONDITION AFLOAT, 454 MT VL

| COLUMN --> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ITEM (Include deck tanks & contents as separate line items) | WEIGHT (MT) Enter Value | LCG (m aft of FR 0 ) LCG Enter Value | L-MOM Col 1 x Col 2 | TCG (m +/- from CL) TCG (+ STBD) Enter Value | T-MOM Col 1 x Col 4 | VCG above MAIN DECK Enter Value | MAIN DK to BL | VCG (m above BL) VCG Col 6 + Col 7 | V-MOM | DECK TANKS MAX FSM (MT-m) |
| Deck Cargo | 222.88 | 54.00 | 12035.52 | 5.00 | 1114.40 | 4.56 | + 4.6= | 9.16 | 2041.58 | |
| | | | | | | | + 4.6= | | | |
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| | | | | | | | + 4.6= | | | |
| | | | | | | | + 4.6= | | | |
| | | | | | | | + 4.6= | | | |
| TOTAL (Record here and on Vessel Loading Form) | 222.88 | | 12035.52 | | 1114.40 | | | | 2041.58 | 0.00 |

**INSTRUCTIONS FOR THE DECK CARGO LOADING FORM**

For each of material carried by the vessel the following shall be determined and entered on the Deck Cargo Loading Form:
1. A complete list of non-tank cargoes is to be entered above with weight, LCG, TCG, and VCG for each item in columns 1, 2, 4 and 6.
2. Calculate the longitudinal moment for each cargo item by multiplying columns 1 and 2 for each item. Calculate the transverse moment for each cargo item by multiplying columns 1 and 4 for each item. Calculate the vertical moment for each cargo item by multiplying columns 1 and 8 for each item.
3. Sum columns 1, 3, 5, and 9 and enter the values in the TOTAL row. These totals are to be entered in the Deck Cargo Loading row of the VESSEL LOADING FORM.
4. Sum column 10 and enter the value in the TOTAL row. This total is to be be added to the TANK LOADING FORM FSC MOM TOTAL and entered into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

# CONDITION 3B: 709 MT Variable Load

**VESSEL LOADING FORM**

CONDITION: FALCON DIAMOND - (3B) LOADED CONDITION AFLOAT, 709 MT VL

| COLUMN → | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) | VCG (m ABL) | V-MOM (MT-m) |
| **LIGHTSHIP** | 5870.87 | 28.00 | *164,361* | -0.50 | *-2,906* | 20.11 | *118086.7* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* | 8.15 | *33* |
| **CREW, EFFECTS, & STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* | 13.60 | *68* |
| **OFFSHORE WORKERS, EFFECTS, & STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* | 13.60 | *272* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 530.74 | 54.00 | *28,660* | 4.00 | *2,123* | 9.16 | *4,862* |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 149.26 | | *3,948* | | *735* | | *113* |
| **TOTAL FSM OF ALL SLACK TANKS (from TANK LOADING FORM and DECK CARGO LOADING FORM)** | | | | | | | *909* |
| TOTALS: | 6,579.87 | | 197,530 | | -48 | | 124,343 |

Vessel Loading Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 197,530 / 6,579.87 = 30.02 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = -48 / 6,579.87 = -0.01 m from CL (+STBD)

(3) KG = VCG = (Total Col. 7 / Total Col. 1) = 124,343 / 6,579.87 = 18.90 m ABL **NOTE: INCLUDES FSE**

(4) DISPLACEMENT = Total Column 1 = 6,579.87 MT

(5) MEAN SW WATER DRAFT (from Hydrostatic Properties) = 3.16 m ABL

**CHECK STABILITY:**

**Does the loading condition's KG fall below the curves of "Allowable KG -vs- Displacement?"**

**YES ____x_____ Loading condition meets the stability requirements**

**NO _____ Loading condition DOES NOT meet the stability criteria.**

Increase ballast and/or decrease deck cargo or take other corrective action.
Correct Loading forms and check KG again.

THE FOLLOWING OPTIONAL CALCULATIONS DETERMINE THE TRIM, HEEL, AND DRAFTS AT THE BOW AND TRANSOM.

(6) LOA = 62.40 m

(7) LCB (from Hydrostatics) = 30.76 m aft of FR0

(8) MOMENT TO TRIM 1mm, MTmm (from Hydrostatics) = 12.34 MT-m

(9) KML (from Hydrostatics) = 118.82 m ABL

(10) MT1mm CORRECTED = MT1mm = (8) X [(9) - (3)] / (9) = 10.38 MT-m

(11) LCF (from Hydrostatics) = 31.85 m aft of FR0

(12) TRIM LEVER = (1) - (7) = -0.74 m

(13) TRIM = [(4) X (12)] / [(10) X 1000 ] = -0.47 m (+Aft/-Fwd)

(14) MEAN DRAFT @ BOW = (5) - $\frac{(13) \times [(6) - (11)]}{(6)}$ = 3.39 m ABL

(15) MEAN DRAFT @ TRANSOM = (13) + (14) = 2.93 m ABL

**(16)* MEAN NAV. DRAFT @ FR 50 = (13) X [ 60 / 62.4 ] + (14) + 0.9 = 3.84 m ABL**

Calculate Average Drafts @ BOW and TRANSOM

(16) BEAM = 39.60 m

(17) MOMENT TO HEEL 1mm, MH1mm (from Hydrostatics) = 8.12 MT-m

(18) KMT (from Hydrostatics) = 50.60 m ABL

(19) MH1mm CORRECTED = MH1mm = (17) X [(18) - (3)] / (18) = 5.09 MT-m

(20) HEEL LEVER = TCG (2) = -0.01 m from CL (+Stbd)

(21) HEEL = [(4) X (20)]/[(19) X 1000] = -0.01 m (+Stbd)

(22) DRAFT @ BOW = (14) +/- (21) / 2: STBD = 3.39 Port = 3.40 m ABL

(22) DRAFT @ TRANSOM = (15) +/- (21) / 2: STBD = 2.92 Port = 2.93 m ABL

**(24) NAV. DRAFT @ FR 50 = (16) +/- (22) / 2: STBD = 3.84 PORT = 3.85 m ABL**

Calculate Port & Stbd Drafts @ BOW and TRANSOM

*** STERN THRUSTER EXTENDS 0.87 m BELOW BASELINE, USE 0.9 m TO ACCOUNT FOR TRIM AND SWING OF NOZZLE**

**TANK LOADING FORM**

CONDITION: FALCON DIAMOND - (3B) LOADED CONDITION AFLOAT, 709 MT VL

| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANK | FILL (%) | WEIGHT (MT) | LCG m aft of FR 0 LCG | L-MOM | TCG (m +/- from CL) TCG (+Stbd) | T-MOM | VCG (m above BASELINE) VCG | V-MOM | TRANS FSM (MT-m) | LONG'L FSM (MT-m) |
| | Enter Value | Enter Value | Enter Value | Col 1 X Col 4 | Enter Value | Col 1 X Col 6 | Enter Value | Col 1 X Col 2 | Enter Value | Enter Value |
| Ballast #1 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #1 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #2 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #2 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #3 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #3 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #4 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #4 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #1 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #1 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #2 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #2 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Day Tank Port | 25 | 2.69 | 24.00 | 64.60 | -13.20 | -35.53 | 2.67 | 7.20 | 2.00 | 2.00 |
| Day Tank Stbd | 25 | 2.69 | 24.00 | 64.60 | 13.20 | 35.53 | 2.67 | 7.20 | 2.00 | 2.00 |
| Fuel Oil Port | 25 | 32.02 | 22.80 | 730.04 | -15.82 | -506.45 | 0.74 | 23.64 | 161.00 | 61.00 |
| Fuel Oil Stbd | 25 | 32.02 | 22.80 | 730.04 | 15.82 | 506.45 | 0.74 | 23.64 | 161.00 | 61.00 |
| Fresh Water Port | 10 | 13.94 | 30.00 | 418.26 | -15.57 | -217.06 | 0.36 | 5.02 | 279.00 | 238.00 |
| Fresh Water Stbd | 42 | 58.56 | 30.00 | 1,756.70 | 16.02 | 938.03 | 0.77 | 45.24 | 279.00 | 238.00 |
| Greywater | 25 | 2.39 | 21.60 | 51.52 | 5.94 | 14.16 | 0.21 | 0.51 | 9.00 | 4.00 |
| Dirty Oil | 10 | 1.32 | 29.40 | 38.83 | 0.00 | 0.00 | 0.06 | 0.08 | 12.00 | 12.00 |
| Lube Oil | 25 | 1.73 | 25.80 | 44.71 | 0.90 | 1.56 | 0.15 | 0.26 | 2.00 | 6.00 |
| Oily Water | 25 | 1.90 | 25.80 | 49.14 | -0.90 | -1.71 | 0.15 | 0.29 | 2.00 | 7.00 |
| TOTAL (Record here and on Vessel Loading Form) | 0 | 149.26 | | 3948.45 | | 734.98 | | 113.07 | 909.00 | 631.00 |

**INSTRUCTIONS FOR THE TANK LOADING FORM**

For each of the vessel's tanks that contain liquid, determined and enter the following on the Tank Loading Form:

1. Take soundings of each tank and enter the liquid level in each tank in column 0 of the TANK LOADING FORM.
2. Consult the TANK CAPACITY TABLES and enter the weight of the liquid in column 1, the LCG of the liquid in column 2, the TCG of the liquid in column 4, and the VCG of the liquid in column 6 corresponding to the sounding. Enter the transverse and longitudinal free surface moments into columns 8 and 9, respectively. If the actual sounding falls between two soundings listed the TANK CAPACITY TABLES, enter the values associated with the higher of the two soundings on the TANK LOADING FORM.
3. Sum the weights in column 1 to obtain the total weight of the liquids in the tanks. Enter this TOTAL on the TANK LOADING FORM and the VESSEL LOADING FORM.
4. Multiply each weight in column 1 by its corresponding LCG in column 2 to obtain the longitudinal moment of the weight and enter this value in column 3. Sum the longitudinal moments in column 3 to obtain the total longitudinal moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
5. Multiply each weight in column 1 by its corresponding TCG in column 4 to obtain the transverse moment of the weight and enter this value in column 5. Sum the transverse moments in column 5 to obtain the total transverse moment of the liquids in the tanks. Note the starboard moments are positive and the port moments are negative. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
6. Multiply each weight in column 1 by its corresponding VCG in column 6 to obtain the vertical moment of the weight and enter this value in column 7. Sum the vertical moments in column 7 to obtain the total vertical moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
7. Individually sum the free surface moments in columns 8 and 9 to obtain the total transverse and longitudinal free surface moments of the internal tanks. Enter the maximum of these two TOTALS on the TANK LOADING FORM. Add this value to the DECK TANKS MAX FSM TOTAL from the DECK CARGO LOADING FORM and enter this value into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

**DECK CARGO LOADING FORM**

CONDITION: FALCON DIAMOND - (3B) LOADED CONDITION AFLOAT, 709 MT VL

| COLUMN --> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ITEM (Include deck tanks & contents as separate line items) | WEIGHT (MT) | LCG (m aft of FR 0 ) LCG | L-MOM | TCG (m +/- from CL) TCG (+ STBD) | T-MOM | VCG above MAIN DECK | MAIN DK to BL | VCG (m above BL) VCG | V-MOM | DECK TANKS MAX FSM (MT-m) |
| | Enter Value | Enter Value | Col 1 x Col 2 | Enter Value | Col 1 x Col 4 | Enter Value | | Col 6 + Col 7 | | |
| Deck Cargo | 530.74 | 54.00 | 28659.96 | 4.00 | 2122.96 | 4.56 | + 4.6= | 9.16 | 4861.58 | |
| | | | | | | | + 4.6= | | | |
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| | | | | | | | + 4.6= | | | |
| TOTAL (Record here and on Vessel Loading Form) | 530.74 | | 28659.96 | | 2122.96 | | | | 4861.58 | 0.00 |

**INSTRUCTIONS FOR THE DECK CARGO LOADING FORM**

For each of material carried by the vessel the following shall be determined and entered on the Deck Cargo Loading Form:

1. A complete list of non-tank cargoes is to be entered above with weight, LCG, TCG, and VCG for each item in columns 1, 2, 4 and 6.
2. Calculate the longitudinal moment for each cargo item by multiplying columns 1 and 2 for each item. Calculate the transverse moment for each cargo item by multiplying columns 1 and 4 for each item. Calculate the vertical moment for each cargo item by multiplying columns 1 and 8 for each item.
3. Sum columns 1, 3, 5, and 9 and enter the values in the TOTAL row. These totals are to be entered in the Deck Cargo Loading row of the VESSEL LOADING FORM.
4. Sum column 10 and enter the value in the TOTAL row. This total is to be be added to the TANK LOADING FORM FSC MOM TOTAL and entered into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

# CONDITION 4: Load Line

**VESSEL LOADING FORM**

Condition: FALCON DIAMOND - (4) LOAD LINE

| COLUMN → | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) | VCG (m ABL) | V-MOM (MT-m) |
| **LIGHTSHIP** | 5870.87 | 28.00 | *164,361* | -0.50 | *-2,906* | 20.11 | *118086.7* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* | 8.15 | *33* |
| **CREW, EFFECTS, & STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* | 13.60 | *68* |
| **OFFSHORE WORKERS, EFFECTS, & STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* | 13.60 | *272* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 462.08 | 48.00 | *22,180* | 3.00 | *1,386* | 6.60 | *3,050* |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 1,240.55 | | *51,044* | | *1,163* | | *2,848* |
| **TOTAL FSM OF ALL SLACK TANKS (from TANK LOADING FORM and DECK CARGO LOADING FORM)** | | | | | | | *909* |
| TOTALS: | 7,602.50 | | 238,146 | | -357 | | 125,266 |

Vessel Loading Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 238,146 / 7,602.50 = 31.32 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = -357 / 7,602.50 = -0.05 m from CL (+STBD)

(3) KG = VCG = (Total Col. 7 / Total Col. 1) = 125,266 / 7,602.50 = 16.48 m ABL **NOTE: INCLUDES FSE**

(4) DISPLACEMENT = Total Column 1 = 7,602.50 MT

(5) MEAN SW WATER DRAFT (from Hydrostatic Properties) = 3.576 m ABL

**CHECK STABILITY:**

**Does the loading condition's KG fall below the curves of "Allowable KG -vs- Displacement?"**

**YES** ____x____ **Loading condition meets the stability requirements**

**NO** _____ **Loading condition DOES NOT meet the stability criteria.**
Increase ballast and/or decrease deck cargo or take other corrective action.
Correct Loading forms and check KG again.

