COMDTPUB P16700.4
NVIC 11-91
16 Jul 1991

NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 11-91

Subj: Ocean Tow of Jackup Drilling Units

1. PURPOSE. The purpose of this Circular is to call attention to and endorse the International Association of Drilling Contractors (IADC) booklet entitled "General Ocean Tow Recommendations for Jackup Drilling Units" dated February 13, 1991.

2. BACKGROUND. The recent loss of a number of jackup drilling units while under tow in severe storms emphasized to the Coast Guard and industry the need to develop a set of guidelines on the ocean tow of jackup drilling units. The Coast Guard suggested to industry under the auspices of the National Offshore Safety Advisory Committee (NOSAC) that a working group be formed to study the problem and develop a set of guidelines. This working group consisted of personnel from the drilling industry, classification societies and insurance underwriters marine surveyors. The guideline booklet was completed and accepted by NOSAC at its February 21, 1991 meeting, with the request that it be issued by the Coast Guard as a Navigation and Vessel Inspection Circular.

3. DISCUSSION. The Coast Guard endorses the guidelines set out in enclosure (1). Use of these guidelines by drilling contractors, classification society surveyors and insurance underwriters marine surveyors will reduce the risk of the loss of jackup drilling units during severe storms while under ocean tow.

4 IMPLEMENTATION.

a. Officers in Charge, Marine Inspection are urged to bring enclosure (1) to the attention of appropriate individuals in the offshore industry in their zones.

b. Owners, classification societies and marine under writers should implement the recommendations of enclosure (1) in order to reduce the risk of the loss of jackup units.

A. E. HENN
Rear Admiral, U.S. Coast Guard
Chief, Office of Marine Safety,
Security and Environmental Protection

End: (1) General Ocean Tow Recommendations for Jackup Drilling Units (IADC) dated February 13, 1991

GENERAL OCEAN TOW RECOMMENDATIONS FOR JACKUP DRILLING UNITS

International Association of Drilling Contractors (I.A.D.C.)

February 13, 1991

Manning

1. Manning should comply with U.S. Coast Guard regulations or other national regulatory rules. The number of crew will be dependent on the length of the voyage and be limited to essential personnel only and should not exceed 50 % of lifeboat capacity.

Ocean Tow Loading Plan

2. A Loading Plan should be formulated and, if required, submitted to the Underwriter's Marine Survey company utilized by the Contractor for the tow in time for proper review. (See Addendum A enclosed for a sample loading plan)

3. Cargo is defined as any material, temporary structure, shipping container, consumable item, machinery, tubular, equipment and items not included in the drill barge lightship weight.

4. Stowage of on the main weather deck of a Jackup drilling unit while on an ocean tow is not desirable and should be avoided with the exceptions noted below.

5. Exceptions to this policy my be permitted if:

   a. A permanent structure has been erected for the stowing and securing of an item such as a pipe rack for drill pipe and drill collars, or a mandrel and locking beams for a BOP. The permanent structures should be adequate for their intended purpose, reviewed, and approved by a classification society in accordance with the appropriate rules.

   b. Cargo is elevated or located above the main deck by mans of a suitable support structure.

   c. Temporary structures are permitted when designed by a registered professional engineer and approved by the underwriter's marine surveyor.

Towage

6. One set of up-to-date navigation charts and pilot books for the tow course and alternate courses should be available for the voyage aboard the rig including detailed charts of ports of refuge.

7. Tow routing should be determined in advance including ports of refuge and the required entry data.

8. A weather service should be selected with a beck ground in ocean tow forecasting. Weather updates should be sent every 12 hours with at least 72 hour advance forecasts. Direct communication with a marine weather forecaster is recommended.

9. The Towing vessel(s), and towing gear, should be designed and equipped for towing in ocean service with full crew aboard. Towing gear should be inspected and approved by the attending marine and the O.I.M. prior to departure.

10. The bollard pull of the towing vessel(s) should be of sufficient size for the intended tow.

11. Communication means between the rig and the towing vessel(s) is of utmost importance. Backup communications should be provided. The vessel should provide a qualified riding crew member to assist the rig crew during tow. Language should not be a barrier.

12. Critical motion curves should be provided to the rig crew and th e towing vessel(s) prior to departure. (see addendum B) Manufacture recommendations for proper leg length and shimming should be adhered to for the tow.

13. An emergency towing line should be strapped along the side of the hull just below top deck level in a manner permitting quick release. me tow line should be of a size suitable for the tow intended accounting for the bollard pull of the tow vessel(s), including shock loads.

14. A polypropylene shock line, the size and length suitable for the bollard pull of the tow vessel(s) being used, should be attached to the emergency tow line with suitable connectors.

15. A main tow line bridle recovery line(s) should be fitted and run from the and of the bridle or tow plate to a winch on the barge to allow retrieval in the main tow wire(s) part.

Stability

16. stability calculations addressing the tow conditions should be performed to insure positive stability in compliance with the rig operating manual. These calculations should be submitted to and approved by the underwriter's Marine Survey company being utilized in time for proper review. (see Addendum A)

Draft and Trim

17. Within the limits of the loadline certificate, the man draft for the tow should be determined from the stability calculations in item 16 above.

18. Weight should be distributed to produce a level condition transversely with a slight trim by the stern. Trim is to be obtained by locating material or equipment carried with necessary liquid trimming ballast kept to a minimum.

19. Liquid variable load should be kept to a minimum. Hull tanks that contain liquids should be pressed and maintained full during the voyage.

20. All tanks, including active mud tanks, not required on the voyage, should be empty at the time of departure.

Watertight Integrity

21. The operating manual for the rig should clearly show the location of watertight closures and should be complied with during the tow.

22. Deck openings such as sounding tubes should be protected from damage

23. Consideration should be given to the modification all weather deck preload hatch covers, vent fan covers, cargo hatch cover, etc. with clamp bars or welded strapping to prevent opening from sea action.

24. Rig service take on lines Such as out, barite, fuel, potable water, or drill water located on the outer lull areas should be capped and protected from sea damage by sea action.

25. All weather/watertight closures, ventilation ducts, etc. with the exception of intakes necessary for the operation of the vessel, should be seed from sea action.

Pumping Arrangements

26. The vessel's bilge/ballast service pumps should be tested and determined to be in good working order prior to departure. Pumps are to be maintained in a state of readiness throughout the tow.

Compartment Sounding

27. All hull compartments and void spaces should be fitted with sounding tubes. All sounding tubes should be clearly identified and fitted with caps that are capable of being tightly secured.

28. Soundings should be taken at least every 12 hours of all void and preload tanks. Hull compartments should be inspected or sounded also and the results should be logged for the duration of the

29. A diagram of the sounding tube locations should be posted in the machinery deck spaces and in the control room.

30. A means of determining the changes in liquid levels in the perimeter hull tanks must be available for use from a protected location.

