From: Sneddon, Iain (Aberdeen)
Sent: Monday, May 24, 2010 9:54 PM
To: Redd, Eddy (Houston); Olsen, Asbjorn (Stavanger)
Cc: MacKay, John (Aberdeen); Blue, Mike (Houston); kiddg1@bp.com; Turlak, Rob (Houston)
Subject: FW: Revised LMRP Removal Procedure DWH

Attachments: image003.gif; image002.gif; image001.wmz; image002.gif; image003.gif; MC252-1_Sec-01_LMRP Removal Procedures rev c.ZIP

Gents,
For your information.
Regards,
Iain Sneddon

Team Leader (Technology Development – CAPM Project)

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From: MacKay, John (Aberdeen)
Sent: 24 May 2010 16:45
To: 'Heironimus, Mark B (LEWCO INTEGRATED TECH SYSTEMS)'; Fleece, Trent J
Cc: Sneddon, Iain (Aberdeen)
Subject: FW: Revised LMRP Removal Procedure DWH

Mark,

DWH LMRP Removal document checked and changes noted.

1.2 Section 26

There is reference made to mud mats and location of same on the seabed / parking area for the DWH LMRP.

The 'introduction' to the document mentions a basket will be on the seabed for landing the DWH LMRP.

1.3 Section 9

PDC crane to apply a load of 138 metric tones – would like to add a note for the drillers in the team – this includes a 50K lbs overpull in preparation for unlatching DEWH LMRP.

Other than that it looks OK.

Regards,

John Mackay

Senior Operations Advisor

(Technology Development - CAPM)

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DOCUMENT(S) PREPARED IN ANTICIPATION OF LITIGATION

MACONDO

Lower Marine Riser (LMRP) Removal Procedures - Deepwater Horizon (DWH)

~~Capping Procedures~~

for

MC-252 #1

Section 1

~~LMRP Recovery Procedures~~

~~C~~D	[AD]	Draft	Mark Heironimus
REV	DATE	DOCUMENT STATUS	PREPARED BY
PRINT DATE	[AD]	FILE NAME	[AF]

AMENDMENT RECORD

Rev	Date	Author	Description	Sec	Page
A	5/18/10	MH	Original For Comment		
B	5/23/10	TF	Update with HAZID feedback		
C	5/23/10	JSW	Update Final Team Review		

TABLE OF CONTENTS

ATTACHMENTS

Attachment 1: LMRP Drawings
Attachment 2: LMRP Sling Arrangement
Attachment 3: LMRP Pulling Contingencies

GLOSSARY

~~Glossary~~

Discoverer Enterprise - DEN
Deepwater Horizon - DWH
Development Driller II and III - DDII and DDIII
Boa Deep C - BDC
Viking Poseidon - VP
Q-4000 - Q4

~~3~~1 LMRP R~~ecovery~~emoval ~~Deepwater Horizon (DWH)~~

~~3.1.~~1.1. Introduction/~~Objective~~

The following procedure was prepared to respond to the Deepwater Horizon incident. The procedure below details the steps to remove the Lower Marine Riser Package (LMRP) from the top of the Deepwater Horizon (DWH) Blow Out Preventer (-BOP) using the Boa Deep C, Viking Poseidon and the Q 4000 vessels. After removal of the LMRP, the Development Driller II (DDII)~~II~~ ~~Semi~~semi-submersible will move in and install a BOP onto the remaining Horizon BOP stack.

The Q4 vessel will be standing by off location attached to the Yellow Pod on the DWH BOP. The role of the Q4 is to unlock the DWH LMRP connector and cut the Yellow Pod mux cable and hydraulic control line after the LMRP connector is unlocked. The Q4 will then move to a safe area.

The Viking Poseidon will be used for various ROV function including Blue Pod stinger retract and installing the subsea accumulator hot line if required.

The Boa Deep Sea will be used to lift the LMRP from the DWH BOP and then park the LMRP in a basket on the sea floor away from the DWH BOP.