THE FOLLOWING OPTIONAL CALCULATIONS DETERMINE THE TRIM, HEEL, AND DRAFTS AT THE BOW AND TRANSOM.

(6) LOA = 62.40 m

(7) LCB (from Hydrostatics) = 30.89 m aft of FR0

(8) MOMENT TO TRIM 1mm, MTmm (from Hydrostatics) = 12.56 MT-m

(9) KML (from Hydrostatics) = 105.07 m ABL

(10) MT1mm CORRECTED = MT1mm = (8) X [(9) - (3)] / (9) = 10.59 MT-m

(11) LCF (from Hydrostatics) = 31.68 m aft of FR0

(12) TRIM LEVER = (1) - (7) = 0.43 m

(13) TRIM = [(4) X (12)] / [(10) X 1000 ] = 0.31 m (+Aft/-Fwd)

(14) MEAN DRAFT @ BOW = (5) - $\frac{(13) \text{ X } [(6) - (11)]}{(6)}$ = 3.42 m ABL

(15) MEAN HULL DRAFT @ TRANSOM = (13) + (14) = 3.73 m ABL

**(16)* MEAN NAV. DRAFT @ FR 50 = (13) X [ 60 / 62.4 ] + (14) + 0.9 = 4.62 m ABL**

Calculate Average Drafts @ BOW and TRANSOM

(17) BEAM = 39.60 m

(18) MOMENT TO HEEL 1mm, MH1mm (from Hydrostatics) = 8.16 MT-m

(19) KMT (from Hydrostatics) = 44.47 m ABL

(20) MH1mm CORRECTED = MH1mm = (18) X [(19) - (3)] / (19) = 5.14 MT-m

(21) HEEL LEVER = TCG (2) = -0.05 m from CL (+Stbd)

(22) HEEL = [(4) X (21)]/[(20) X 1000] = -0.07 m (+Stbd)

(23) DRAFT @ BOW = (14) +/- (22) / 2: STBD = 3.39 PORT = 3.46 m ABL

(23) DRAFT @ TRANSOM = (15) +/- (22) / 2: STBD = ~~3.40~~ 3.70 PORT = ~~3.45~~ 3.77 m ABL

**(24) NAV. DRAFT @ FR 50 = (16) +/- (22) / 2: STBD = 4.59 PORT = 4.66 m ABL**

Calculate Port & Stbd Drafts @ BOW and TRANSOM

*** STERN THRUSTER EXTENDS 0.87 m BELOW BASELINE, USE 0.9 m TO ACCOUNT FOR TRIM AND SWING OF NOZZLE**

**TANK LOADING FORM**

Condition: FALCON DIAMOND - (4) LOAD LINE

| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANK | FILL | WEIGHT | LCG m aft of FR 0 | | TCG (m +/- from CL) | | VCG (m above BASELINE) | | TRANS FSM | LONG'L FSM |
| | (%) | (MT) | LCG | L-MOM | TCG (+Stbd) | T-MOM | VCG | V-MOM | (MT-m) | (MT-m) |
| | Enter Value | Enter Value | Enter Value | Col 1 X Col 4 | Enter Value | Col 1 X Col 6 | Enter Value | Col 1 X Col 2 | Enter Value | Enter Value |
| Ballast #1 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #1 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #2 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #2 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #3 Port | 100 | 311.75 | 51.56 | *16,074.51* | -4.77 | *-1,488.27* | 2.35 | *733.54* | 0.00 | 0.00 |
| Ballast #3 Stbd | 100 | 311.75 | 51.56 | *16,074.51* | 4.77 | *1,488.27* | 2.35 | *733.54* | 0.00 | 0.00 |
| Ballast #4 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #4 Stbd | 100 | 81.02 | 58.60 | *4,748.10* | 14.18 | *1,149.19* | 3.16 | *256.19* | 0.00 | 0.00 |
| Zero Discharge #1 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #1 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #2 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #2 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Day Tank Port | 95 | 10.23 | 24.00 | *245.49* | -13.20 | *-135.02* | 3.44 | *35.24* | 2.00 | 2.00 |
| Day Tank Stbd | 95 | 10.23 | 24.00 | *245.49* | 13.20 | *135.02* | 3.44 | *35.24* | 2.00 | 2.00 |
| Fuel Oil Port | 95 | 121.67 | 22.71 | *2,762.61* | -16.09 | *-1,957.80* | 2.21 | *269.28* | 161.00 | 61.00 |
| Fuel Oil Stbd | 95 | 121.67 | 22.71 | *2,762.61* | 16.09 | *1,957.80* | 2.21 | *269.28* | 161.00 | 61.00 |
| Fresh Water Port | 95 | 132.45 | 30.00 | *3,973.50* | -17.12 | *-2,268.15* | 1.94 | *257.44* | 279.00 | 238.00 |
| Fresh Water Stbd | 95 | 132.45 | 30.00 | *3,973.50* | 17.12 | *2,268.15* | 1.94 | *257.44* | 279.00 | 238.00 |
| Greywater | 25 | 2.39 | 21.60 | *51.52* | 5.94 | *14.16* | 0.21 | *0.51* | 9.00 | 4.00 |
| Dirty Oil | 10 | 1.32 | 29.40 | *38.83* | 0.00 | *0.00* | 0.06 | *0.08* | 12.00 | 12.00 |
| Lube Oil | 25 | 1.73 | 25.80 | *44.71* | 0.90 | *1.56* | 0.15 | *0.26* | 2.00 | 6.00 |
| Oily Water | 25 | 1.90 | 25.80 | *49.14* | -0.90 | *-1.71* | 0.15 | *0.29* | 2.00 | 7.00 |
| TOTAL (Record here and on Vessel Loading Form) | 0 | 1240.55 | | 51044.50 | | 1163.19 | | 2848.31 | 909.00 | 631.00 |

**INSTRUCTIONS FOR THE TANK LOADING FORM**

For each of the vessel's tanks that contain liquid, determined and enter the following on the Tank Loading Form:

1. Take soundings of each tank and enter the liquid level in each tank in column 0 of the TANK LOADING FORM.
2. Consult the TANK CAPACITY TABLES and enter the weight of the liquid in column 1, the LCG of the liquid in column 2, the TCG of the liquid in column 4, and the VCG of the liquid in column 6 corresponding to the sounding. Enter the transverse and longitudinal free surface moments into columns 8 and 9, respectively. If the actual sounding falls between two soundings listed the TANK CAPACITY TABLES, enter the values associated with the higher of the two soundings on the TANK LOADING FORM.
3. Sum the weights in column 1 to obtain the total weight of the liquids in the tanks. Enter this TOTAL on the TANK LOADING FORM and the VESSEL LOADING FORM.
4. Multiply each weight in column 1 by its corresponding LCG in column 2 to obtain the longitudinal moment of the weight and enter this value in column 3. Sum the longitudinal moments in column 3 to obtain the total longitudinal moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
5. Multiply each weight in column 1 by its corresponding TCG in column 4 to obtain the transverse moment of the weight and enter this value in column 5. Sum the transverse moments in column 5 to obtain the total transverse moment of the liquids in the tanks. Note the starboard moments are positive and the port moments are negative. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
6. Multiply each weight in column 1 by its corresponding VCG in column 6 to obtain the vertical moment of the weight and enter this value in column 7. Sum the vertical moments in column 7 to obtain the total vertical moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
7. Individually sum the free surface moments in columns 8 and 9 to obtain the total transverse and longitudinal free surface moments of the internal tanks. Enter the maximum of these two TOTALS on the TANK LOADING FORM. Add this value to the DECK TANKS MAX FSM TOTAL from the DECK CARGO LOADING FORM and enter this value into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

**DECK CARGO LOADING FORM**

CONDITION: FALCON DIAMOND - (4) LOAD LINE

| COLUMN --> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ITEM (Include deck tanks & contents as separate line items) | WEIGHT (MT) | LCG (m aft of FR 0 ) LCG | L-MOM | TCG (m +/- from CL) TCG (+ STBD) | T-MOM | VCG above MAIN DECK | MAIN DK to BL | VCG (m above BL) VCG | V-MOM | DECK TANKS MAX FSM (MT-m) |
| | Enter Value | Enter Value | Col 1 x Col 2 | Enter Value | Col 1 x Col 4 | Enter Value | | Col 6 + Col 7 | | |
| Deck Cargo | 462.08 | 48.00 | 22179.84 | 3.00 | 1386.24 | 2.00 | + 4.6= | 6.60 | 3049.73 | |
| | | | | | | | + 4.6= | | | |
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| | | | | | | | + 4.6= | | | |
| TOTAL (Record here and on Vessel Loading Form) | 462.08 | | 22179.84 | | 1386.24 | | | | 3049.73 | 0.00 |

**INSTRUCTIONS FOR THE DECK CARGO LOADING FORM**

For each of material carried by the vessel the following shall be determined and entered on the Deck Cargo Loading Form:
1. A complete list of non-tank cargoes is to be entered above with weight, LCG, TCG, and VCG for each item in columns 1, 2, 4 and 6.
2.Calculate the longitudinal moment for each cargo item by multiplying columns 1 and 2 for each item. Calculate the transverse moment for each cargo item by multiplying columns 1 and 4 for each item. Calculate the vertical moment for each cargo item by multiplying columns 1 and 8 for each item.
3. Sum columns 1, 3, 5, and 9 and enter the values in the TOTAL row. These totals are to be entered in the Deck Cargo Loading row of the VESSEL LOADING FORM.
4. Sum column 10 and enter the value in the TOTAL row. This total is to be be added to the TANK LOADING FORM FSC MOM TOTAL and entered into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

# CONDITION 5A: 454 MT Variable Load + Helicopter

**VESSEL LOADING FORM**

Condition: FALCON DIAMOND - (5A) LOADED CONDITION AFLOAT, 454 MT VL + H

| COLUMN → | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) | VCG (m ABL) | V-MOM (MT-m) |
| **LIGHTSHIP** | 5870.87 | 28.00 | *164,361* | -0.50 | *-2,906* | 20.11 | *118086.7* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* | 8.15 | *33* |
| **CREW, EFFECTS, & STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* | 13.60 | *68* |
| **OFFSHORE WORKERS, EFFECTS, & STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* | 13.60 | *272* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 229.68 | 52.03 | *11,951* | 4.85 | *1,114* | 9.44 | *2,168* |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 508.85 | | *22,208* | | *1,830* | | *859* |
| **TOTAL FSM OF ALL SLACK TANKS (from TANK LOADING FORM and DECK CARGO LOADING FORM)** | | | | | | | *1,442* |
| TOTALS: | 6,638.40 | | 199,081 | | 38 | | 122,929 |

Vessel Loading Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 199,081 / 6,638.40 = 29.99 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = 38 / 6,638.40 = 0.01 m from CL (+STBD)

(3) KG = VCG = (Total Col. 7 / Total Col. 1) = 122,929 / 6,638.40 = 18.52 m ABL **NOTE: INCLUDES FSE**

(4) DISPLACEMENT = Total Column 1 = 6,638.40 MT

(5) MEAN SW WATER DRAFT (from Hydrostatic Properties) = 3.19 m ABL

**CHECK STABILITY:**

**Does the loading condition's KG fall below the curves of "Allowable KG -vs- Displacement?"**

**YES ____x_____ Loading condition meets the stability requirements**

**NO _____ Loading condition DOES NOT meet the stability criteria.**

Increase ballast and/or decrease deck cargo or take other corrective action.
Correct Loading forms and check KG again.

THE FOLLOWING OPTIONAL CALCULATIONS DETERMINE THE TRIM, HEEL, AND DRAFTS AT THE BOW AND TRANSOM.

(6) LOA = 62.40 m

(7) LCB (from Hydrostatics) = 30.77 m aft of FR0

(8) MOMENT TO TRIM 1mm, MTmm (from Hydrostatics) = 12.36 MT-m

(9) KML (from Hydrostatics) = 117.90 m ABL

(10) MT1mm CORRECTED = MT1mm = (8) X [(9) - (3)] / (9) 10.41 MT-m

(11) LCF (from Hydrostatics) = 31.84 m aft of FR0

(12) TRIM LEVER = (1) - (7) = -0.78 m

(13) TRIM = [(4) X (12)] / [(10) X 1000 ] = -0.49 m (+Aft/-Fwd)

(14) MEAN DRAFT @ BOW = (5) - $\frac{(13) \times [(6) - (11)]}{(6)}$ = 3.43 m ABL

(15) MEAN DRAFT @ TRANSOM = (13) + (14) = 2.94 m ABL

**(16)* MEAN NAV. DRAFT @ FR 50 = (13) X [ 60 / 62.4 ] + (14) + 0.9 = 3.85 m ABL**

Calculate Average Drafts @ BOW and TRANSOM

(16) BEAM = 39.60 m

(17) MOMENT TO HEEL 1mm, MH1mm (from Hydrostatics) = 8.12 MT-m

(18) KMT (from Hydrostatics) = 50.19 m ABL

(19) MH1mm CORRECTED = MH1mm = (17) X [(18) - (3)] / (18) = 5.12 MT-m

(20) HEEL LEVER = TCG (2) = 0.01 m from CL (+Stbd)

(21) HEEL = [(4) X (20)]/[(19) X 1000] = 0.01 m (+Stbd)