31. The manufacturer's data should be furnished to indicate that the derrick can withstand the roll motions anticipated for the tow. This data should be in the rig operating manual.

32. All Derrick traveling equipment should be seared for the tow.

33. Bow anchors should be removed from below water racks and strapped to the deck or stored if there is the possibility of becoming entangled in the tow gear.

34. Secure or remove anchor buoys from their racks to prevent dislodging by sea action.

Cranes

35. Crane should be lowered into steel support structures and secured against vertical or lateral movement.

36. Cranes should be secured against revolving per manufactures recommendations.

Navigation Lights, Signals and Safety Equipment

37. Side Lights and stern light should be checked to make sure they are in good working order.

38. Life vests, throw over life rings and other means of rescue should be checked and readied for deployment, if need.

39. Signaling devices should be stored in the control room, inspected and determined that they are within inspection dates for use, if needed.

Potable Water and Fuel Oil

40. Sufficient potable water and fuel for the length of the tow, plus 25% safety factor, should be carried.

41. A potable pump should be available to obtain water from the potable water tanks in the event of pump failure.

42. Because sediment in the fuel tanks can be stirred up during tow, a centrifuge should be installed prior to departure to remove contaminants from the fuel pumped to the engine day tanks. Extra engine fuel filters should be in supply.

Damage Control

43. The following emergency and/or damage control equipment and material is recommended to carried aboard for the tow, or it's equivalent.

400 lbs. cement
400 lbs. sad
20 lbs. concrete mix accelerator
40 ft. of 1" x 12" timber
24 lbs. of oakum or similar caulking compound
24 wooden wedges
24 wooden plugs of various sizes
Welding and cutting apparatus
50 ft. of 4" x 4" angle iron
100 sq. ft. of 1/2" steel plate.
100 sq. ft. of 1" steel plate
500 ft. 1" polypropylene rope
500 ft. 1" wire rope
20 Ton Portapower hydraulic jack
100 ft. 2" x 4" x 10’ timber
Two portable diaphragm air pumps

44. Spare shackle, heaving lines, turnbuckles, etc. should be aboard for the tow.

45. Fog horn, ship whistle or bell, search light, etc. should be in operating condition.

46. Secure all equipment in the accommodations area for heavy seas.

47. Strip water from the preload tanks, unused drill water tanks and void tanks prior to and during the tow.

48. Lifeboat machinery and equipment should be checked for compliance with existing regulations and be in proper operating condition. Lifeboat fuel tanks should be checked for contaminants and feel cleaned or replaced as necessary Spare fuel filters should be stowed aboard the lifeboat for use, if required.

49. The emergency power source should be available for use at all times and teed at periodic intervals

Riding Crew Instructions

50. Sea watches should be maintained at all times during the tow. The following information should be entered into the log:
    a. Weather data including; wind force, wave/swell height/Period.

b. Motion characteristics of the vessel are of the utmost importance. The Drill Barge Master (licensed or unlicensed) must observe degrees of pitch and roll and their corresponding periods and request the tug to change course and/or speed to prevent the Drill Barge motions from exceeding the values given in the Operations Manual critical motion curves.

c. All important communication with the towing vessel(s) including speed, course, change in tow wire length, etc. should be recorded.

d. me Position should be obtained from the towing vessel(s) every 6 hours and recorded in the rig log.

51. Each hull tank should be sounded and logged every 12 hours.

52. All watertight doors between compartment and from the compartments to outside exits should be kept closed at all times except when personnel pass.

53. Tow gear should be inspected every 6 hours and the results logged.

54. At least two (2) members of the crew should be awake at all times.

55. Radio contact mist be maintained on a 24 hour basis with the tow vessel(s).

56. Emergency drills should be held prior to departure and once a week during the tow. Results should be logged.

57. All navigation lights should be checked every 6 hours and the results logged.

58. Daily reports are should be forwarded to the Contractor’s headquarters at least daily.

OCEAN TOW LOADING PLAN
ADDENDUM A

FEBRUARY 13, 1991

ADDENDUM A

TO: General Marine Surveyor Company

FROM: United Marine Drilling Contractors

SUBJ: Ocean Tow Stowage Plan

Please review the enclosed Ocean Tow Loading Plan for our 116 class hull. The loading plan is comprised of the following:

1. A completed loading calculation for the start of the tow based on the latest information from our rig survey. The stability calculations are based on two leg down positions (12.17 ft. for 70 knots and 45.90 ft. for severe storm).

2. All loose gear will be stowed below deck in stowage areas 11 through 13 and secured to prevent shifting during the tow. (see enclosed drawings)

3. The drilling tubulars will be secured with turnbuckles and chain and containment barriers will be fabricated at the ends of the racks, subject to your final approval. Four areas are anticipated at this time. (see enclosed drawings)