~~3.2.~~1.2. Pre-Deployment Activities

1. All vessels involved in this operation have been working at or near the well and Dynamic Positioning (-DP) systems have been reviewed and deemed acceptable by the Gulf of Mexico (GoM) Marine Authority as suitable for the planned operations. . No additional DP system reviews- are required for this operation.
2. Ensure the Enterprise (DEN) and other vessels not directly involved are in safe areas outside of the 500 meter zone. As required, the- VoC Dispersant Vessels may be actively engaged in controlling surface oil. Enterprise standing by to recover oil with a top hat.
3. Ensure Simultaneous Operations (SIMOPS) plan is reviewed with each vessel and the SIMOPS control systems are followed. Ensure that all -vessels can communicate with each other. Test communications systems and have a redundant ~~back-~~back-up communications system available. Ensure both the DDII and DDIII are also in communication with the Q4, VP, and BDC vessels.
4. Control of the SIMOPS vessel movements is the responsibility of -the SIMOPS Field Coordinator on the DDIII drilling platform.
5. The sequence of execution of the following plan will be commanded by the BP Houston SIMOPS HIVE.
6. The VP will pre-install the LMRP slings on the DWH LMRP. This is addressed under separate procedure~~. (Attached)~~

~~6.~~7. Ensure BDC crane loading for this critical lift is approved per Aker Solutions ~~/~~ Boa Offshore Critical Lift Procedures and BP's Lifting Authority (Allen Ginnard).~~-~~

~~7.~~8. Ensure DWH BOP status document was reviewed and is understood (will be issued when operations are turned over to the LMRP pulling team).

~~8.~~9. Check that mini-beacon is installed on the BDC main crane ~~-~~hook to allow a straight pull over the lift.

~~9.~~10. BDC Remotely Operated Vehicles ~~(~~ROV No. 1 and ROV No. 2~~s)~~ will be equipped with 17 D hot stabs for secondary release of the DWH LMRP. Both ROVs will be manned to support 24~~-~~hour operations and both ROVs will be deployed to support lifting operations.~~-~~

~~10.~~10. Ensure ~~one of the~~ ROV~~s~~ No. 1 ~~has a chop saw~~ grinder ~~or~~and ROV 2 has a sling cutter available to cut the link to the DWH LMRP if an emergency disconnect of the rigging is required prior to pulling the LMRP.

11. ~~Note: BDC to determine if a chop saw or wire cutter is quicker to cut the crane wire sling attached to the Horizon LMRP.~~

~~11.~~12. BDC ROVs to have 17 D hot stabs to operate functions on the BOP as a contingency.

~~12.~~13. Two Diamond Wire Saws will be located on the VP which will be used to cut Drill Pipe/Casing stub proud of the DWH stack when the DWH LMRP is pulled (if required).

~~13.~~14. Ensure Deepwater Horizon upper and lower a~~n~~nnular BOPs are in the open position (pressure released from previous operation to close annular BOPs).

~~14.~~15. Confirm DDII rig has their BOP stack deployed and ready to move on to land their BOP after the DWH LMRP is removed.

~~15.~~16. Conduct Crew Engagement sessions on the Q4~~DWH~~, VP, DDII and BDC before starting operations.

17. Ensure BP Subsea Accumulator Bank is on the seafloor with a 100-ft~~'~~ pig tail as a contingency DWH LMRP release system. Pig tail should be equipped with 17 D hot stab connection. The Accumulator should be fully charged and spaced near the DWH BOP to allow the DWH LMRP to be lifted ~~100' 100~~50-ft up and not part the hot line.

~~17.~~18. ~~Review and understand~~ VP ROV No.1 and ROV No. 2 to review and locate ROV panel functions for the DWH BOP/LMRP. DWH LMRP release primary control will be the Yellow Pod operated by the ~~Q4~~Q4 vessel. The secondary DWH LMRP release will be the BP Subsea Accumulator Bank with 100'-ft pig tail which will be connected to the DWH LMRP hot stab via the ~~BDC~~VP ROV No. 1. The VP ROV No.2 will be used to function Blue Pod disconnect sequences.

~~18.~~19. BDC to ~~R~~review and understand stack up dimensional drawing's/weights of the DWH LMRP (Attachment 1~~ed~~).

~~19. Position mud mat to the West of the well head, in safe area for LMRP storage and advise BOA Deep C of the location of the LMRP storage area.~~

20. Verify operation, and communication of yellow POD from the ~~Q4000~~Q4 work rig.

a. Verify established communications with Yellow POD through PETU and WinTsim from laptop on board the ~~Q4000~~Q4.

b. Checks for any, "coil faults/breaks" on LMRP unlatch solenoid through WinTsim on laptop.

c. Checks for "coil faults/breaks" on choke/kill mini-connector unlatch through WinTsim.

d. Verify riser stinger on Yellow POD is extended, and energized.

e. Verify POD supply hyd. Pressure is at 5000psi from laptop.

21. Set LMRP regulator from laptop to 1500psi, and verify read back from laptop.

22. BDC ROV No. 1 needs to verify condition of slings on DWH LMRP (Attachment 2) and BDC ROV No. 2 to monitor operations around the BOP.