(22) DRAFT @ BOW = (14) +/- (21) / 2: STBD = 3.43 Port = 3.43 m ABL

(22) DRAFT @ TRANSOM = (15) +/- (21) / 2: STBD = 2.94 Port = 2.93 m ABL

**(24) NAV. DRAFT @ FR 50 = (16) +/- (22) / 2: STBD = 3.86 PORT = 3.85 m ABL**

Calculate Port & Stbd Drafts @ BOW and TRANSOM

*** STERN THRUSTER EXTENDS 0.87 m BELOW BASELINE, USE 0.9 m TO ACCOUNT FOR TRIM AND SWING OF NOZZLE**

**TANK LOADING FORM**

Condition: FALCON DIAMOND - (5A) LOADED CONDITION AFLOAT, 454 MT VL + H

| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANK | SOUNDING (%) | WEIGHT (MT) | LCG m aft of FR 0 LCG | L-MOM | TCG (m +/- from CL) TCG (+Stbd) | T-MOM | VCG (m above BASELINE) VCG | V-MOM | TRANS FSM (MT-m) | LONG'L FSM (MT-m) |
| | Enter Value | Enter Value | Enter Value | Col 1 X Col 4 | Enter Value | Col 1 X Col 6 | Enter Value | Col 1 X Col 2 | Enter Value | Enter Value |
| Ballast #1 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #1 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #2 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #2 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #3 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Ballast #3 Stbd | 50 | 155.87 | 51.53 | 8,031.50 | 4.75 | 739.96 | 1.23 | 191.49 | 533.00 | 300.00 |
| Ballast #4 Port | 100 | 69.83 | 58.60 | 4,091.69 | -14.46 | -1,009.88 | 3.14 | 218.92 | 0.00 | 0.00 |
| Ballast #4 Stbd | 100 | 81.02 | 58.60 | 4,748.10 | 14.18 | 1,149.19 | 3.16 | 256.19 | 0.00 | 0.00 |
| Zero Discharge #1 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #1 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #2 Port | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Zero Discharge #2 Stbd | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Day Tank Port | 35 | 3.77 | 24.00 | 90.44 | -13.20 | -49.74 | 2.78 | 10.50 | 2.00 | 2.00 |
| Day Tank Stbd | 35 | 3.77 | 24.00 | 90.44 | 13.20 | 49.74 | 2.78 | 10.50 | 2.00 | 2.00 |
| Fuel Oil Port | 35 | 44.82 | 22.80 | 1,022.05 | -15.84 | -710.07 | 0.94 | 42.16 | 161.00 | 61.00 |
| Fuel Oil Stbd | 35 | 44.82 | 22.80 | 1,022.05 | 15.84 | 710.07 | 0.94 | 42.16 | 161.00 | 61.00 |
| Fresh Water Port | 15 | 20.91 | 30.00 | 627.39 | -15.68 | -327.92 | 0.42 | 8.87 | 279.00 | 238.00 |
| Fresh Water Stbd | 55 | 76.68 | 30.00 | 2,300.45 | 16.49 | 1,264.25 | 1.01 | 77.38 | 279.00 | 238.00 |
| Greywater | 25 | 2.39 | 21.60 | 51.52 | 5.94 | 14.16 | 0.21 | 0.51 | 9.00 | 4.00 |
| Dirty Oil | 10 | 1.32 | 29.40 | 38.83 | 0.00 | 0.00 | 0.06 | 0.08 | 12.00 | 12.00 |
| Lube Oil | 25 | 1.73 | 25.80 | 44.71 | 0.90 | 1.56 | 0.15 | 0.26 | 2.00 | 6.00 |
| Oily Water | 25 | 1.90 | 25.80 | 49.14 | -0.90 | -1.71 | 0.15 | 0.29 | 2.00 | 7.00 |
| TOTAL (Record here and on Vessel Loading Form) | | 508.85 | | 22208.32 | | 1829.60 | | 859.29 | 1442.00 | 931.00 |

**INSTRUCTIONS FOR THE TANK LOADING FORM**

For each of the vessel's tanks that contain liquid, determined and enter the following on the Tank Loading Form:

1. Take soundings of each tank and enter the liquid level in each tank in column 0 of the TANK LOADING FORM.
2. Consult the TANK CAPACITY TABLES and enter the weight of the liquid in column 1, the LCG of the liquid in column 2, the TCG of the liquid in column 4, and the VCG of the liquid in column 6 corresponding to the sounding. Enter the transverse and longitudinal free surface moments into columns 8 and 9, respectively. If the actual sounding falls between two soundings listed the TANK CAPACITY TABLES, enter the values associated with the higher of the two soundings on the TANK LOADING FORM.
3. Sum the weights in column 1 to obtain the total weight of the liquids in the tanks. Enter this TOTAL on the TANK LOADING FORM and the VESSEL LOADING FORM.
4. Multiply each weight in column 1 by its corresponding LCG in column 2 to obtain the longitudinal moment of the weight and enter this value in column 3. Sum the longitudinal moments in column 3 to obtain the total longitudinal moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
5. Multiply each weight in column 1 by its corresponding TCG in column 4 to obtain the transverse moment of the weight and enter this value in column 5. Sum the transverse moments in column 5 to obtain the total transverse moment of the liquids in the tanks. Note the starboard moments are positive and the port moments are negative. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
6. Multiply each weight in column 1 by its corresponding VCG in column 6 to obtain the vertical moment of the weight and enter this value in column 7. Sum the vertical moments in column 7 to obtain the total vertical moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
7. Individually sum the free surface moments in columns 8 and 9 to obtain the total transverse and longitudinal free surface moments of the internal tanks. Enter the maximum of these two TOTALS on the TANK LOADING FORM. Add this value to the DECK TANKS MAX FSM TOTAL from the DECK CARGO LOADING FORM and enter this value into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

**DECK CARGO LOADING FORM**

Condition: FALCON DIAMOND - (5A) LOADED CONDITION AFLOAT, 454 MT VL + H

| COLUMN --> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ITEM (Include deck tanks & contents as separate line items) | WEIGHT (MT) Enter Value | LCG (m aft of FR 0 ) LCG Enter Value | L-MOM Col 1 x Col 2 | TCG (m +/- from CL) TCG (+ STBD) Enter Value | T-MOM Col 1 x Col 4 | VCG above MAIN DECK Enter Value | MAIN DK to BL | VCG (m above BL) VCG Col 6 + Col 7 | V-MOM | DECK TANKS MAX FSM (MT-m) |
| Deck Cargo | 222.88 | 54.00 | 12035.52 | 5.00 | 1114.40 | 4.56 | + 4.6= | 9.16 | 2041.58 | |
| Agusta AW-139 Chopper | 6.80 | -12.43 | -84.50 | 0.00 | 0.00 | 14 | + 4.6= | 18.60 | 126.48 | |
| | | | | | | | + 4.6= | | | |
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| TOTAL (Record here and on Vessel Loading Form) | 229.68 | | 11951.02 | | 1114.40 | | | | 2168.06 | 0.00 |

**INSTRUCTIONS FOR THE DECK CARGO LOADING FORM**

For each of material carried by the vessel the followings shall be determined and entered on the Deck Cargo Loading Form:

1. A complete list of non-tank cargoes is to be entered above with weight, LCG, TCG, and VCG for each item in columns 1, 2, 4 and 6.
2. Calculate the longitudinal moment for each cargo item by multiplying columns 1 and 2 for each item. Calculate the transverse moment for each cargo item by multiplying columns 1 and 4 for each item. Calculate the vertical moment for each cargo item by multiplying columns 1 and 8 for each item.
3. Sum columns 1, 3, 5, and 9 and enter the values in the TOTAL row. These totals are to be entered in the Deck Cargo Loading row of the VESSEL LOADING FORM.
4. Sum column 10 and enter the value in the TOTAL row. This total is to be be added to the TANK LOADING FORM FSC MOM TOTAL and entered into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

# CONDITION 5B: 709 MT Variable Load + Helicopter

## VESSEL LOADING FORM

Condition: FALCON DIAMOND - (5B) LOADED CONDITION AFLOAT, 709 MT VL + H

| COLUMN → | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) | VCG (m ABL) | V-MOM (MT-m) |
| **LIGHTSHIP** | 5870.87 | 28.00 | *164,361* | -0.50 | *-2,906* | 20.11 | *118086.7* |
| **LIGHTSHIP ADJUSTMENTS** | 4.00 | 31.25 | *125* | 0.00 | *0* | 8.15 | *33* |
| **CREW, EFFECTS, & STORES** | 5.00 | 17.43 | *87* | 0.00 | *0* | 13.60 | *68* |
| **OFFSHORE WORKERS, EFFECTS, & STORES** | 20.00 | 17.43 | *349* | 0.00 | *0* | 13.60 | *272* |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | 537.54 | 53.16 | *28,575* | 3.95 | *2,123* | 9.28 | *4,988* |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | 149.26 | | *3,948* | | *735* | | *113* |
| **TOTAL FSM OF ALL SLACK TANKS (from TANK LOADING FORM and DECK CARGO LOADING FORM)** | | | | | | | *909* |
| TOTALS: | 6,586.67 | | 197,446 | | -48 | | 124,469 |

Vessel Loading Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = 197,446 / 6,586.67 = 29.98 m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = -48 / 6,586.67 = -0.01 m from CL (+STBD)

(3) KG = VCG = (Total Col. 7 / Total Col. 1) = 124,469 / 6,586.67 = 18.90 m ABL **NOTE: INCLUDES FSE**

(4) DISPLACEMENT = Total Column 1 = 6,586.67 MT

(5) MEAN SW WATER DRAFT (from Hydrostatic Properties) = 3.17 m ABL

**CHECK STABILITY:**

**Does the loading condition's KG fall below the curves of "Allowable KG -vs- Displacement?"**

**YES ____x_____ Loading condition meets the stability requirements**

**NO _____ Loading condition DOES NOT meet the stability criteria.**

Increase ballast and/or decrease deck cargo or take other corrective action.
Correct Loading forms and check KG again.

THE FOLLOWING OPTIONAL CALCULATIONS DETERMINE THE TRIM, HEEL, AND DRAFTS AT THE BOW AND TRANSOM.

(6) LOA = 62.40 m

(7) LCB (from Hydrostatics) = 30.76 m aft of FR0

(8) MOMENT TO TRIM 1mm, MTmm (from Hydrostatics) = 12.34 MT-m

(9) KML (from Hydrostatics) = 118.71 m ABL

(10) MT1mm CORRECTED = MT1mm = (8) X [(9) - (3)] / (9) = 10.38 MT-m

(11) LCF (from Hydrostatics) = 31.85 m aft of FR0

(12) TRIM LEVER = (1) - (7) = -0.78 m

(13) TRIM = [(4) X (12)] / [(10) X 1000 ] = -0.50 m (+Aft/-Fwd)

(14) MEAN DRAFT @ BOW = (5) - $\frac{(13) \times [(6) - (11)]}{(6)}$ = 3.41 m ABL

(15) MEAN DRAFT @ TRANSOM = (13) + (14) = 2.91 m ABL

**(16)* MEAN NAV. DRAFT @ FR 50 = (13) X [ 60 / 62.4 ] + (14) + 0.9 = 3.83 m ABL**

Calculate Average Drafts @ BOW and TRANSOM

(16) BEAM = 39.60 m

(17) MOMENT TO HEEL 1mm, MH1mm (from Hydrostatics) = 8.12 MT-m

(18) KMT (from Hydrostatics) = 50.55 m ABL

(19) MH1mm CORRECTED = MH1mm = (17) X [(18) - (3)] / (18) = 5.08 MT-m

(20) HEEL LEVER = TCG (2) = -0.01 m from CL (+Stbd)

(21) HEEL = [(4) X (20)]/[(19) X 1000] = -0.01 m (+Stbd)

(22) DRAFT @ BOW = (14) +/- (21) / 2: STBD = 3.40 Port = 3.41 m ABL

(22) DRAFT @ TRANSOM = (15) +/- (21) / 2: STBD = 2.91 Port = 2.92 m ABL

**(24) NAV. DRAFT @ FR 50 = (16) +/- (22) / 2: STBD = 3.83 PORT = 3.84 m ABL**

Calculate Port & Stbd Drafts @ BOW and TRANSOM

*** STERN THRUSTER EXTENDS 0.87 m BELOW BASELINE, USE 0.9 m TO ACCOUNT FOR TRIM AND SWING OF NOZZLE**

**TANK LOADING FORM**

Condition: FALCON DIAMOND - (5B) LOADED CONDITION AFLOAT, 709 MT VL + H

| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANK | FILL | WEIGHT | LCG m aft of FR 0 | | TCG (m +/- from CL) | | VCG (m above BASELINE) | | TRANS FSM | LONG'L FSM |
| | (%) | (MT) | LCG | L-MOM | TCG (+Stbd) | T-MOM | VCG | V-MOM | (MT-m) | (MT-m) |
| | Enter Value | Enter Value | Enter Value | Col 1 X Col 4 | Enter Value | Col 1 X Col 6 | Enter Value | Col 1 X Col 2 | Enter Value | Enter Value |
| Ballast #1 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #1 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #2 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #2 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #3 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #3 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #4 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Ballast #4 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #1 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #1 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #2 Port | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Zero Discharge #2 Stbd | 0 | 0.00 | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | *0.00* | 0.00 | 0.00 |
| Day Tank Port | 25 | 2.69 | 24.00 | *64.60* | -13.20 | *-35.53* | 2.67 | *7.20* | 2.00 | 2.00 |
| Day Tank Stbd | 25 | 2.69 | 24.00 | *64.60* | 13.20 | *35.53* | 2.67 | *7.20* | 2.00 | 2.00 |
| Fuel Oil Port | 25 | 32.02 | 22.80 | *730.04* | -15.82 | *-506.45* | 0.74 | *23.64* | 161.00 | 61.00 |
| Fuel Oil Stbd | 25 | 32.02 | 22.80 | *730.04* | 15.82 | *506.45* | 0.74 | *23.64* | 161.00 | 61.00 |
| Fresh Water Port | 10 | 13.94 | 30.00 | *418.26* | -15.57 | *-217.06* | 0.36 | *5.02* | 279.00 | 238.00 |
| Fresh Water Stbd | 42 | 58.56 | 30.00 | *1,756.70* | 16.02 | *938.03* | 0.77 | *45.24* | 279.00 | 238.00 |
| Greywater | 25 | 2.39 | 21.60 | *51.52* | 5.94 | *14.16* | 0.21 | *0.51* | 9.00 | 4.00 |
| Dirty Oil | 10 | 1.32 | 29.40 | *38.83* | 0.00 | *0.00* | 0.06 | *0.08* | 12.00 | 12.00 |
| Lube Oil | 25 | 1.73 | 25.80 | *44.71* | 0.90 | *1.56* | 0.15 | *0.26* | 2.00 | 6.00 |
| Oily Water | 25 | 1.90 | 25.80 | *49.14* | -0.90 | *-1.71* | 0.15 | *0.29* | 2.00 | 7.00 |
| TOTAL (Record here and on Vessel Loading Form) | 0 | 149.26 | | 3948.45 | | 734.98 | | 113.07 | 909.00 | 631.00 |

**INSTRUCTIONS FOR THE TANK LOADING FORM**

For each of the vessel's tanks that contain liquid, determined and enter the following on the Tank Loading Form:

1. Take soundings of each tank and enter the liquid level in each tank in column 0 of the TANK LOADING FORM.
2. Consult the TANK CAPACITY TABLES and enter the weight of the liquid in column 1, the LCG of the liquid in column 2, the TCG of the liquid in column 4, and the VCG of the liquid in column 6 corresponding to the sounding. Enter the transverse and longitudinal free surface moments into columns 8 and 9, respectively. If the actual sounding falls between two soundings listed the TANK CAPACITY TABLES, enter the values associated with the higher of the two soundings on the TANK LOADING FORM.
3. Sum the weights in column 1 to obtain the total weight of the liquids in the tanks. Enter this TOTAL on the TANK LOADING FORM and the VESSEL LOADING FORM.
4. Multiply each weight in column 1 by its corresponding LCG in column 2 to obtain the longitudinal moment of the weight and enter this value in column 3. Sum the longitudinal moments in column 3 to obtain the total longitudinal moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
5. Multiply each weight in column 1 by its corresponding TCG in column 4 to obtain the transverse moment of the weight and enter this value in column 5. Sum the transverse moments in column 5 to obtain the total transverse moment of the liquids in the tanks. Note the starboard moments are positive and the port moments are negative. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
6. Multiply each weight in column 1 by its corresponding VCG in column 6 to obtain the vertical moment of the weight and enter this value in column 7. Sum the vertical moments in column 7 to obtain the total vertical moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
7. Individually sum the free surface moments in columns 8 and 9 to obtain the total transverse and longitudinal free surface moments of the internal tanks. Enter the maximum of these two TOTALS on the TANK LOADING FORM. Add this value to the DECK TANKS MAX FSM TOTAL from the DECK CARGO LOADING FORM and enter this value into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

**DECK CARGO LOADING FORM**

Condition: FALCON DIAMOND - (5B) LOADED CONDITION AFLOAT, 709 MT VL + H

| COLUMN --> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ITEM (Include deck tanks & contents as separate line items) | WEIGHT (MT) Enter Value | LCG (m aft of FR 0 ) LCG Enter Value | L-MOM Col 1 x Col 2 | TCG (m +/- from CL) TCG (+ STBD) Enter Value | T-MOM Col 1 x Col 4 | VCG above MAIN DECK Enter Value | MAIN DK to BL | VCG (m above BL) VCG Col 6 + Col 7 | V-MOM | DECK TANKS MAX FSM (MT-m) |
| Deck Cargo | 530.74 | 54.00 | 28659.96 | 4.00 | 2122.96 | 4.56 | + 4.6= | 9.16 | 4861.58 | |
| Agusta AW-139 Chopper | 6.80 | -12.43 | -84.50 | 0.00 | 0.00 | 14 | + 4.6= | 18.60 | 126.48 | |
| | | | | | | | + 4.6= | | | |
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| | | | | | | | + 4.6= | | | |
| TOTAL (Record here and on Vessel Loading Form) | 537.54 | | 28575.46 | | 2122.96 | | | | 4988.06 | 0.00 |

**INSTRUCTIONS FOR THE DECK CARGO LOADING FORM**

For each of material carried by the vessel the following shall be determined and entered on the Deck Cargo Loading Form:
1. A complete list of non-tank cargoes is to be entered above with weight, LCG, TCG, and VCG for each item in columns 1, 2, 4 and 6.
2. Calculate the longitudinal moment for each cargo item by multiplying columns 1 and 2 for each item. Calculate the transverse moment for each cargo item by multiplying columns 1 and 4 for each item. Calculate the vertical moment for each cargo item by multiplying columns 1 and 8 for each item.
3. Sum columns 1, 3, 5, and 9 and enter the values in the TOTAL row. These totals are to be entered in the Deck Cargo Loading row of the VESSEL LOADING FORM.
4. Sum column 10 and enter the value in the TOTAL row. This total is to be be added to the TANK LOADING FORM FSC MOM TOTAL and entered into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

## 10.8 Blank Example Forms and KG Allowable Curves

10.8.1 The following blank loading forms and KG allowable versus Draft plot are included for copying and use by the vessel's crew when evaluating stability.

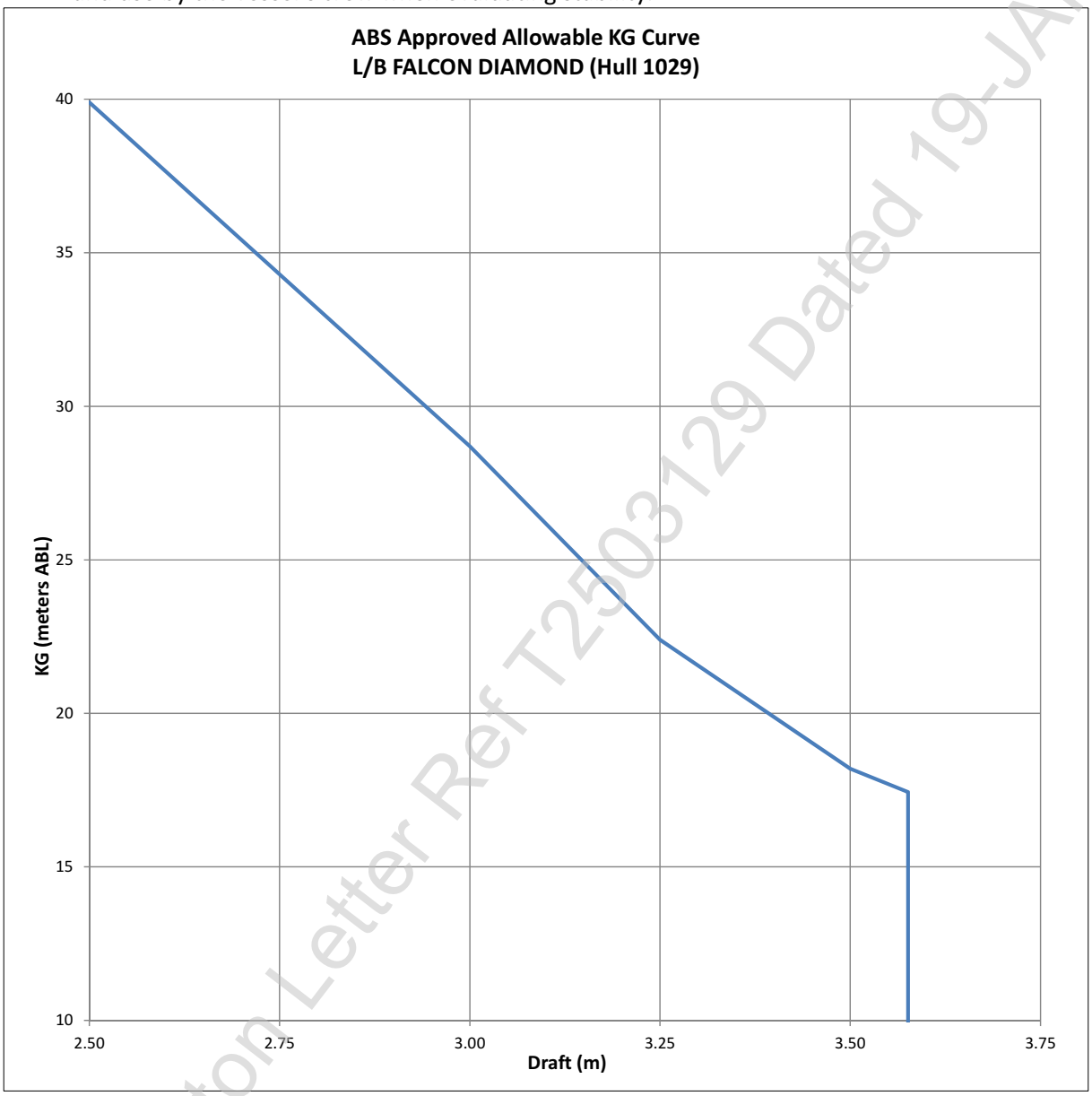


Figure 10-3: ABS Allowable KG Curves

| ALLOWABLE KG CURVE | | |
|---|---|---|
| **Displacement** | **DRAFT** | **$KG_A$** |
| **(MT)** | **(m)** | **(m)** |
| 4941 | 2.50 | 39.9 |
| 6173 | 3.00 | 28.7 |
| 6792 | 3.25 | 22.4 |
| 7413 | 3.50 | 18.2 |
| 7602 | 3.576 | 17.44 |

## VESSEL LOADING FORM

Condition:

| COLUMN → | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Item | WEIGHT (MT) | LCG (m aft FR0) | L-MOM (MT-m) | TCG (m from CL, +STBD) | T-Mom (MT-m) | VCG (m ABL) | V-MOM (MT-m) |
| **LIGHTSHIP** | | | | | | | |
| **LIGHTSHIP ADJUSTMENTS** | | | | | | | |
| **CREW, EFFECTS, & STORES** | | | | | | | |
| **OFFSHORE WORKERS, EFFECTS, & STORES** | | | | | | | |
| **TOTAL DECK CARGO (from DECK CARGO LOADING FORM)** | | | | | | | |
| **TANK LIQUIDS IN VESSEL'S TANKS (from TANK LOADING FORM)** | | | | | | | |
| **TOTAL FSM OF ALL SLACK TANKS (from TANK LOADING FORM and DECK CARGO LOADING FORM)** | | | | | | | |
| TOTALS: | | | | | | | |

Vessel Loading Calculations

(1) LCG = (Total Col. 3 / Total Col. 1) = _____ _____ _____ m aft of FR 0

(2) TCG = (Total Col. 5 / Total Col. 1) = _____ _____ _____ m from CL (+STBD)

(3) KG = VCG = (Total Col. 7 / Total Col. 1) = _____ _____ _____ m ABL **NOTE: INCLUDES FSE**

(4) DISPLACEMENT = Total Column 1 = _____ MT

(5) MEAN SW WATER DRAFT (from Hydrostatic Properties) = _____ m ABL

**CHECK STABILITY:**

**Does the loading condition's KG fall below the curves of "Allowable KG -vs- Displacement?"**

**YES** **Loading condition meets the stability requirements**

**NO** _____ **Loading condition DOES NOT meet the stability criteria.**
Increase ballast and/or decrease deck cargo or take other corrective action.
Correct Loading forms and check KG again.

THE FOLLOWING OPTIONAL CALCULATIONS DETERMINE THE TRIM, HEEL, AND DRAFTS AT THE BOW AND TRANSOM.

(6) LOA = 62.40 m

(7) LCB (from Hydrostatics) = _____ m aft of FR0

(8) MOMENT TO TRIM 1mm, MTmm (from Hydrostatics) = _____ MT-m

(9) KML (from Hydrostatics) = _____ m ABL

(10) MT1mm CORRECTED = MT1mm = (8) X [(9) - (3)] / (9) _____ MT-m

(11) LCF (from Hydrostatics) = _____ m aft of FR0

(12) TRIM LEVER = (1) - (7) = _____ m

(13) TRIM = [(4) X (12)] / [(10) X 1000 ] = _____ m (+Aft/-Fwd)

(14) MEAN DRAFT @ BOW = (5) - $\frac{(13) \text{ X } [(6) - (11)]}{(6)}$ = m ABL

(15) MEAN DRAFT @ TRANSOM = (13) + (14) = _____ m ABL

**(15A)* MEAN NAV. DRAFT @ FR 50 = (13) X [ 60 / 62.4 ] + (14) + 0.9 = _____ m ABL**

Calculate Average Drafts @ BOW and TRANSOM

(16) BEAM = 39.60 m

(17) MOMENT TO HEEL 1mm, MH1mm (from Hydrostatics) = _____ MT-m

(18) KMT (from Hydrostatics) = _____ m ABL

(19) MH1mm CORRECTED = MH1mm = (17) X [(18) - (3)] / (18) = _____ MT-m

(20) HEEL LEVER = TCG (2) = _____ m from CL (+Stbd)

(21) HEEL = [(4) X (20)]/[(19) X 1000] = _____ m (+Stbd)

(22) DRAFT @ BOW = (14) +/- (21) / 2: STBD = _____ Port = _____ m ABL

(22) DRAFT @ TRANSOM = (15) +/- (21) / 2: STBD = _____ Port = _____ m ABL

**(24) NAV. DRAFT @ FR 50 = (16) +/- (22) / 2: STBD = _____ PORT = _____ m ABL**

Calculate Port & Stbd Drafts @ BOW and TRANSOM

*** STERN THRUSTER EXTENDS 0.87 m BELOW BASELINE, USE 0.9 m TO ACCOUNT FOR TRIM AND SWING OF NOZZLE**

**TANK LOADING FORM**

Condition:

| COLUMN → | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| TANK | FILL | WEIGHT | LCG m aft of FR 0 | | TCG (m +/- from CL) | | VCG (m above BASELINE) | | TRANS FSM | LONG'L FSM |
| | (%) | (MT) | LCG | L-MOM | TCG (+Stbd) | T-MOM | VCG | V-MOM | (MT-m) | (MT-m) |
| | Enter Value | Enter Value | Enter Value | Col 1 X Col 4 | Enter Value | Col 1 X Col 6 | Enter Value | Col 1 X Col 2 | Enter Value | Enter Value |
| Ballast #1 Port | | | | | | | | | | |
| Ballast #1 Stbd | | | | | | | | | | |
| Ballast #2 Port | | | | | | | | | | |
| Ballast #2 Stbd | | | | | | | | | | |
| Ballast #3 Port | | | | | | | | | | |
| Ballast #3 Stbd | | | | | | | | | | |
| Ballast #4 Port | | | | | | | | | | |
| Ballast #4 Stbd | | | | | | | | | | |
| Zero Discharge #1 Port | | | | | | | | | | |
| Zero Discharge #1 Stbd | | | | | | | | | | |
| Zero Discharge #2 Port | | | | | | | | | | |
| Zero Discharge #2 Stbd | | | | | | | | | | |
| Day Tank Port | | | | | | | | | | |
| Day Tank Stbd | | | | | | | | | | |
| Fuel Oil Port | | | | | | | | | | |
| Fuel Oil Stbd | | | | | | | | | | |
| Fresh Water Port | | | | | | | | | | |
| Fresh Water Stbd | | | | | | | | | | |
| Greywater | | | | | | | | | | |
| Dirty Oil | | | | | | | | | | |
| Lube Oil | | | | | | | | | | |
| Oily Water | | | | | | | | | | |
| TOTAL (Record here and on Vessel Loading Form) | | | | | | | | | | |