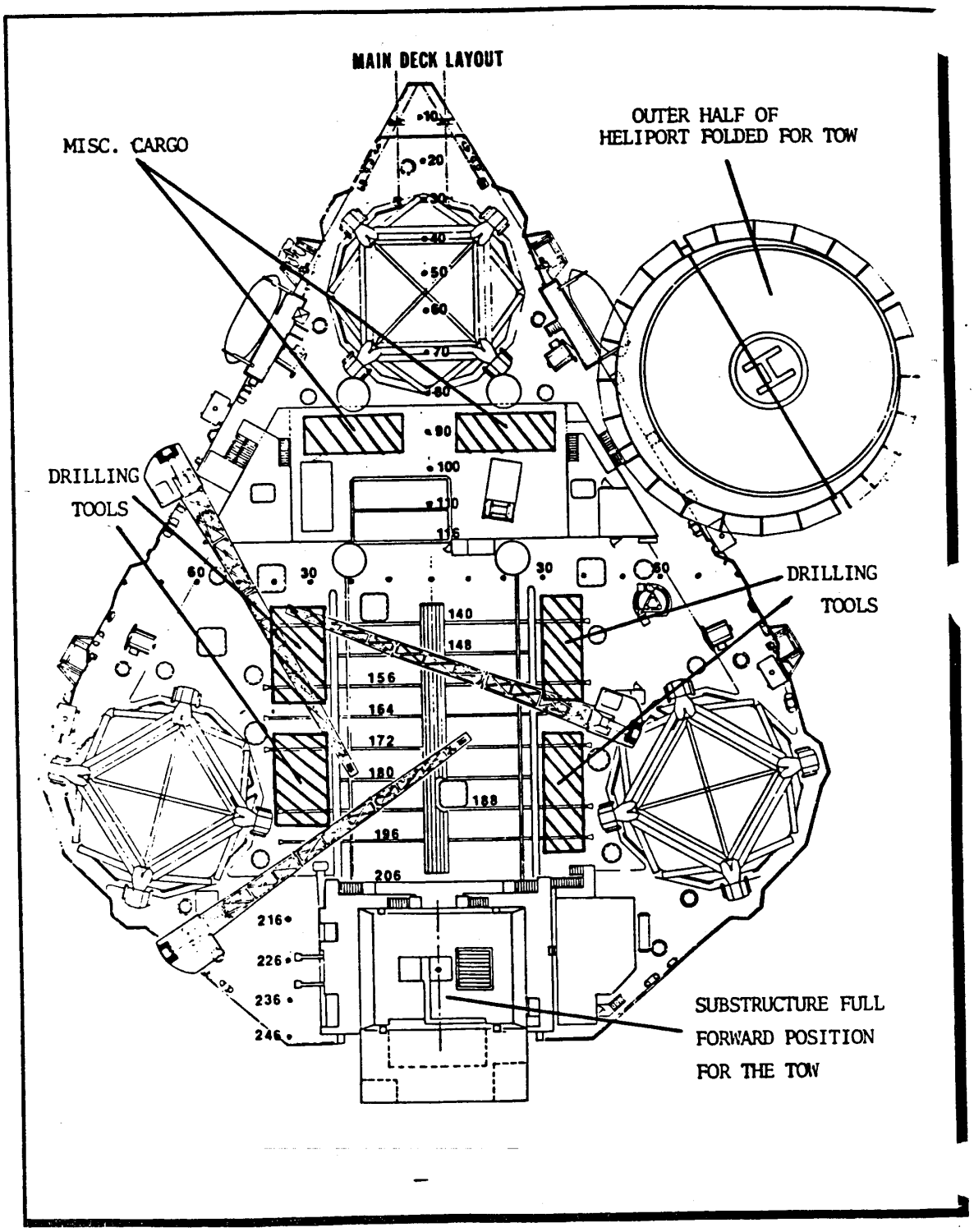
4. Two miscellaneous cargo areas will be constructed on top of the quarters in containment areas in order to remove these items from possible sea action. (see enclosed drawings)

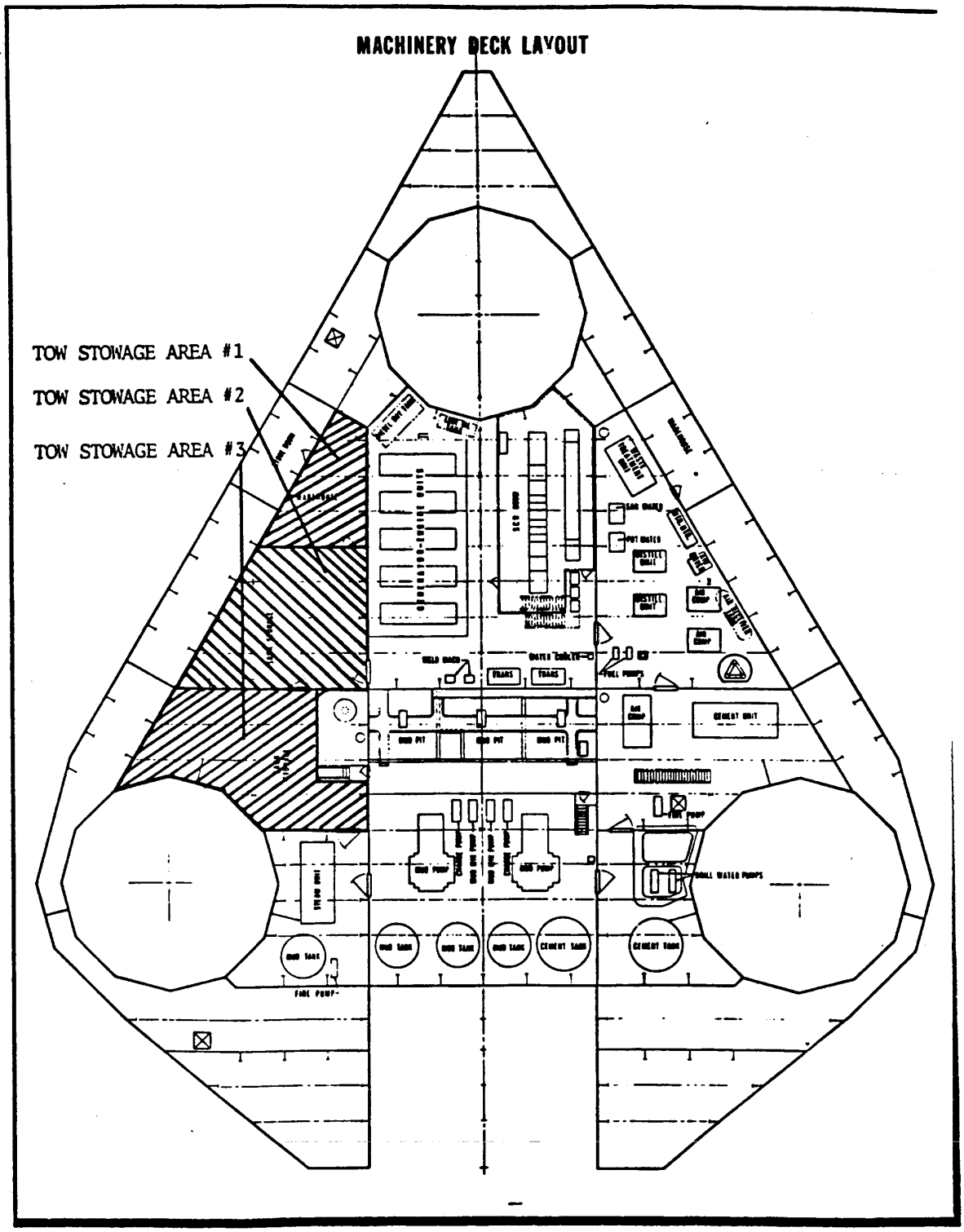
5. The Substructure/drill floor assembly will be in the full forward position for the tow and secured to the hull with the clamping arrangement provided by the manufacturer.

6. The emergency tow gear will be strapped along the port side of the hull and provisions made for the deployment in severe weather if the need should arise.

7. The deepwell tower will be secured to the hull with clamping arrangements designed by the manufacturer. Three 3/4 inch guy wires will be connected to the tower in three different directions securing the tower from the rig motions anticipated.

Please review the Loading Plan provided at this time. As you kn ow, final loading will depend on your survey prior to the departure of the rig.