**INSTRUCTIONS FOR THE TANK LOADING FORM**

For each of the vessel's tanks that contain liquid, determined and enter the following on the Tank Loading Form:

1. Take soundings of each tank and enter the liquid level in each tank in column 0 of the TANK LOADING FORM.
2. Consult the TANK CAPACITY TABLES and enter the weight of the liquid in column 1, the LCG of the liquid in column 2, the TCG of the liquid in column 4, and the VCG of the liquid in column 6 corresponding to the sounding. Enter the transverse and longitudinal free surface moments into columns 8 and 9, respectively. If the actual sounding falls between two soundings listed the TANK CAPACITY TABLES, enter the values associated with the higher of the two soundings on the TANK LOADING FORM.
3. Sum the weights in column 1 to obtain the total weight of the liquids in the tanks. Enter this TOTAL on the TANK LOADING FORM and the VESSEL LOADING FORM.
4. Multiply each weight in column 1 by its corresponding LCG in column 2 to obtain the longitudinal moment of the weight and enter this value in column 3. Sum the longitudinal moments in column 3 to obtain the total longitudinal moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
5. Multiply each weight in column 1 by its corresponding TCG in column 4 to obtain the transverse moment of the weight and enter this value in column 5. Sum the transverse moments in column 5 to obtain the total transverse moment of the liquids in the tanks. Note the starboard moments are positive and the port moments are negative. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
6. Multiply each weight in column 1 by its corresponding VCG in column 6 to obtain the vertical moment of the weight and enter this value in column 7. Sum the vertical moments in column 7 to obtain the total vertical moment of the liquids in the tanks. Enter this value on the TANK LOADING FORM and the VESSEL LOADING FORM.
7. Individually sum the free surface moments in columns 8 and 9 to obtain the total transverse and longitudinal free surface moments of the internal tanks. Enter the maximum of these two TOTALS on the TANK LOADING FORM. Add this value to the DECK TANKS MAX FSM TOTAL from the DECK CARGO LOADING FORM and enter this value into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

**DECK CARGO LOADING FORM**

CONDITION:

| COLUMN --> | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| ITEM (Include deck tanks & contents as separate line items) | WEIGHT (MT) Enter Value | LCG (m aft of FR 0 ) LCG Enter Value | L-MOM Col 1 x Col 2 | TCG (m +/- from CL) TCG (+ STBD) Enter Value | T-MOM Col 1 x Col 4 | VCG above MAIN DECK Enter Value | MAIN DK to BL | VCG (m above BL) VCG Col 6 + Col 7 | V-MOM | DECK TANKS MAX FSM (MT-m) |
| | | | | | | | +4.6= | | | |
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| TOTAL (Record here and on Vessel Loading Form) | | | | | | | | | | |

**INSTRUCTIONS FOR THE DECK CARGO LOADING FORM**

For each of material carried by the vessel the following shall be determined and entered on the Deck Cargo Loading Form:

1. A complete list of non-tank cargoes is to be entered above with weight, LCG, TCG, and VCG for each item in columns 1, 2, 4 and 6.
2. Calculate the longitudinal moment for each cargo item by multiplying columns 1 and 2 for each item. Calculate the transverse moment for each cargo item by multiplying columns 1 and 4 for each item. Calculate the vertical moment for each cargo item by multiplying columns 1 and 8 for each item.
3. Sum columns 1, 3, 5, and 9 and enter the values in the TOTAL row. These totals are to be entered in the Deck Cargo Loading row of the VESSEL LOADING FORM.
4. Sum column 10 and enter the value in the TOTAL row. This total is to be be added to the TANK LOADING FORM FSC MOM TOTAL and entered into the TOTAL FSM OF ALL SLACK TANKS row of the VESSEL LOADING FORM.

**DECK TANK FSM CALCULATION WORKSHEET**

**CONDITION:**

**Temporary Tank Description:**

| | | | | | |
|---|---|---|---|---|---|
| (1) Tank Dimensions: | (1a) L = | m | (1b) W = | | m |
| (2) Fluid Density: | D = | $t/m^3$ | (2a) Fluid SG = | | |
| | | | (2b) Fluid Density, D = (2a) x 1 $t/m^3$ = | | $t/m^3$ |
| | (3) $W^3 = (1b)^3$ = | $m^3$ | | | |
| | (4) Tank FSM = D x L x $W^3$ = (2) x (1a) x (3) = | m-ton | Record here and on Deck Cargo Loading Form | | |

Instructions for Deck Tank FSM Determination

1) When carrying temporary deck tanks, the weight of the empty tank and the liquid weights should be entered as separate line items on the Deck Cargo Loading Form. This worksheet aids in determining the FSM of common tank geometries to be entered in the appropriate column on the Deck Cargo Loading Form.

2) The maximum free surface moment of the temporary deck tank may be determined for rectangular or cylindrical tanks oriented as shown on the attached sketch, as follows:

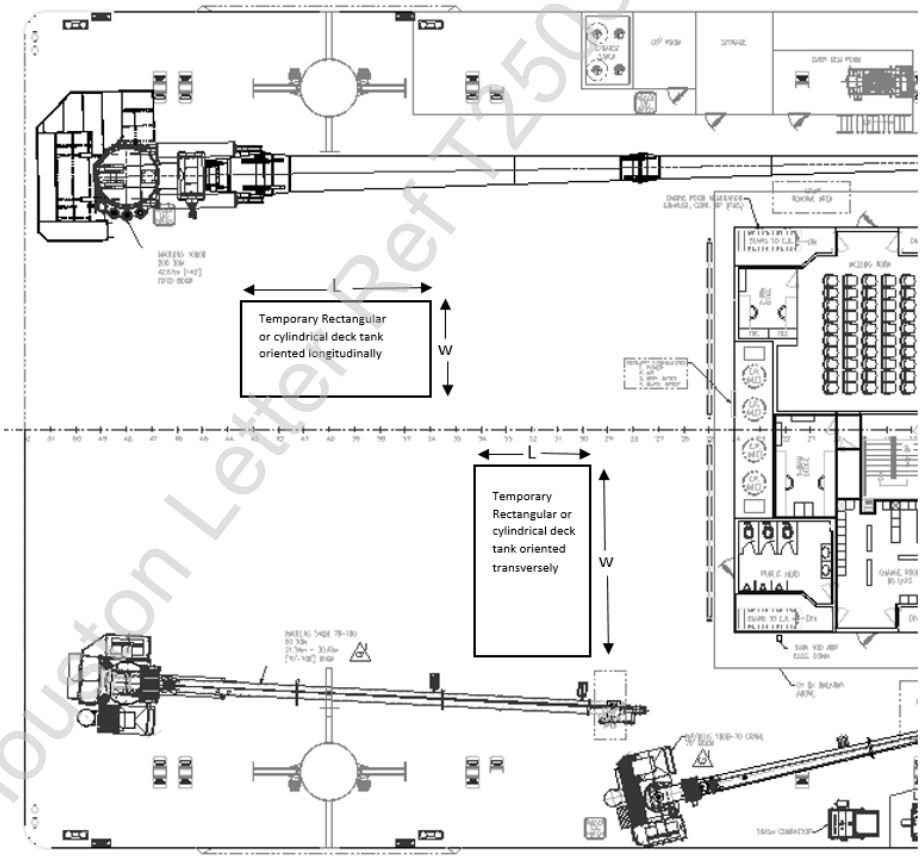
a) Determine L, the maximum longitudinal dimension of the tank. See the accompanying sketch. Enter this value on teh worksheet, line (1a).

b) Determine W, the maximum transverse dimension of the tank. See the accompanying sketch. Enter this value on teh worksheet, line (1b).

c) Determine D, the density of the liquid in the tank. This value is often provided as a specific gravity (SG). The density can be determined from the SG using the calculations in lines (2a) and (2b). Enter the density, D, on the worksheet, line (2).

d) Cube the width dimension, W, and enter this value on the worksheet, line (3).

e) Determine the FSM using the calculation in line (4). Enter this value on the worksheet and on the Deck Cargo Loading Form.




MAIN DECK PLAN

# EXAMPLE DECK TANK CALCULATION

**DECK TANK FSM CALCULATION WORKSHEET**

**CONDITION: Example Temporary Tank**

**Temporary Tank Description: 3m x 4m rectangular tank carrying salt water**

| | | | | |
|---|---|---|---|---|
| (1) Tank Dimensions: | (1a) L = 3 | m | (1b) W = 4 | m |
| (2) Fluid Density: | D = 1.02500 | $t/m^3$ | (2a) Fluid SG = | |
| | | | (2b) Fluid Density, D = (2a) x 1 $t/m^3$ = | $ton/m^3$ |
| | (3) $W^3 = (1b)^3$ = 64 | $m^3$ | | |
| (4) Tank FSM = D x L x $W^3$ = (2) x (1a) x (3) = 196.8 | | m-ton | Record here and on Deck Cargo Loading Form | |

Instructions for Deck Tank FSM Determination

1) When carrying temporary deck tanks, the weight of the empty tank and the liquid weights should be entered as separate line items on the Deck Cargo Loading Form. This worksheet aids in determining the FSM of common tank geometries to be entered in the appropriate column on the Deck Cargo Loading Form.

2) The maximum free surface moment of the temporary deck tank may be determined for rectangular or cylindrical tanks oriented as shown on the attached sketch, as follows:

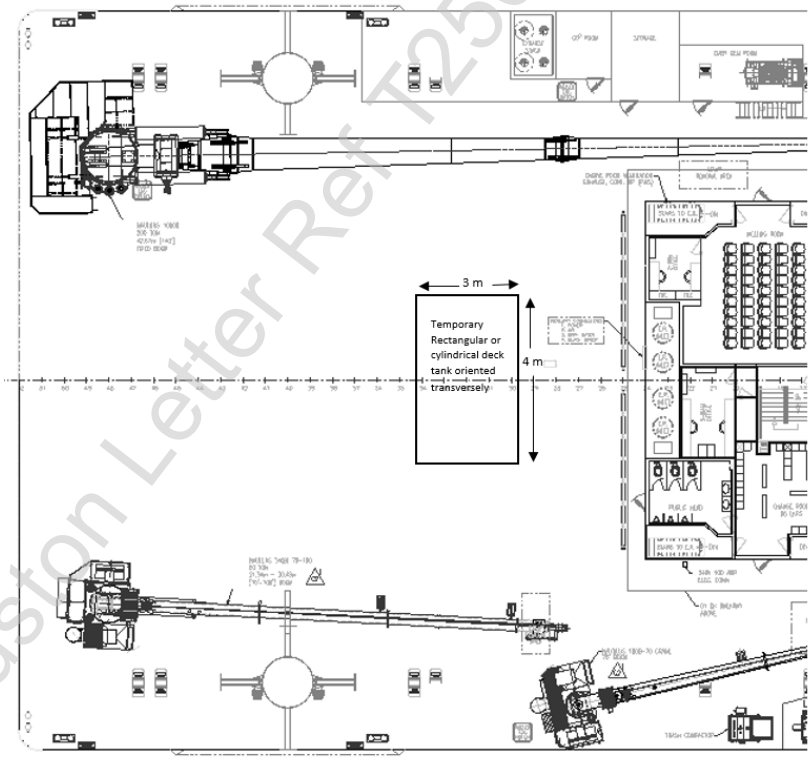
a) Determine L, the maximum longitudinal dimension of the tank. See the accompanying sketch. Enter this value on teh worksheet, line (1a).

b) Determine W, the maximum transverse dimension of the tank. See the accompanying sketch. Enter this value on teh worksheet, line (1b).

c) Determine D, the density of the liquid in the tank. This value is often provided as a specific gravity (SG). The density can be determined from the SG using the calculations in lines (2a) and (2b). Enter the density, D, on the worksheet, line (2).

d) Cube the width dimension, W, and enter this value on the worksheet, line (3).

e) Determine the FSM using the calculation in line (4). Enter this value on the worksheet and on the Deck Cargo Loading Form.




MAIN DECK PLAN

## 10.9 Downflooding Points

10.9.1 The following is a list of unprotected downflooding points. Where required, watertight closures are provided for doors and hatches and should be secured at all times. Air pipes (see drawing 0722-503-001 Vents Fills and Sounds (Appendix H) for locations and arrangements) and other such openings are protected by manual or automatic weathertight closures which are to be secured as required.

| POINT | X (m) + AFT of FP | Y (m) + Stbd OCL | Z (m) +ABL | DESCRIPTION |
|---|---|---|---|---|
| *EXH | 36.00 | -18.75 | 10.72 | ER Exhaust Stack |
| *INP | 28.20 | -4.20 | 9.10 | ER Air Intake, Port Extent |
| *INS | 28.20 | 4.20 | 9.10 | ER Air Intake, Stbd Extent |
| *VENFP | 25.20 | -9.09 | 9.10 | ER Exhaust Air, Forward Port |
| *VENAP | 28.80 | -9.09 | 9.10 | ER Exhaust Air, Aft Port |
| *VENFS | 25.20 | 9.09 | 9.10 | ER Exhaust Air, Forward Stbd |
| *VENAS | 28.80 | 9.09 | 9.10 | ER Exhaust Air, Aft Stbd |

# 11 Crane Capacity Tables

All lifts shall comply with the following load charts, regulatory restrictions, latest API standards, and any crane manufacturer's specifications contained in the crane-specific operations manual. Cranes shall not be used unless the vessel is in the elevated condition.

# Nautilus Model 1000B-140

## 181.44 t max capacity

## 42.67 m Boom length

# Nautilus Model 340BT-70/100

## 54.43 t max capacity

## 21.34 m-30.48 m Boom length

# Nautilus Model 180B-70

## 22.68 t max capacity

## 21.34 m Fixed Boom

# 12 Tank Sounding Tables

12.1 Tank sounding tables are provided as Appendix A.

13.2 The sounding tables provide capacities; the vertical, longitudinal, and transverse centers of gravity for each 0.05 m interval of sounding as well as free surface data of each tank.

13.3 The sounding tables provide the capacities and center of gravity for each void. Each void is provided with permanently installed bilge suction, as seen in Appendix E.

# 13 Location of Stored Dangerous Substances

The vessel has no designated storage areas for dangerous substances.

# 14 General Arrangement

Please See Appendix B for General Arrangement drawing.

# 15 Fire and Safety Plan

15.1 The Fire Control Plan is provided in Appendix C.

This plan is located on the vessel in the following locations:

1. Meeting Room; 05 Level
2. Fwd Side of Stairtower Exterior; 04 Level
3. Fwd Side of Stairtower Exterior; 03 Level
4. Fwd Side of Stairtower Exterior; 02 Level
5. Forward End of Deckhouse Near CL; Foclse Deck
6. Near Change Room (Port side of Deckhouse) Door; Main Deck
7. Near aft side of stack; Main Deck
8. ECC; Hold Level

15.2 The Safety Plan is provided in Appendix D.

This plan is located on the vessel in the following locations:

1. Meeting Room; 05 Level
2. Fwd end of Mess Room; Main Deck
3. ECC; Hold Level

15.3 Inner Joiner Doors

15.3.1 Where inner joiner doors are provided in the same location as exterior watertight or weathertight doors, the joiner doors shall be locked open in normal operating conditions.

# 16 List of Shutdown Locations

## 16.1 Shutdown Appliance Table

| Shutdown Appliance | E-Stop # (from H1028-438-001-60) | Location | Equipment |
|---|---|---|---|
| Port Engine Room | 01 | ECC Room near ER Door | MCC #1 (port) emergency shutdown shunt trip, Port engine room supply fan #1 & #2 - damper control, Port engine room exhaust fan #1 & #2 - damper control, Port fuel suction valve shutdown |
| | 03 | Meeting Rm Mn Dk ER Door | |
| | 07 | Pilothouse Aft Console | |
| | 10 | Pilothouse Forward Console | |
| Stbd Engine Room | 02 | ECC Room near ER Door | Mcc #2 (stbd) emergency shutdown shunt trip, Stbd engine room supply fan #1 & #2 - damper control, Stbd engine room exhaust fan #1 & #2 - damper control, Stbd fuel suction valve shutdown |
| | 04 | Change Room Outside ER Door | |
| | 08 | Pilothouse Aft Console | |
| | 12 | Pilothouse Forward Console | |
| Emergency Generator room | 13 | Pilothouse Aft Console | Emergency generator exhaust fan, Emergency generator room intake damper control |
| | 14 | Pilothouse Forward Console | |
| | 15 | Main Deck House Wall Across from Egen Room | |
| Galley | 05 | Mess Outside Galley Door | P407 galley equipment emergency shutdown shunt trip<br>Galley supply fan - damper control<br>galley exhaust fan - damper control |
| | 06 | Passage Outside Pantry | |
| | Ansul Release Station | Galley Hood | |
| Central Ventilation | 09 | Pilothouse Aft Console | P202-10 FAMU shunt trip<br>P209 220v central ventilation emergency shutdown shunt trip,<br>P408 480 central ventilation emergency shutdown shunt trip |
| | 11 | Pilothouse Forward Console | |
| Jacking System | | Bridge Control Panel | Jacking System |
| Hose Reel HPU | | Main Deck | Hose Reel HPU |
| Water Makers | | Port Engine Room | Water Makers |
| Port Thruster | | Pilothouse | Port Thruster |
| | | ECC Room | |
| Starboard Thruster | | Pilothouse | Starboard Thruster |
| | | ECC Room | |
| Bow Thrusters | | Pilothouse | Bow Thrusters (2) |
| | | ECC Room | |

| | | | |
|---|---|---|---|
| Port Main Generators (2) | | Port Engine Room | Port Main Generators (2) |
| Stbd Main Generators (2) | | Starboard Engine Room | Starboard Main Generators (2) |
| Emergency Generator | | Emergency Generator Room | Emergency Generator |
| Fuel Oil Transfer | | Main Deck Discharge | Fuel Oil Transfer Pump |
| | | ECC Room Outside ER Door | |

Table 16-1: Shutdown Appliance Locations

## 16.2 Guidance on Restarting after Shutdowns

16.2.1 After a shutdown, the cause of the shutdown shall be determined and corrected. After the causes of the shutdown and any equipment damage are corrected, the shutdown appliances shall be reset to their normal operation mode, and the affected equipment can be restarted using normal starting procedures.

# 17 Dewatering and Ballasting

## 17.1 General

17.1.1 The vessel is equipped with a bilge/ballast/fire system. See Appendix E for system diagram.

17.1.2 This system includes two 41.5 kW bilge/ballast/fire pumps, two submersible 58 kW ballast/fire pumps on hose reels for use while elevated, and one 3.5 kW zero discharge pump. The hull bilge and void suctions are routed through a bilge manifold, and each ballast tank uses a combined fill/discharge pipe routed through a ballast manifold. The manifold and pump start/stop controls are located in the engine rooms and the pilot house. In general, the engine room controls should be used when operating the system in the bilge and ballast mode. Each port and starboard engine room contains one bilge/ballast/fire pump and one bilge manifold and one ballast manifold corresponding to the tanks on that side of the vessel. The manifolds' suctions and discharges are cross connected between engine rooms. The zero discharge pump is located in the starboard engine room, and the two submersible pumps and hose reels are located on the 01 deck port side above the generator room, at frames 15 and 34.

17.1.3 The vessel is equipped with bilge high level alarms to sound when unexpected flooding occurs. The location of the flood alarms are indicated in Figure 17-1. Bilge sensors are also located in the all crane pedestals, thruster compartment P/S, engine room P/S and bow thruster compartment P/S.

17.1.4 All ballast operations are to be in accordance with the requirements of the Ballast Water Management Plan. Refer to MiNO Document 0916-841-002.

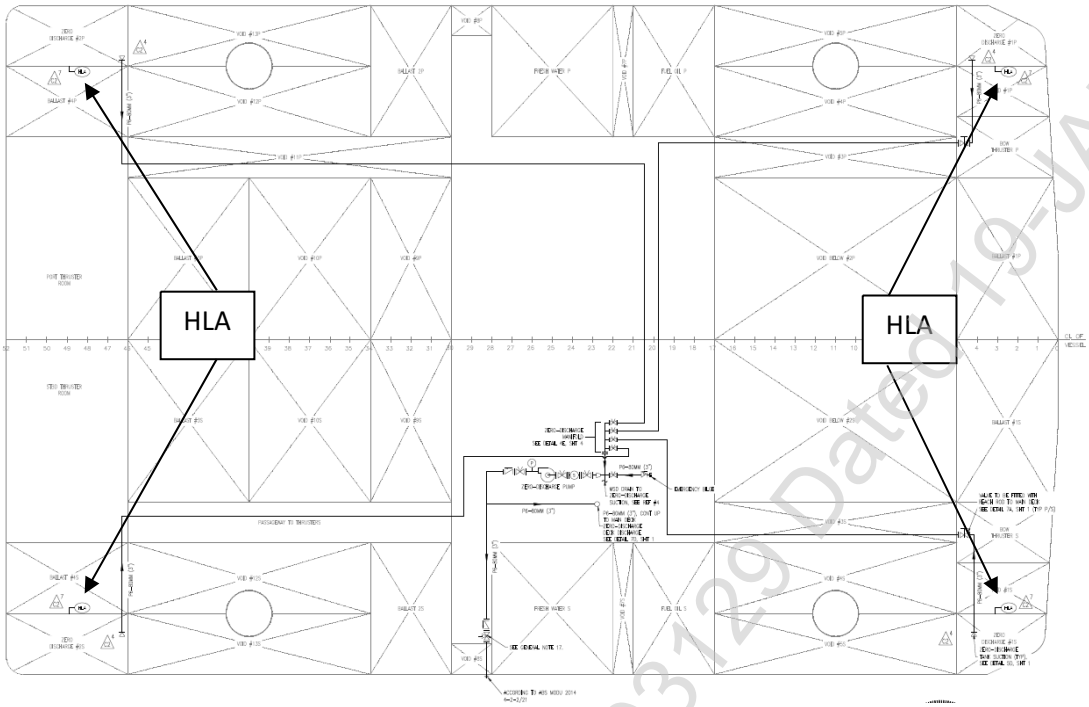



Figure 17-1: Hold Plan

17.1.5 When afloat, one of the bilge/ballast/fire pumps shall be readily available for use as a fire pump at all times.

## 17.2 Bilge System Description & Operating Guidance

17.2.1 The engine rooms, bow thruster compartments, thruster compartments, HPU compartments, and below deck voids can be dewatered through the bilge manifold using one of the bilge/ballast/fire pumps. Each engine room also has an independent bilge suction that can be utilized independently of the bilge manifold.

Discharge of the bilge or void contents is directed to the overboard discharge, port or starboard, to the oily water bilge tank, or routed through the ballast manifold to a ballast tank for storage. To prevent accidental discharge of machinery space bilge water, the overboard discharge valves, port and starboard, shall be normally closed. No bilge contents from machinery spaces shall be discharged to any ballast tanks. The maximum flow rate for one bilge line to be discharged overboard is 73 $m^3$/hr.

All machinery space bilges (including P&S engine rooms, P&S bow thruster compartments, P&S thruster compartments, and P&S HPU compartments) are to normally be discharged to the oily water tank. Bilge water from any machinery space is only to be discharged directly overboard only in the event of an emergency where there is immediate danger to the vessel. In the event that the un-treated bilge water from any machinery space is discharged directly overboard, such discharged is to be recorded in the vessels Oil Record Book as required by MARPOL Annex I (regulation 17). The contents of the oily water bilge tank shall be treated by the Oily Water Separator prior to discharging overboard. Machinery space bilges are to be pumped consistent with applicable regulatory pollution prevention regulations, MARPOL Annex I.

17.2.2 To prevent progressive flooding, the sliding watertight door between engine rooms must be closed. All other doors are normally closed with proper alarms and indication.

## 17.3 Ballast System Description and Operating Guidance

17.3.1 The ballast system can draw external water from the port and starboard seachests when afloat, or using the submersible ballast/fire pumps when elevated.

17.3.2 The ballast manifolds can be configured to draw suction from any ballast tank and discharge into any other ballast tank, overboard, or to the port deck discharge.

# 18 Propulsion Equipment Description

## 18.1 General

18.1.1 The vessel has a diesel electric power plant consisting of four (4) generators with two (2) in each engine room. The power management system determines the number and type of generators providing power to the system.

18.1.2 The propulsors consist of two (2) 360 degree azimuthing 1,566 kW Steerprop SP-20 D thrusters in the stern and two (2) 405 kW CAT (Berg) tunnel bow thrusters. The stern thrusters are located in the stern thruster compartments accessed via a passageway from the machinery room. The bow thrusters are located in the forward thruster compartments and are accessed via deck hatches. The drives for both motors are located in the ECC room. The bow thruster motors are located in the bow thruster compartments and the drives are located in the ECC room. All thrusters can be controlled from the pilothouse and from the ECC room in an emergency.

18.1.3 Please see Appendix G for the arrangement of the thrusters and associated equipment. Please see Appendix F for the electrical system schematics. Additional information may be found in information provided by vendors. See Table 18-1 below for a listing of the primary propulsion equipment.

**Table 18-1: Propulsion Main Equipment**

| Equipment | Vendor | Manufacturer | Model | Location |
|---|---|---|---|---|
| Main Gensets | Tractors Singapore | Caterpillar/KATO | CAT 3512C/ DSG86L1/4 | Port / Stbd Engine Room |
| Emergency Genset | Tractors Singapore | Caterpillar | CAT C9 | Port Main Deck Compartment |
| Stern Thruster Drives | RAACI Division Trident Marine Services | RAACI / Siemens | - | ECC Room |
| Stern Thruster Motors | Tractors Singapore | Marelli | B5J 500 LB4 | Port / Stbd Thruster Room |
| Stern Thrusters | Tractors Singapore | Steerprop | SP-20 D | Port / Stbd Thruster Room |
| Bow Thruster Drives | RAACI, Inc. | RAACI / Siemens | - | ECC Room |
| Bow Thruster Motors | Tractors Singapore | Marelli | B4J 355 LB4 | Port / Stbd Bow Thruster Compartment |
| Bow Thrusters | Tractors Singapore | CAT (Berg) Propulsion | BTT113 | Port / Stbd Bow Thruster Compartment |

## 18.2 Dynamic Positioning

18.2.1 This vessel is equipped with an integrated Dynamic Positioning system, class DP-2. The system integrates control of the thrusters and takes inputs from sensors to maintain the desired position/heading. The system features:

a. Two (2) x Operator Stations (Workstations)
b. Two (2) x 3-axis Joystick
c. Two (2) x Differential GPS Units
d. Three (3) x Wind Sensors w/ Display
e. Two (2) x Controller Cabinets
f. One (1) x Laser Reference System
g. Three (3) x Vertical Reference Units
h. One (1) x Duplex Changeover Switch
i. Three (3) x Gyro Compass Units
j. Two (2) x Printer
k. Two (2) x Uninterruptable Power Supply

18.2.2 Limiting Conditions are given in capability plots found in the DP system manual. The worst-case design scenario was given with a current of 2.5kts from 90 degrees with legs up, and legs down. Capability plots for each of these cases are shown below. See Reference [3] for DP Plots with other environmental conditions.