MAIN DECK LAYOUT
MISC. CARGO
OUTER HALF OF
HELIPORT FOLDED FOR TOW
DRILLING
TOOLS
DRILLING
TOOLS
SUBSTRUCTURE FULL
FORWARD POSITION
FOR THE TOW


MACHINERY DECK LAYOUT
TOW STOWAGE AREA #1
TOW STOWAGE AREA #2
TOW STOWAGE AREA #3

CALCULATIONS FOR: OCEAN TOW

DATE: NOV 1,1990
SHEET NO. 1 OF 4

ITEM NO.	DESCRIPTION PORT	HT's INS.	WEIGHT (IN KIPS)	LEVER LCG	FROM BOW (FT. KIPS)	LEVER TCG	STBD-PORT (FT. KIPS)	LEVER VCG	FROM KEEL (FT. KIPS)	TFSC	LFSC
8	POTABLE WATER TANK #1	72	308.390	100.17	30,891.423	13.00	4,009.070	3.00	925.170	0.0000	0.0000
9	DRILL WATER TANK #3	0	0.000	100.94	0.000	36.71	0.000	0.00	0.000	0.0000	0.0000
10	DRILL WATER TANK #5	72	231.290	128.17	29,644.438	13.00	3,006.770	3.00	693.870	0.0000	0.0000
11	DRILL WATER TANK #7	20	87.028	129.30	11,252.689	45.27	3,939.747	0.83	72.523	0.3275	0.1354
12	DRILL WATER TANK #15	20	71.161	193.29	13,754.729	13.00	925.094	0.83	59.301	0.1264	0.1398
13	DRILL WATER TANK #21	0	0.000	0.00	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000
14	D/WATER,D/FUEL,BRINE #9	0	0.000	168.08	0.000	13.00	0.000	0.00	0.000	0.0000	0.0000
15	DIESEL FUEL TANK #11	72	266.240	156.13	41,568.042	38.97	10,375.371	3.00	798.720	0.0000	0.0000
16	DIESEL FUEL TANK #13	72	174.200	152.59	26,581.173	63.53	11,066.924	3.00	522.600	0.0000	0.0000
17	DIESEL FUEL TANK #17	72	271.170	190.47	51,649.750	38.53	10,448.180	3.00	813.510	0.0000	0.0000
18	DIRTY OIL TANK #35	0	0.000	121.17	0.000	28.00	0.000	0.00	0.000	0.0000	0.0000
19	PORT MUD PIT 0	0	0.000	148.17	0.000	17.87	0.000	6.00	0.000	0.0000	0.0000
20	CENTER MUD PIT 0	0	0.000	147.54	0.000	0.87	0.000	6.00	0.000	0.0000	0.0000
21	SLUGGING PIT 0	0	0.000	153.18	0.000	6.93	0.000	6.00	0.000	0.0000	0.0000
22	BULK TANK #1 (1040 CU.FT.)		0.000	199.58	0.000	41.21	0.000	0.00	0.000		
23	BULK TANK #2 (1040 CU.FT.)		0.000	197.83	0.000	20.00	0.000	0.00	0.000		
24	BULK TANK #3 (1040 CU.FT.)		0.000	197.83	0.000	6.00	0.000	0.00	0.000		
25	CREW & EFFECTS		20.000	100.00	2,000.000	0.00	0.000	35.00	700.000		
26	ELECTRICAN SHOP		5.000	85.35	426.750	45.15	225.750	8.00	40.000		
27	WAREHOUSE (STOWAGE #1)		40.000	94.44	3,777.600	34.82	1,392.800	8.00	320.000		
28	SACK ROOM (STOWAGE #2)		150.000	125.60	18,840.000	43.89	6,583.500	8.00	1,200.000		
29	HOPPER ROOM (STOWAGE #3)		260.000	154.67	40,214.200	48.89	12,711.400	8.00	2,080.000		
30	ENGINE ROOM		0.000	0.00	0.000	0.00	0.000	0.00	0.000		
31	DRILL PIPE RACK #1		118.500	153.30	18,166.050	34.90	4,135.650	29.50	3,495.750		
32	DRILL PIPE RACK #2		58.000	185.30	10,747.400	34.90	2,024.200	28.00	1,624.000		
33	HYDRILL		25.200	209.00	5,266.800	48.00	1,209.600	28.00	705.600		
34	CASING		0.000	0.00	0.000	0.00	0.000	0.00	0.000		
35	MISC. (QUARTERS TOP)		15.000	90.00	1,350.000	20.00	300.000	54.00	810.000		
36			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
37	PORT LEG AREA		46.000	200.00	9,200.000	41.00	1,886.000	40.00	1,840.000		
38	DRUMS ON BOW GEAR UNIT, UPPER		5.000	74.00	370.000	0.00	0.000	28.00	140.000		
39	28 JTS 8" D.C.		124.300	150.17	18,666.131	40.00	4,972.000	28.00	3,480.400		
40			0.000	0.00	0.000	40.00	0.000	0.00	0.000		
41			0.000	0.00	0.000	37.00	0.000	0.00	0.000		
42			0.000	0.00	0.000	29.00	0.000	0.00	0.000		
43			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
44			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
45			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
46			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
47			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
48			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
49			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
50			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
51			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
52	SUB TOTAL-PORT		2,276.479	146.88	334,367.176	-34.80	(79,212.055)	8.93	20,321.444	0.4539	0.2752