Figure 18-1: Worst-Case DP Capability Plot with Legs Retracted

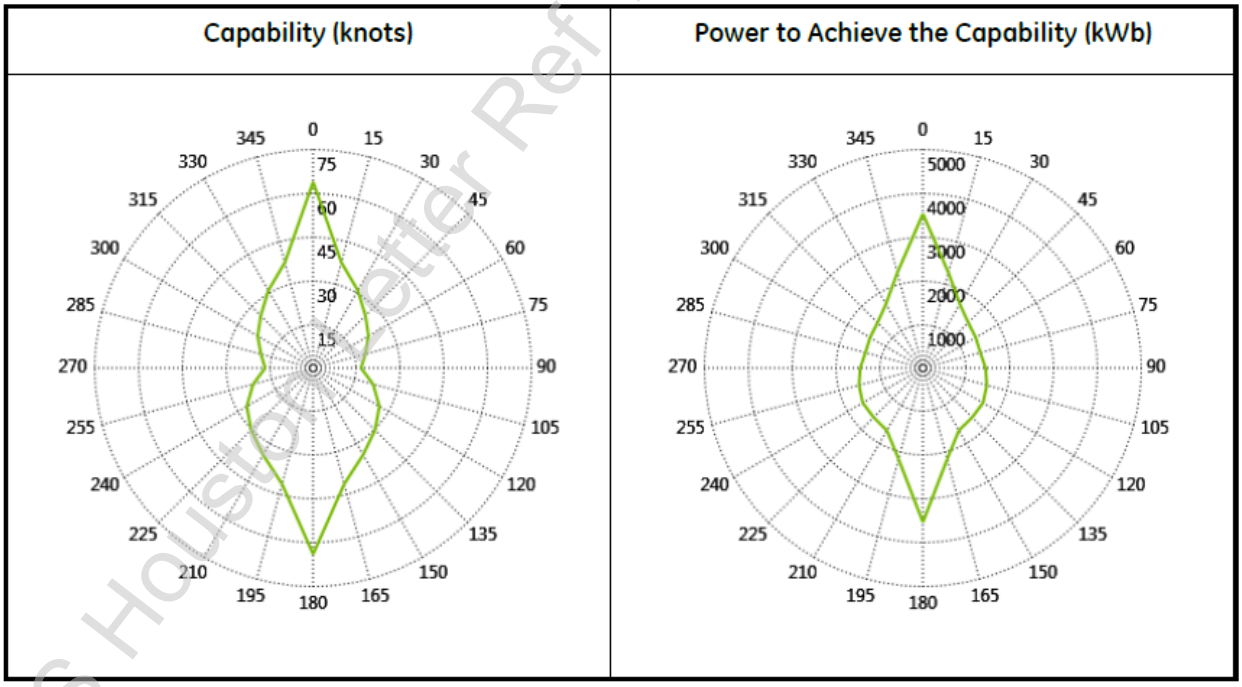
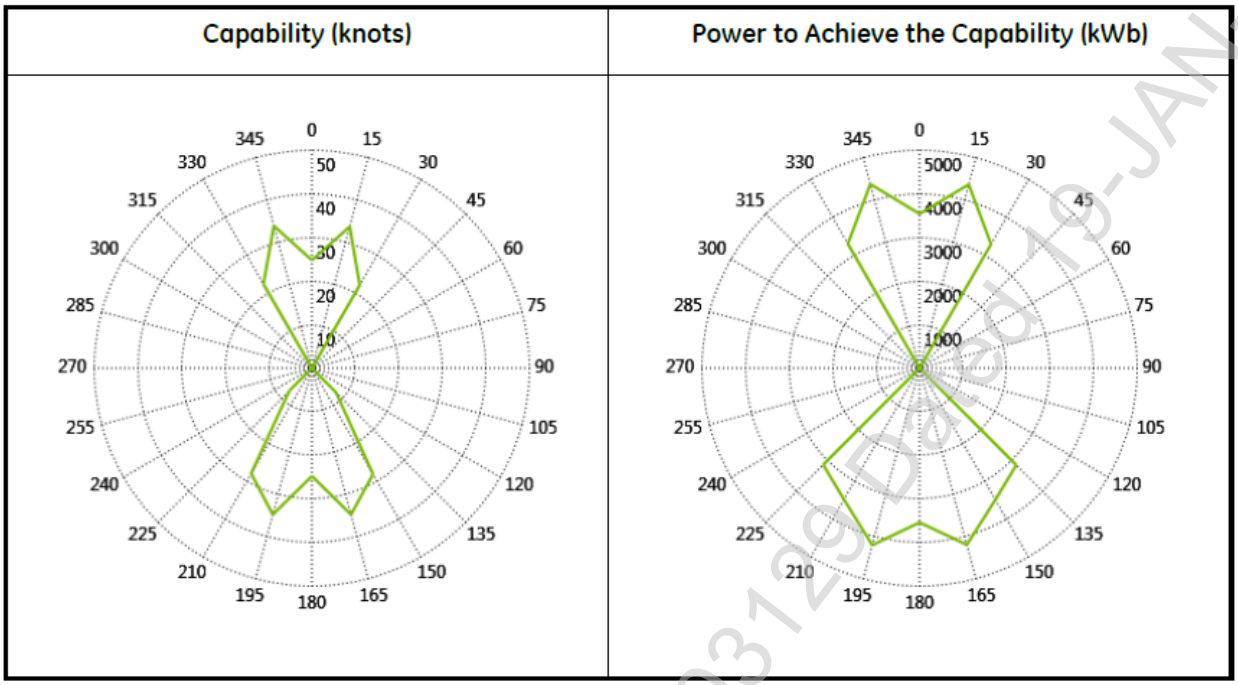


Figure 18-2: Worst-Case DP Capability Plot with Legs Extended



# 19 Jacking System Description & Operation

## 19.1 General

19.1.1 The vessel's jacking system is electro-hydraulic and located in two rooms P&S on the hold deck. The port leg's gears are fed from the Hydraulic Power Units (HPU) located in the port jacking system room. The starboard legs are fed from the Hydraulic Power Units (HPU) located in the starboard jacking system room. The jacking control station is located in the pilothouse.

19.1.2 Each leg tower includes seventeen (17) Hydraquip CSI S60 liftboat planetary gearboxes.

19.1.3 Each jacking power unit consists of two (2) 300 HP electric motors driving hydraulic pumps.

**Starboard FWD Leg Jacking System**

| | |
|---|---|
| STBD FWD Motor 1 Primary Circuit: | 601-6 |
| STBD FWD Motor 2 Primary Circuit: | 602-6 |

**Port FWD Leg Jacking System**

| | |
|---|---|
| PORT FWD Motor 1 Primary Circuit: | 601-4 |
| PORT FWD Motor 2 Primary Circuit: | 602-4 |

**Starboard Aft Leg Jacking System**

| | |
|---|---|
| STBD AFT Motor 1 Primary Circuit: | 601-5 |
| STBD AFT Motor 2 Primary Circuit: | 602-5 |

**Port Aft Leg Jacking System**

| | |
|---|---|
| PORT AFT Motor 1 Primary Circuit: | 601-3 |
| PORT AFT Motor 2 Primary Circuit: | 602-3 |

# 20 Helideck Operations

## 20.1 General

20.1.1 The vessel has a helideck cantilevered off the forecastle deck and transversely centered on the ship. This helideck can accommodate the helicopters listed in Table 20-1 as well as any helicopter with D-values and weights smaller than the maximums shown, subject to restrictions on maximum take-off weight depending on the mode of the vessel (elevated or afloat).

## 20.2 Maximum Take-Off Weight Restrictions

20.2.1 When elevated, the maximum take-off weight for a helicopter is: 12,600 kg

20.2.2 When afloat, the maximum take-off weight for a helicopter is: 11,000 kg

Table 20-1: Typical Helicopter Dimensions

| Type | D-value (metres) | Perimeter 'D' marking | Rotor diameter (metres) | Max weight (kg) | 't' value |
|---|---|---|---|---|---|
| Bolkow Bo 105D | 12.00 | 12 | 9.90 | 2400 | 2.4t |
| EC 135 | 12.10 | 12 | 10.20 | 2720 | 2.7t |
| Bolkow 117 | 13.00 | 13 | 11.00 | 3200 | 3.2t |
| Agusta A109 | 13.05 | 13 | 11.00 | 2600 | 2.6t |
| Dauphin SA 365N2 | 13.68 | 14 | 11.93 | 4250 | 4.3t |
| EC 155B1 | 14.30 | 14 | 12.60 | 4850 | 4.9t |
| Sikorsky S76 | 16.00 | 16 | 13.40 | 5307 | 5.3t |
| Agusta/Westland AW 139[1] | 16.66 | 17 | 13.80 | 6400 | 6.4t |
| Bell 412 | 17.13 | 17 | 14.02 | 5397 | 5.4t |
| Bell 212 | 17.46 | 17 | 14.63 | 5080 | 5.1t |
| Super Puma AS332L | 18.70 | 19 | 15.00 | 8599 | 8.6t |
| Bell 214ST | 18.95 | 19 | 15.85 | 7936 | 8.0t |
| Super Puma AS332L2 | 19.50 | 20 | 16.20 | 9300 | 9.3t |
| EC 225 | 19.50 | 20 | 16.20 | 11000 | 11.0t |
| Sikorsky S92[1] | 20.88 | 21 | 17.17 | 12020 | 12.0t |
| Sikorsky S61N | 22.20 | 22 | 18.90 | 9298 | 9.3t |

**Maximum D-Value: 22.2 meters [72 feet]**

**Maximum Take-off Weight (Elevated): 12,600 kg [27,778.2 lbs]**

**Maximum Take-off Weight (Afloat): 11,000 kg [24,250.8 lbs]**

## 20.3 Helideck Operations

20.3.1 Prior to any landing or take-off, the helideck perimeter lighting must be illuminated.

20.3.2 Additionally, while any helicopter operations are taking place the DIFF system pump must be activated to arm the deck integrated firefighting system required for helicopter operations.

20.3.3 The ship's rescue boat should be ready for immediate lowering.

20.3.4 There are no facilities onboard for helicopter refueling.

20.3.5 Helicopter arrival and departure procedures are to be consistent with the helicopter operator's preferences and practices. Refer to the ICS (International Chamber of Shipping) Guide to Helicopter/Ship Operations for recommendations on helicopter operating practices. The vessel's master shall be satisfied that the following conditions are satisfied prior to take-off or landing:

20.3.5.1 Radio contact with the helicopter must be made prior to landing or take-off. Refer to the ICS Guide or helicopter operator's practices in the event radio contact is lost.

20.3.5.2 An officer shall be on watch near the helideck DIFF system control panel during landings and takeoffs

20.3.6 If the helideck is used while the vessel is afloat, the following restrictions must be observed:

20.3.6.1 Vessel forward speed should be 2.5 knots or as requested by helicopter pilot

20.3.6.2 Wave heights shall not exceed 1.22m (4.0 feet) from any heading

20.3.6.3 Wind speed shall be appropriate for helicopter take-off or landing but must not exceed 70 knots under any circumstances

20.3.6.4 Pitch, Roll, and Heavy Limitations can vary according to helicopter type. The vessel's master should check specific helicopter limits with the helicopter operator. As guidance, pitch, roll, and heave rate should be limited as shown in Table 20-2, reproduced from the Helideck Certification Agency (HCA) Helideck Limitations List (HLL) Part C. Limitations are given for a Category 1 helideck. The inclination limits refer to any initial list or trim of the vessel.

Table 20-2: Pitch, Roll and Heave Limitations

| Aircraft Category | Helideck Category | | | | |
|---|---|---|---|---|---|
| | | 1 | | | |
| | | Pitch/Roll (degrees) | Inclination (degrees) | Heave Rate (m/s) | Heave Amplitude (m) |
| **A** | DAY | ±3 | 3.5 | 1.3 | 5 |
| | Night | ±2 | 2.5 | 1.0 | 4 |
| **B** | DAY | ±4 | 3.5 | 1.3 | 5 |
| | Night | ±3 | 2.5 | 1.0 | 4 |
| **Aircraft Categories** | | | | | |
| **A =** | S92, EC225, AS332 Series, AW189 | | | | |
| **B =** | AW139, S76 series, AS365 Series, B212, B412, EC135, EC145, EC155, EC175, AW169 | | | | |

# 21 Evacuating & Embarkation/Disembarkation Procedures

## 21.1 General

21.1.1 Primary and secondary escape routes leading to muster stations are indicated on the vessel Safety Plan (Appendix D).

21.1.2 When the vessel is afloat and experiences a situation in which the vessel needs to be evacuated or abandoned, the following procedures will apply:

- 21.1.2.1 The Master will sound the abandon ship alarm over the vessel's general alarm bell and will inform the crew of the situation over the vessel's public address (PA) system.
- 21.1.2.2 The master will instruct crew members and persons in addition to crew to report to their assigned muster stations.
- 21.1.2.3 Once all onboard personnel are accounted for, the Master will then give instructions to the vessel crew to board the lifeboats or launch the life rafts.
- 21.1.2.4 If lifeboats are used to abandon ship, the vessel's crew will assist in the boarding of the lifeboats.
- 21.1.2.5 Once all persons have boarded the lifeboats, instructions will be given to launch the lifeboats.
- 21.1.2.6 If instructions are given to launch the life rafts, the vessel's crew will launch the life rafts and assist in the boarding of the life rafts.

21.1.3 When the vessel is elevated and experiences a situation in which the vessel needs to be evacuated or abandoned, the following procedures will apply:

- 21.1.3.1 The Master will sound the abandon ship alarm over the vessel's general alarm bell and will inform the crew of the situation over the vessel's public address (PA) system.
- 21.1.3.2 The master will instruct crew members and persons in addition to crew to report to their assigned muster stations.
- 21.1.3.3 Once all onboard personnel are accounted for, the Master will then give instructions to evacuate to the offshore installation.
- 21.1.3.4 Once aboard the offshore installation, a head count will occur to account for all persons aboard.
- 21.1.3.5 In the event the vessel is in the elevated state and not adjacent to an offshore installation the procedure for evacuating/abandon ship while afloat will be utilized.

21.1.4 The following procedures must be followed when hoisting personnel:

- 21.1.4.1 All cranes used to transfer personnel will have an operable anti two block device installed.
- 21.1.4.2 All hooks used for support of personnel must have a closed safety latch.
- 21.1.4.3 The load must be under control in both up and down directions.
- 21.1.4.4 Those riding personnel baskets must wear Personal Floatation Devices.

21.1.4.5 When transferring personnel the operator should raise the personnel basket only high enough off the deck to clear all obstructions; swing the personnel basket over the water; raise or lower it in such a manner as to minimize swinging; position it slightly above the landing area; and gently lower it to the deck.

21.1.4.6 A loaded personnel carrier should only be raised or lowered over the water, minimizing the time suspended above a deck.

21.1.5 A listing of useful plans and schematics for emergency situations is as follows:

1. 0722-801-001 General Arrangement
2. 0722-831-001-Fire Control Plan
3. 0722-831-002-Fire Boundary Plan
4. 0722-832-001-Safety Plan
5. 0722-833-001-Damage Control Plan
6. 0722-521-001-Firemain System
7. 0722-529-001-Bilge System
8. 0722-092-001-Emergency Towing Procedure
9. H1028-438-001-60-Emergency Shutdowns

# 22 Alarms and Monitoring

## 22.1 Fire Alarm

22.1.1 The vessel is equipped with a fire alarm system utilizing addressable call points and an audible and visual alarm.

22.1.2 The fire alarm is a continuous siren with flashing strobe light with alarm stations distributed throughout the ship, including in each cabin.

## 22.2 General Alarm

22.2.1 The vessel is equipped with a general alarm system activated from the pilothouse, utilizing an audible alarm.

22.2.2 The general alarm plays an alarm tone through the same siren as the fire alarm, but in the pattern of 7 short tones followed by 1 long.

## 22.3 Abandon Ship Alarm

22.3.1 The abandon ship alarm plays an alarm tone through the same siren as the fire alarm, but in the pattern of 1 short tone followed by 1 long.

# 23 Exemption Requests

Several letters documenting interpretations in the 2009 IMO MODU were presented to the International Registries Technical Branch regarding the M300-4 Liftboat (Triyards SSY Hulls 1028/1029). These letters and responses are included in the following Appendices:

**Appendix K: Letter to the Marshall Islands 0722-MI-001 and Response**

This letter is submitted to introduce a newbuild vessel project and explore any existing precedent for interpretations of operational service limitations (that is, an interpretation of "normal operating conditions" for offshore service with regards to design wind speeds as) beyond those explicitly enumerated in the IMO MODU Code for a vessel built to the Code and flagged with the Republic of the Marshall Islands (RMI).

**Appendix L: Letter to the Marshall Islands 0722-MI-002 and Response**

The letter was submitted to request approval for limited dispensations from the access opening size requirements per the IMO MODU Code Section 2.2.4.

**Appendix M: Letter to the Marshall Islands 0722-MI-003 and Response**

The letter was submitted to request approval for further limited dispensations from the access opening size requirements per the IMO MODU Code Section 2.2.4.

**Appendix N: Letter to the Marshall Islands 0722-MI-004 and Response**

This letter is submitted to request approval for exemption from having a handrail support (bracket/stay) at every third stanchion on removable type handrails per the IMO Load Line Convention LL47.

**Appendix O: Letter to the Marshall Islands 0722-MI-006 and Response**

The letter was submitted to request approval for further limited dispensations from the access opening size requirements per the IMO MODU Code Section 2.2.4.

# 24 Lightship Monitoring Procedure and Record

## 24.1 General

24.1.1 A record of all changes to machinery, structure, outfitting and equipment that affect the lightship data should be maintained in the operating manual or in a lightship data alterations log and be taken into account in daily operations.

24.1.2 Lightship is the weight of the vessel complete in all respects, but does not include consumables, stores, cargo, crew and their effects. It does not include any liquids onboard expect machinery fluids, such as lubricants and hydraulics, at operating levels.

24.1.3 Changes in lightship must be tracked and the vessel re-inclined if the weight change exceeds 1% of the lightship at the time of incline. If a weight is added please enter the changes in the lightship log below. These values will then be entered as line items in the stability and elevated loading forms. If a weight is removed please use a negative number in the weight column. If the changes include many individual items, please use a copy of the blank form provided in Section 24.1.5 to consolidate the items.

24.1.4 Please inform Seacor Marine, Inc. of all changes to the lightship weight.

| Date | Item No. | Description | Weight (MT) | LCG (m aft F0) | TCG (m +Stbd) | VCG (m ABL) |
|---|---|---|---|---|---|---|
| | 1 | Helideck drain tank structure | 1.345 | -1.85 | -3.595 | 9.64 |
| | 2 | FW pump foundation | 0.018 | 27.205 | 12.19 | 1.555 |
| | 3 | Kingpost foundation ONLY | 1 | 55.2 | 19.8 | 15.35 |
| | 4 | RO unit sub pump foundation and pump locking | 0.932 | 18.16 | -18.615 | 7.65 |
| | 5 | Louver coaming modification | 0.143 | 20.39 | -16.48 | 6.13 |
| | 6 | Gearbox access ladder | 1.58 | 30.6 | 0 | 8.3 |
| | 7 | Helideck drain tank foundation | 0.764 | -1.85 | -3.595 | 7.65 |
| | 8 | Signal mast modification | 0.085 | 19.23 | 0 | 27.78 |
| | 9 | Superstructure reinforcement | 0.219 | 28.8 | 0 | 5.3 |
| | 10 | Access ladder for accomm. vent flaps | 1.816 | 17.26 | 0.2 | 15.2 |
| | 11 | TV antenna foundation | 0.023 | 21 | -4.2 | 25.21 |
| | 12 | AUX seawater system | 0.784 | 19.17 | -12.35 | 3.1 |
| | 13 | FW transfer pump | 0.068 | 26.9 | 14.58 | 2.9 |
| | 14 | Helideck drain piping | 1.41 | -8.9 | -3.8 | 14.16 |
| | 15 | FW pump line | 0.02 | 29.451 | 10.72 | 2.9 |
| | 16 | RO unit sub pump line | 0.03 | 18.54 | -14.4 | 2.69 |
| | 17 | FW pump | 0.094 | 27.205 | 12.19 | 1.947 |
| | 18 | RO unit sub pump | 1.627 | 17.84 | -19.09 | 8.64 |
| | 19 | 2 Gearboxes FWD (P&S) | 2 | 13.5 | 0 | ~~11~~ 8.15 |
| | 20 | 2 Gearboxes AFT (P&S) | 2 | 49 | 0 | ~~11~~ 8.15 |

Table 24-1: Light ship data alterations log*

24.1.5 Light Ship Alterations Survey Form:

24.1.6 The following form is useful for consolidating several lightship changes that occurred at the same time into one log entry in the operations manual. The item number listed on this form should match the item number it is used to consolidate in the light ship log. This form should be kept with the operations manual for record keeping. If an item is removed from the vessel that is considered lightship weight, use a negative weight in column one.

| | |
|---|---|
| **Item Number:** | |
| **Date:** | |
| **Prepared By:** | |

***Items 1 to 18 in Table 24-1 have been included in the vessel's lightship characteristics. Items 19 and 20 in Table 24-1 are to be considered lightship adjustments in the Vessel Loading Form.**

| Column Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| **Description** | **Weight (MT)** | **LCG (m aft FP)** | **LMom (MT-m)** | **TCG (m from CL, +STBD)** | **TMom (MT-m)** | **VCG (m ABL)** | **VMom (MT-m)** |
| | | | | | | | |

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| **Total (sum)** | | | | | | | |

| Lightship Adjustment | Value | Units |
|---|---|---|
| Weight = Total Col 1. | | MT |
| LCG = (Total Col 3. / Total Col 1.) | | m aft FP |
| TCG = (Total Col 5. / Total Col 1.) | | m from CL, + STBD |
| VCG = (Total Col 7. / Total Col 1.) | | m ABL |

Enter the results in the above cells into the Lightship data log in the operations manual.

**Table 24-2: Light Ship Alterations Survey Form**

# 25 Additional Entry Requirements for Tanks with Special Access Openings

## 25.1 General

25.1.1 Vessel crew and other personnel should observe confined space entry practices when entering any tank, void, or similar compartment onboard the vessel.

25.1.2 Several compartments with special access openings are present throughout the vessel. The access openings into these compartments satisfy IMO MODU code requirements, but due to the nature of compartment structure, some interior openings are smaller. The Republic of the Marshall Islands has authorized exemption of these smaller openings from the MODU Code requirements. However, special care should be taken to minimize the risks to persons required to enter these tanks.

The compartments with special access openings include (indicated in Figure 25-1 and 25-2).

- Double Bottom Tanks below engine room and public spaces
- Voids in way of leg tower foundations
- Structure in way of 200t (1000B) crane foundation

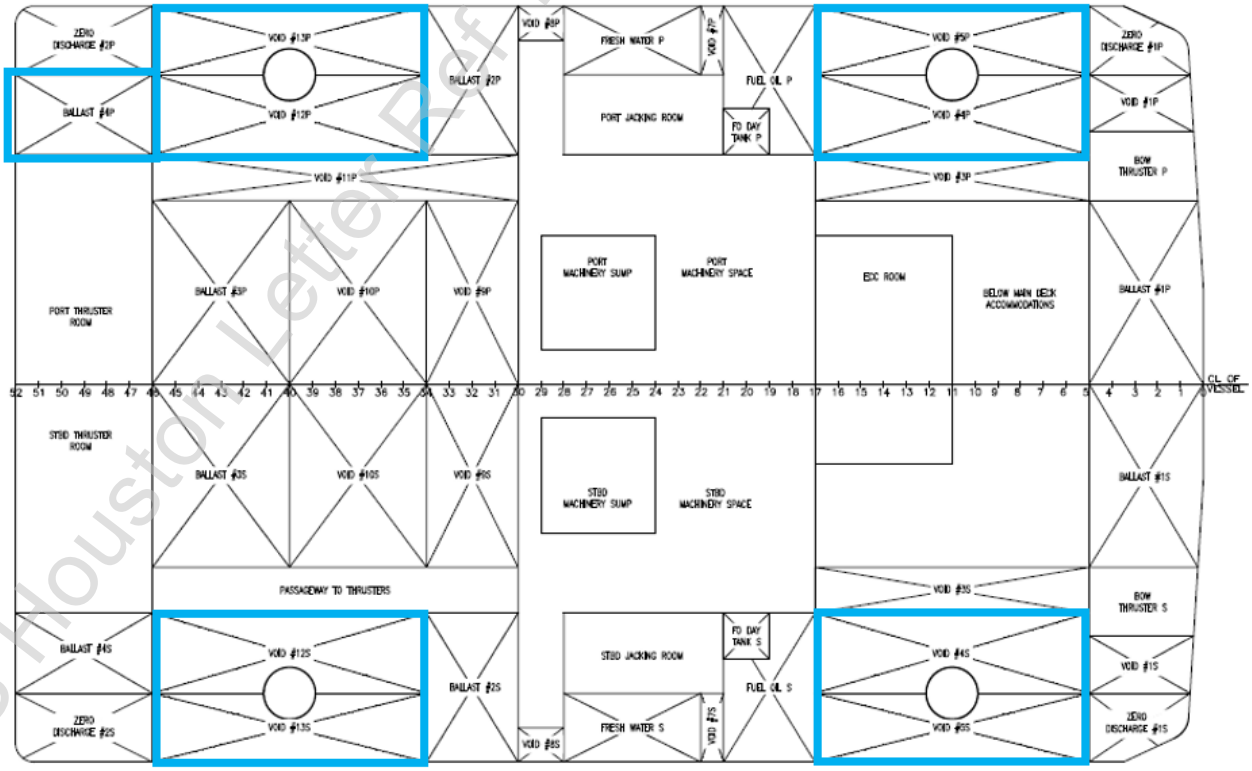


Figure 25-1: Hold Plan

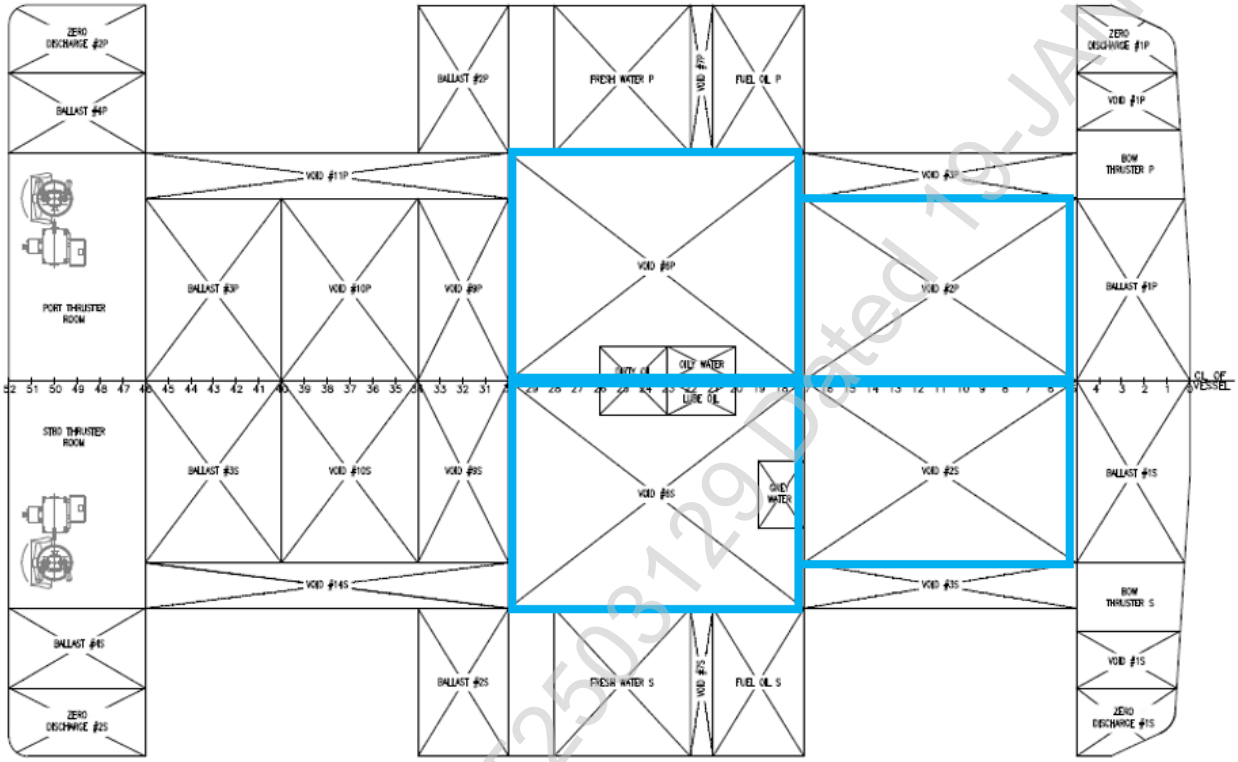


Figure 25-2: Double Bottom Plan

25.1.3 Access in these areas is only permitted for authorized entrants with an attendant present. Tanks and voids should not be entered without the Master's approval.

25.1.4 Prior to entry to any tank, both manholes are to be fully opened (small double bottom tanks have only one manhole). Forced ventilation by means of blower or other powered equipment is to be used to bring fresh air into the space.

25.1.5 A chemist or other qualified person should ensure that the tank is gas-free and has as safe atmosphere prior to entry.

25.1.6 An authorized entrant is required to:

1. Know space hazards, including information on the means of exposure such as inhalation or dermal absorption, signs of symptoms and consequences of the exposure
2. Use appropriate personal protective equipment properly
3. Maintain communication with attendants as necessary to enable them to monitor the entrant's status and alert the entrant to evacuate when necessary;

4. Alert the attendant when a prohibited condition exists or when warning signs or symptoms of exposure exist.

25.1.7 An attendant is required to:

1. Remain outside the permit space during entry operations unless relieved by another authorized attendant
2. Maintain communication with and keep an accurate account of those workers entering the permit space
3. Summon rescue and other services during an emergency

# Index