CALCULATIONS FOR: OCEAN TOW

DATE: NOV 1,1990
SHEET NO. 2 OF 4

ITEM NO.	DESCRIPTION STBD	HT's (IN)	WEIGHT (IN KIPS)	LEVER LCG	FROM BOW (FT. KIPS)	LEVER TCG	STBD-PORT (FT. KIPS)	LEVER VCG	FROM KEEL (FT. KIPS)	TFSC	LFSC
61	POTABLE WATER TANK #2	50	214.160	100.17	21,452.377	13.00	2,784.076	2.08	446.166	0.1522	0.2327
62	DRILL WATER TANK #4	50	182.667	100.94	18,438.372	36.71	6,705.693	2.08	380.556	0.1130	0.2697
63	DRILL WATER TANK #6	0	0.000	128.17	0.000	13.00	0.000	0.00	0.000	0.0000	0.0000
64	DRILL WATER TANK #8	0	0.000	128.63	0.000	43.71	0.000	0.00	0.000	0.0000	0.0000
65	DRILL WATER TANK #16	50	177.903	193.29	34,386.823	13.00	2,312.736	2.08	370.631	0.1264	0.1398
66	D/WATER,D/FUEL,BRINE #10	0	0.000	168.08	0.000	13.00	0.000	0.00	0.000	0.0000	0.0000
67	DIESEL FUEL TANK #12	72	252.050	156.45	39,433.217	39.33	9,913.125	3.00	756.150	0.0000	0.0000
68	DIESEL FUEL TANK #14	72	174.200	152.59	26,581.173	63.53	11,066.924	3.00	522.600	0.0000	0.0000
69	DIESEL FUEL TANK #20	0	0.000	197.81	0.000	38.33	0.000	0.00	0.000	0.0000	0.0000
70	STARBOARD MUD PIT 0	0	0.000	148.17	0.000	17.87	0.000	0.00	0.000	0.0000	0.0000
71	MUD PIT SAND TRAP	0	0.000	148.17	0.000	23.25	0.000	0.00	0.000		
72	BULK TANK #4 (1040 CU.FT.)		0.000	197.83	0.000	6.00	0.000	6.50	0.000		
73	BULK TANK #5 (1323 CU.FT.)		0.000	197.83	0.000	18.50	0.000	6.50	0.000		
74	BULK TANK #6 (1323 CU.FT.)		0.000	197.83	0.000	38.96	0.000	6.50	0.000		
75	AIR COMPRESSOR ROOM		3.000	118.00	354.000	38.00	114.000	9.00	27.000		
76	MECHANIC SHOP		5.000	85.35	426.750	45.15	225.750	12.00	60.000		
77	POLLUTION CONTROL TANK		0.000	210.00	0.000	62.00	0.000	0.00	0.000		
78	CEMENT UNIT ROOM		3.000	153.00	459.000	58.00	174.000	8.00	24.000		
79	PUMP ROOM		3.000	182.00	546.000	0.00	0.000	8.00	24.000		
80	DRILL PIPE RACK #1		118.500	142.90	16,933.650	34.70	4,111.950	28.00	3,318.000		
81	DRILL PIPE RACK #2		258.000	184.90	47,704.200	34.70	8,952.600	29.50	7,611.000		
82	PAINT LOCKER & CONTENTS		6.000	62.00	372.000	29.00	174.000	29.00	174.000		
83	MUD LOG HOUSE		0.000	220.00	0.000	38.00	0.000	48.00	0.000		
84	ELECTRIC WIRE LINE UNIT		0.000	105.00	0.000	20.00	0.000	0.00	0.000		
85	SAND TRAPS		0.000	229.00	0.000	38.00	0.000	0.00	0.000		
86	CASING		0.000	0.00	0.000	0.00	0.000	0.00	0.000		
87	HELI. FUEL		15.580	90.00	1,402.200	10.85	169.043	56.00	872.480		
88	OXY/ACET. RACKS		7.000	144.00	1,008.000	40.00	280.000	28.00	196.000		
89	MISC. (QUARTERS-TOP)		12.000	90.00	1,080.000	20.00	240.000	54.00	648.000		
90			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
91			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
92			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
93			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
94			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
95			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
96			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
97			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
98			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
99			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
100			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
101			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
102			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
103			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
104	SUB-TOTAL--STARBOARD		1,432.059	147.05	210,577.762	32.98	47,223.897	10.78	15,430.582	0.3916	0.6422
105	TOTAL PORT & STBD.		3,708.538	146.94	544,944.938	-8.63	(31,988.158)	9.64	35,752.026	0.8455	0.9174

DATE: NOV 1,1990

CALCULATIONS FOR: OCEAN TOW SHEET NO. 3 OF 4

ITEM NO.	DESCRIPTION LOADING SUMMARY	HT's INS.	WEIGHT (IN KIPS)	LEVER LCG	FROM BOW (FT. KIPS)	LEVER TCG	STBD-PORT (FT. KIPS)	LEVER VCG	FROM KEEL (FT. KIPS)	TFSC	LFSC
114	ENTER POSTION OF ROTORY FROM BOW)			149.58	(FULL FORWARD POSITION		149.58 FT.)				
115	SUBBASE LOADING										
116	B.O.P. STACK		55.000	149.58	8,226.900	-15.00	(825.000)	32.00	1,760.000		
117			0.000	0.00	0.000	20.00	0.000	0.00	0.000		
118	PARTS FOR DIVERTER SYS		12.000	168.07	2,016.840	7.32	87.840	32.00	384.000		
119	CHANGES TO SUBBASE ASSY.		0.000	0.00	0.000	0.00	0.000	0.00	0.000		
120	SUBBASE ASSY.		144.640	153.07	22,140.045	-1.83	(264.691)	32.38	4,683.443		
121	TOTAL SUBBASE ASSY.		211.640	153.01	32,383.785	-4.73	(1,001.851)	32.26	6,827.443		
123	ENTER POSITION OF ROTARY FROM C/L)			0.00	(- PORT + STBD)						
124	RIG FLOOR LOADING										
125	HOOK,ROTARY & SETBACK		0.000	149.58	0.000	0.00	0.000	0.00	0.000		
126	CONDUCTOR TENSION		0.000	149.58	0.000	0.00	0.000	0.00	0.000		
127	MISC BEHIND RIG FLOOR		15.000	153.07	2,296.050	0.00	0.000	48.00	720.000		
128			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
129			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
130	CHANGES TO SUB./STR, D.F.		77.800	154.14	11,992.092	0.68	52.904	121.36	9,441.808		
131	SUB./STR. &-DRILL FLOOR		786.570	153.07	120,400.270	-1.83	(1,439.423)	61.46	48,342.592		
132	TOTAL RIG FLOOR LOADING		879.370	153.16	134,688.412	-1.58	(1,386.519)	66.53	58,504.400		
134	TOTAL SUBSTRUCTURE ASSY.		1,091.010	153.14	167,072.197	-2.19	(2,388.370)	59.88	65,331.843		
136	HULL,BASIC & FIXED LOADS		9,314.900	137.53	1,281,078.197	3.80	35,396.620	23.80	221,694.620		
137	CHANGES TO HULL,BASIC,FIXED		100.760	136.05	13,708.700	9.95	1,002.670	28.79	2,900.650		
138	TOTAL HULL,BASIC & FIXED		9,415.660	137.51	1,294,786.897	3.87	36,399.290	23.85	224,595.270		
140	TOTAL OF ITEMS No.										
141	105,134,138,184		14,215.208	141.17	2,006,804.032	0.14	2,022.761	22.91	325,679.139	0.8455	0.9174
143	LEGS, T.O.C. DOWN 12.17'		5,729.270	141.30	809,545.851	0.36	2,062.537	134.24	769,097.205		
144	FIELD TRANSIT (W/ TRIM/HEEL)		19,944.478	141.21	2,816,349.883	0.10	4,085.299	54.89	1,094,776.344	0.8455	0.9174
145											
146	TRANSFER TO TRIM										
147	TANK #4 TO #15		30.000	92.35	2,770.500	-49.71	(1,491.300)	-4.16	(124.800)		
148	TANK #4 TO #16		16.000	92.35	1,477.600	-23.71	(379.360)	-3.75	(60.000)		
149			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
150			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
151			0.000	0.00	0.000	0.00	0.000	0.00	0.000		
152	FIELD TRANSIT (LEVEL)		19,944.478	141.42	2,820,597.983	0.11	2,214.639	54.88	1,094,591.544	0.8455	0.9174
153											
154	LOWER LEGS (T.O.C. 45.90')							-33.73	(193,248.277)		
155	TRANSIT - SEVERE STORM		19,944.478	141.42	2,820,597.983	0.11	2,214.639	45.19	901,343.267	0.8455	0.9174
156											
157											
158											

CALCULATIONS FOR: OCEAN TOW — DATE: NOV 1,1990 — SHEET NO. 4 OF 4

ITEM NO.	DESCRIPTON PRELOAD	HT's In's	WEIGHT (IN KIPS)	LEVER LCG	FROM BOW (FT. KIPS)	LEVER TCG	STBD-PORT (FT. KIPS)	LEVER VCG	FROM KEEL (FT. KIPS)	TFSC	LFSC
169	PRELOAD TK #21 (312")	0	0.000	VAR.	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000
170	PRELOAD TK #22 (312")	0	0.000	63.27	0.000	28.70	0.000	0.00	0.000	0.0000	0.0000
171	PRELOAD TK #23 (312")	0	0.000	63.33	0.000	-28.58	0.000	0.00	0.000	0.0000	0.0000
172	PRELOAD TK #24 (312")	0	0.000	117.08	0.000	63.47	0.000	0.00	0.000	0.0000	0.0000
173	PRELOAD TK #25 (312")	0	0.000	117.08	0.000	-63.47	0.000	0.00	0.000	0.0000	0.0000
174	PRELOAD TK #26 (312")	0	0.000	158.05	0.000	86.24	0.000	0.00	0.000	0.0000	0.0000
175	PRELOAD TK #27 (312")	0	0.000	158.05	0.000	-86.24	0.000	0.00	0.000	0.0000	0.0000
176	PRELOAD TK #28 (312")	0	0.000	VAR.	0.000	VAR.	0.000	0.00	0.000	0.0000	0.0000
177	PRELOAD TK #29 (312")	0	0.000	VAR.	0.000	VAR.	0.000	0.00	0.000	0.0000	0.0000
178	PRELOAD TK #30 (230")	0	0.000	VAR.	0.000	VAR.	0.000	0.00	0.000	0.0000	0.0000
179	PRELOAD TK #31 (230")	0	0.000	VAR.	0.000	VAR.	0.000	0.00	0.000	0.0000	0.0000
180	ALL MUD PITS (120")	0	0.000	144.92	0.000	0.61	0.000	6.00	0.000	0.0000	0.0000
181											
182											
183											
184	TOTAL PRELOAD		0.000	0.00	0.000	0.00	0.000	0.00	0.000	0.0000	0.0000
185	TOTAL LOADING (ITEM 152)		19,944.478	141.42	2,820,597.983	0.11	2,214.639	54.88	1,094,591.544	0.8455	0.9174
187	REACTION AFT LEGS	TOTAL LOADING (IN KIPS) X (RIG L.C.G.(-) 55.00'/ 129.00'							13,361.64	AFT	REACTION
188	REACTION BOW LEG	TOTAL LOADING (-) REACTION ON AFT LEGS							6,582.84	BOW	REACTION
189	REACTION STBD LEG	REACTION ON AFT LEGS X (71.00' (+) RIG T.C.G.) / 142.00'							6,691.27	STBD	REACTION
190	REACTION PORT LEG	REACTION OF AFT (-) PORT OR STBD LEG REACTION							6,670.37	PORT	REACTION

192	TOTAL CALCULATED LOAD	19,944.478		VARIABLE LOAD-STORM	4,053.890	KIPS	ANGLE OBSERVED	
193	LESS HOOK,ROTORY & SETBACK	0.000	(-)	VARIABLE LOAD-MOVE	(3,969.098)	KIPS	TRIM	0.10 DEGREES
194	LESS CONDUCTOR TENSION	0.000		MAKE UP PRELOAD	84.792	KIPS	HEEL	0.00 DEGREES
195								
196	LESS TOTAL LIGHTSHIP	(15,975.380)		MINIMUM PRELOAD	8,650.000	KIPS		
197	TOTAL VARIABLE	3,969.098	(+)	MAKE UP PRELOAD	84.792	KIPS	OBSERVED DRAFT	14.35 FEET
198	MAX. VARIABLE LOAD (STORM)	4,053.890		MIN. REQUIRED PRELOAD	8,734.792	KIPS	CALCULATED DRAFT	14.35 FEET
199	MAX. VARIABLE LOAD (DRILLING)	5,553.890						
200	MAX. VARIABLE LOAD (MOVE)	4,009.490						
201								
202	POTABLE WATER TOTAL BBL'S=	1,491.46		LARGEST REACTION CALCULATED	6,691	KIPS		
203	" " " GALLONS=	62,641.52		MAX. ALLOWABLE LEG REACTION	9,475	KIPS		
204	" " " TONS =	233.28						
205	" " " LITERS=	237,098.14						
206	DRILL WATER TOTAL BBL'S=	2,140.76		WIND DIRECTION				
207	" " " GALLONS=	89,912		MAX. WATER DEPTH		FEET		
208	" " " TONS =	550.45		MAX. WINDS SPEED		KNOTS		
209	" " " LITERS=	340,317		MAX. SEA & SWELL		FEET		
210	DIESEL FUEL TOTAL BBL'S=	3,752.84						
211	" " " GALLONS=	157,619						
212	" " " TONS =	507.97						
213	" " " LITERS=	596,589						

ITEM NO. RIG: TRANSIT CONDITION = FIELD TRANSIT
WIND VELOCITY = 70 Kts. CALCULATED BY:
T.O.C. DOWN 12.17 FT.

DATE: NOV 1,1990

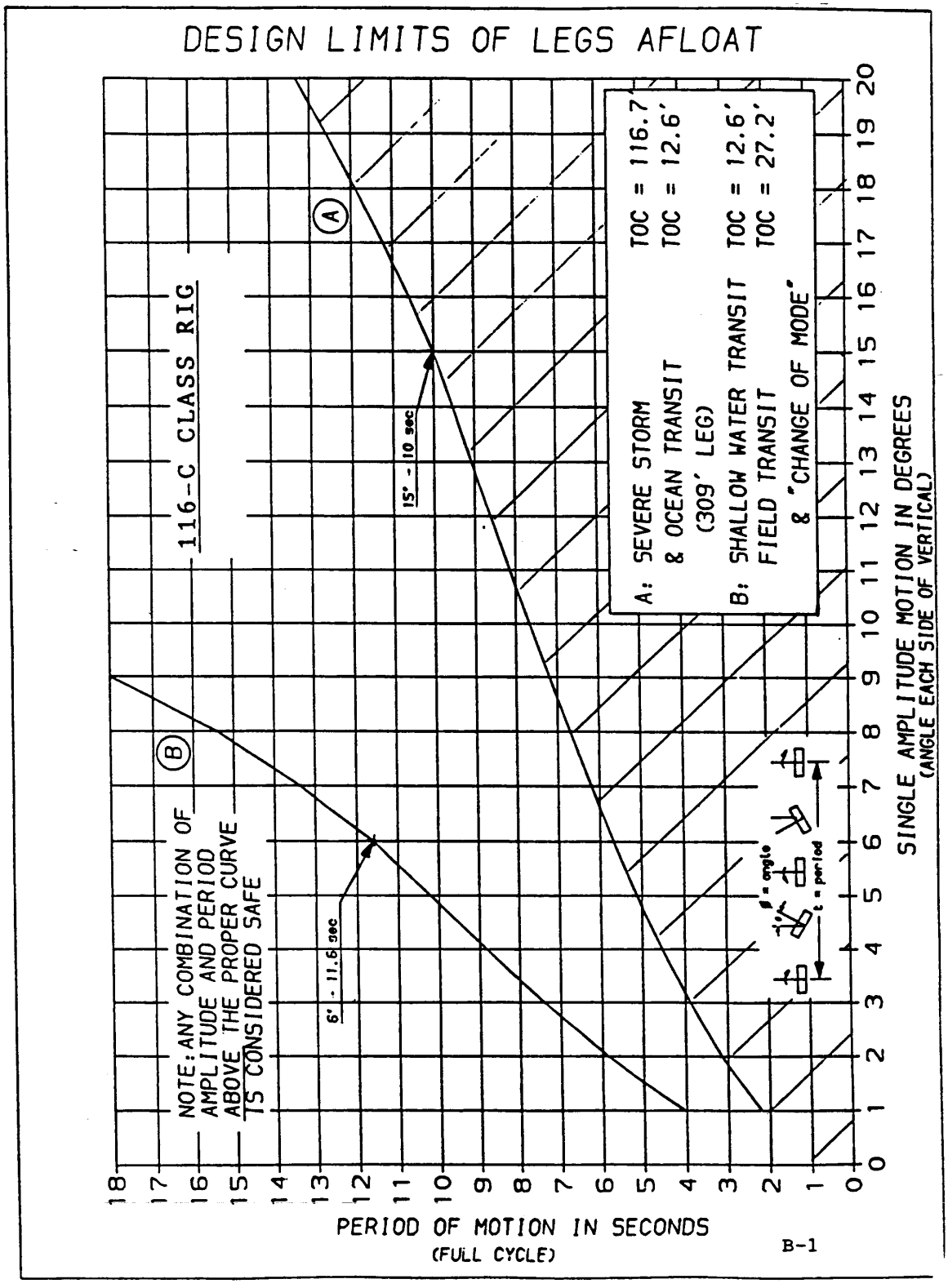
SHEET: 1 OF 2

	No.	ITEM	SOURCE	TOTAL	UNITS
327		PARTICULARS			
328	A	DISPLACEMENT	FROM LOAD FORM ITEM 152	19,944.48	KIPS
329	B	DRAFT	FROM HYDROSTATICS	14.35	FEET
330	C	KG, UNCORRECTED	FROM LOAD FORM ITEM 152	54.88	FEET
331	D	CALCULATED FSC DISPLACEMENT	CHAPTER 4 SECTION 3	19,040.00	KIPS
332	E	LFSC SUM	FROM LOAD FORM ITEM 152	0.9174	FEET
333	F	CORRECTED LFSC	[F]=([E]X[D])/[A]	0.8758	FEET
334	G	TFSC SUM	FROM LOAD FORM ITEM 152	0.8455	FEET
335	H	CORRECTED TFSC	[H]=([G]X[D])/[A]	0.8072	FEET
336	I	LARGEST FSC, CORRECTED	MAXIMUM [F] OR [H]	0.8758	FEET
338		STABILITY CALCULATION			
339	J	CORRECTED KG	[J]=[C]+[I]	55.76	FEET
340	K	ALLOWABLE KG	ALLOWABLE KG CURVES	80.27	FEET
342		TRIM AND HEEL CALCULATIONS			
343	L	HULL LENGTH	FROM CHAPTER 1, SECTION 4	247.58	FEET
344	M	HULL WIDTH	FROM CHAPTER 1, SECTION 4	200.50	FEET
345	N	KML @ [B]	FROM HYDROSTATICS	209.09	FEET
346	P	CORRECTED KGL	[P]=[C]+[F]	55.76	FEET
347	Q	GML	[Q]=[N]-[P]	153.34	FEET
348	R	MT1' @ [B]	[R]=([Q]X[A])/HULL LENGTH	12,352.35	FT. KIPS
349	S	LCB @ [B]	FROM HYDROSTATICS	141.10	FEET
350	T	LCG	FROM LOAD FORM ITEM 152	141.42	FEET
351	U	TRIMMING LEVER (LCG-LCB)	[U]=[T]-[S]	0.32	FEET
352	V	TRIM (FT.)	[V]=[A]X[U]/[R]	0.52	FEET
353	W	TRIM (DEG)	[W]=([U]X57.3)/[Q]	0.12	DEGREES
354	X	KMT @ [B]	FROM HYDROSTATICS	140.23	FEET
355	Y	CORRECTED KGT	[Y]=[C]+[H]	55.69	FEET
356	Z	GMT	[Z]=[X]-[Y]	84.54	FT. KIPS
357	AA	MH1' @ [B]	[AA]=([Z]X[A])/HULL WIDTH	8,409.99	FT. KIPS
358	BB	TCG	FROM LOAD FORM ITEM 152	0.11	FEET
359	CC	HEEL (FEET)	[CC]=([.074-[BB])*[A]/[AA]	0.09	FEET
360	DD	HEEL (DEG)	[DD]=([BB]/[Z]*57.3)	0.06	DEGREES
361	EE	DRAFT BOW PORT HULL-LCG	DRAFT MARK PORT HULL	1.00	FEET
362	FF	DRAFT BOW PORT HULL-TCG	DRAFT MARK PORT HULL	(5.00)	FEET
363	GG	DRAFT KEY SLOT-LCG	DRAFT MARK KEY SLOT	208.00	FEET
364	HH	DRAFT KEY SLOT-TCG	DRAFT MARK KEY SLOT	26.00	FEET
365	JJ	DRAFT PORT HULL-LCG	DRAFT MARK PORT HULL	196.00	FEET
366	KK	DRAFT PORT HULL-TCG	DRAFT MARK PORT HULL	(98.00)	FEET
367	LL	DRAFT STBD. HULL-LCG	DRAFT MARK STBD HULL	196.00	FEET
368	MM	DRAFT STBD HULL-TCG	DRAFT MARK STBD HULL	98.00	FEET
369	NN	LCF @[A]	FROM HYDROSTATICS	144.22	FEET
370	PP	DRAFT BOW PORT HULL	DRAFT=[B]-[V]X([NN]-[EE])/[L]+[CC]([FF]/[M]	14.05	FEET
371	QQ	DRAFT KEY SLOT	DRAFT=[B]-[V]X([NN]-[GG])/[L]-[CC]([HH]/[M]	14.47	FEET
372	RR	DRAFT PORT HULL	DRAFT=[B]+[V]X([JJ]-[NN])/[L]+[CC]([KK]/[M]	14.41	FEET
373	SS	DRAFT STBD HULL	DRAFT=[B]+[V]X([LL]-[NN])/[L]+[CC]([MM]/[M]	14.50	FEET

ITEM NO.	RIG: TRANSIT CONDITION = WIND VELOCITY = 100 Kts. T.O.C. DOWN 45.90 FT.	LONG MOVES CALCULATED BY:	DATE: NOV 1,1990 SHEET: 2 OF 2	
No.	ITEM	SOURCE	TOTAL	UNITS
395	PARTICULARS			
396	A DISPLACEMENT	FROM LOAD FORM ITEM 155	19,944.48	KIPS
397	B DRAFT	FROM HYDROSTATICS	14.35	FEET
398	C KG, UNCORRECTED	FROM LOAD FORM ITEM 155	45.19	FEET
399	D CALCULATED FSC DISPLACEMENT	CHAPTER 4 SECTION 3	19,040.00	KIPS
400	E LFSC SUM	FROM LOAD FORM ITEM 155	0.9174	FEET
401	F CORRECTED LFSC	[F]=([E]X[D])/[A]	0.8758	FEET
402	G TFSC SUM	FROM LOAD FORM ITEM 155	0.8455	FEET
403	H CORRECTED TFSC	[H]=([G]X[D])/[A]	0.8072	FEET
404	I LARGEST FSC, CORRECTED	MAXIMUM [F] OR [H]	0.8758	FEET
406	STABILITY CALCULATION			
407	J CORRECTED KG	[J]=[C]+[I]	46.07	FEET
408	K ALLOWABLE KG	ALLOWABLE KG CURVES	58.61	FEET
410	TRIM AND HEEL CALCULATIONS			
411	L HULL LENGTH	FROM CHAPTER 1, SECTION 4	243.08	FEET
412	M HULL WIDTH	FROM CHAPTER 1, SECTION 4	200.50	FEET
413	N KML @ [B]	FROM HYDROSTATICS	209.09	FEET
414	P CORRECTED KGL	[P]=[C]+[F]	46.07	FEET
415	Q GML	[Q]=[N]-[P]	163.02	FEET
416	R MT1' @ [B]	[R]=([Q]X[A])/HULL LENGTH	13,376.02	FT. KIPS
417	S LCB @ [B]	FROM HYDROSTATICS	141.10	FEET
418	T LCG	FROM LOAD FORM ITEM 155	141.42	FEET
419	U TRIMMING LEVER (LCG-LCB)	[U]=[T]-[S]	0.32	FEET
420	V TRIM (FT.)	[V]=[A]X[U]/[R]	0.48	FEET
421	W TRIM (DEG)	[W]=([U]X57.3)/[Q]	0.11	DEGREES
422	X KMT @ [B]	FROM HYDROSTATICS	140.23	FEET
423	Y CORRECTED KGT	[Y]=[C]+[H]	46.00	FEET
424	Z GMT	[Z]=[X]-[Y]	94.23	FT. KIPS
425	AA MH1' @ [B]	[AA]=([Z]X[A])/HULL WIDTH	9,373.82	FT. KIPS
426	BB TCG	FROM LOAD FORM ITEM 155	0.11	FEET
427	CC HEEL (FEET)	[CC]=([.074-[BB])*[A]/[AA]	0.08	FEET
428	DD HEEL (DEG)	[DD]=([BB]/[Z]*57.3)	0.05	DEGREES
429	EE DRAFT BOW PORT HULL-LCG	DRAFT MARK PORT HULL	1.00	FEET
430	FF DRAFT BOW PORT HULL-TCG	DRAFT MARK PORT HULL	(5.00)	FEET
431	GG DRAFT KEY SLOT-LCG	DRAFT MARK KEY SLOT	208.00	FEET
432	HH DRAFT KEY SLOT-TCG	DRAFT MARK KEY SLOT	26.00	FEET
433	JJ DRAFT PORT HULL-LCG	DRAFT MARK PORT HULL	196.00	FEET
434	KK DRAFT PORT HULL-TCG	DRAFT MARK PORT HULL	(98.00)	FEET
435	LL DRAFT STBD. HULL-LCG	DRAFT MARK STBD HULL	196.00	FEET
436	MM DRAFT STBD HULL-TCG	DRAFT MARK STBD HULL	98.00	FEET
437	NN LCF @[A]	FROM HYDROSTATICS	144.22	FEET
438	PP DRAFT BOW PORT HULL	DRAFT=[B]-[V]X([NN]-[EE])/[L]+[CC]([FF]/[M]	14.06	FEET
439	QQ DRAFT KEY SLOT	DRAFT=[B]-[V]X([NN]-[GG])/[L]-[CC]([HH]/[M]	14.46	FEET
440	RR DRAFT PORT HULL	DRAFT=[B]+[V]X([JJ]-[NN])/[L]+[CC]([KK]/[M]	14.41	FEET
441	SS DRAFT STBD HULL	DRAFT=[B]+[V]X([LL]-[NN])/[L]+[CC]([MM]/[M]	14.49	FEET

ADDENDUM B

FEBRUARY 13, 1991


DESIGN LIMITS OF LEGS AFLOAT
116-C CLASS RIG
A: SEVERE STORM & OCEAN TRANSIT (309' LEG) TOC = 116.7' TOC = 12.6'
B: SHALLOW WATER TRANSIT FIELD TRANSIT & "CHANGE OF MODE" TOC = 12.6' TOC = 27.2'
15' - 10 sec
6' - 11.6 sec
NOTE: ANY COMBINATION OF AMPLITUDE AND PERIOD ABOVE THE PROPER CURVE IS CONSIDERED SAFE
PERIOD OF MOTION IN SECONDS (FULL CYCLE)
SINGLE AMPLITUDE MOTION IN DEGREES (ANGLE EACH SIDE OF VERTICAL)
B-1