23. Q4 ROV No. 1 to check to ensure Mux and control cables from the Yellow Pod to the Q4 are clear of snag points.

24. De-energize and Retract Stack Stinger on ~~y~~Yellow ~~p~~Pod through PETU. Re-energize Yellow Pod Stack Stinger in test ring.

25. VP ~~Insert~~ ROV No. 2 to insert hot stab in ROV receptacle located on the top of the Blue POD, and apply 1800, to 2200 psi to de-energize, and retract stack, and riser stingers on blue POD.

    a. Note: If stack stinger does not retract on blue POD, it will take little, to no over pull to lift LMRP.

26. Position mud mat to the West of the well head, in safe area for LMRP storage and advise BOA Deep C of the location of the LMRP storage area. Mud Mat Location is:

```
Input CS: NAD27 UTM, Zone 16 North, US Foot
Output CS: WGS84 Lat/Long's, Degrees, -180 ==> +180
                        North          East                Latitude      Longitude
LMRP PARKING LOC.   10431999.00'   1206266.00'   ==>>   28°44'22.302"-88°21'18.515"
```

~~3.3.~~1.3. Deepwater Horizon LMRP Re~~covery~~moval (Dual Vessel Activity)

1. Monitor Weather forecast, and review ~~C~~current profile to ensure appropriate window for pulling DWH LMRP and DDII BOP installation. SIMOPS Field coordinator to evaluate T time for vessels and DDII and determine if weather window is sufficient to complete the capping operation.

~~1.~~2. Ensure VP deploys diamond wire saws and other cutting equipment to the seafloor and ready for operation.

~~3.~~BDC ROV No. 1 to perform visual inspection of the DWH wellhead connector to confirm indicator rod is in the latched position. BDC ROV No. 2 to ~~F~~fly DWH BOP stack and wellhead and seafloor scan for video reference.

3.

~~3.~~4. Ensure Q4 is standing off the well location ready to operate the Yellow Pod LMRP release function.

Note: ~~before~~ Before engaging the DWH LMRP for ~~recovery~~removal, *heightened DP alert levels need to be in effect and continue throughout the remainder of this procedure*.

~~4.~~5. Deploy BDC's ROV No. 1 and No. 2 and ~~M~~move BDC over well center. Have BDC ROV No. 1 operator verify hook can attach to pre-installed LMRP sling. Deploy crane hook to sea bed while monitoring with a BDC ROV No. 2~~ROV~~. Locate hook near pre-installed DWH LMRP sling near the sea floor.

~~5.~~6. Connect DWH LMRP ~~recovery~~removal sling to the BDC hook using BDC ROV No. 1.

~~6.~~7. Ensure Active Heave Compensation mode is activated on BDC crane.

~~7.~~8. Check BDC's mini-beacon for alignment over LMRP to ensure straight up lift.

9. ~~8.~~ Program BDC Crane to take one hundred thirty four (1348mT ~~mt~~) metric tonnes load ON HOOK.

~~8.~~

~~9. HOOK.~~

~~10.~~ 9. After confirming with BP Representative, Aker Representative, and any authorized

~~11.~~ Federal officials, BDC Master to authorize Crane Operator to take programmed load

10. on main hook.

11. Q4 to ~~F~~function Choke and Kill Connectors Unlatch, verify connectors unlatched

12. Q4 to ~~F~~function LMRP Connector Unlatch; verify connector unlatches

~~12.~~

~~12.~~13. Heave Compensation on the BDC crane should stroke indicating unlatch and lifting LMRP clear of the lower BOP. Confirm unlatch with BDC ROV No1. If the LMRP does not release, check indicator rod and follow LMRP Unlatch Contingency diagram (Attachment 31)~~attached at end of this procedure)~~.

~~13.~~14. Once DWH LMRP is confirmed to have unlatched, ~~pull up 100' 100-ft with~~ BDC crane to ~~and~~lift Horizon LMRP 50 feet.

~~14.~~15. ~~Q4~~Q4 to then vent hydraulic supply to yellow pod. Cut mux umbilical to Yellow Pod and cut hydraulic supply line to Yellow Pod.

~~15.~~16. Move ~~Q4~~Q4 to safe area.

~~16.~~17. ~~Move~~ BDC to transit with LMRP suspended 400 feet above the sea bottom to storage area and park LMRP ~~o~~in pre-laid ~~mud mats~~basket. The bottom of the DWH LMRP is flat.

~~17.Have VP ROV check DWH BOP for:~~

~~a.Drill Pipe protruding from BOP.~~

~~b.Check if AX gasket was removed with LMRP.~~

~~c.Check the condition of the Male HC connector Hub.~~

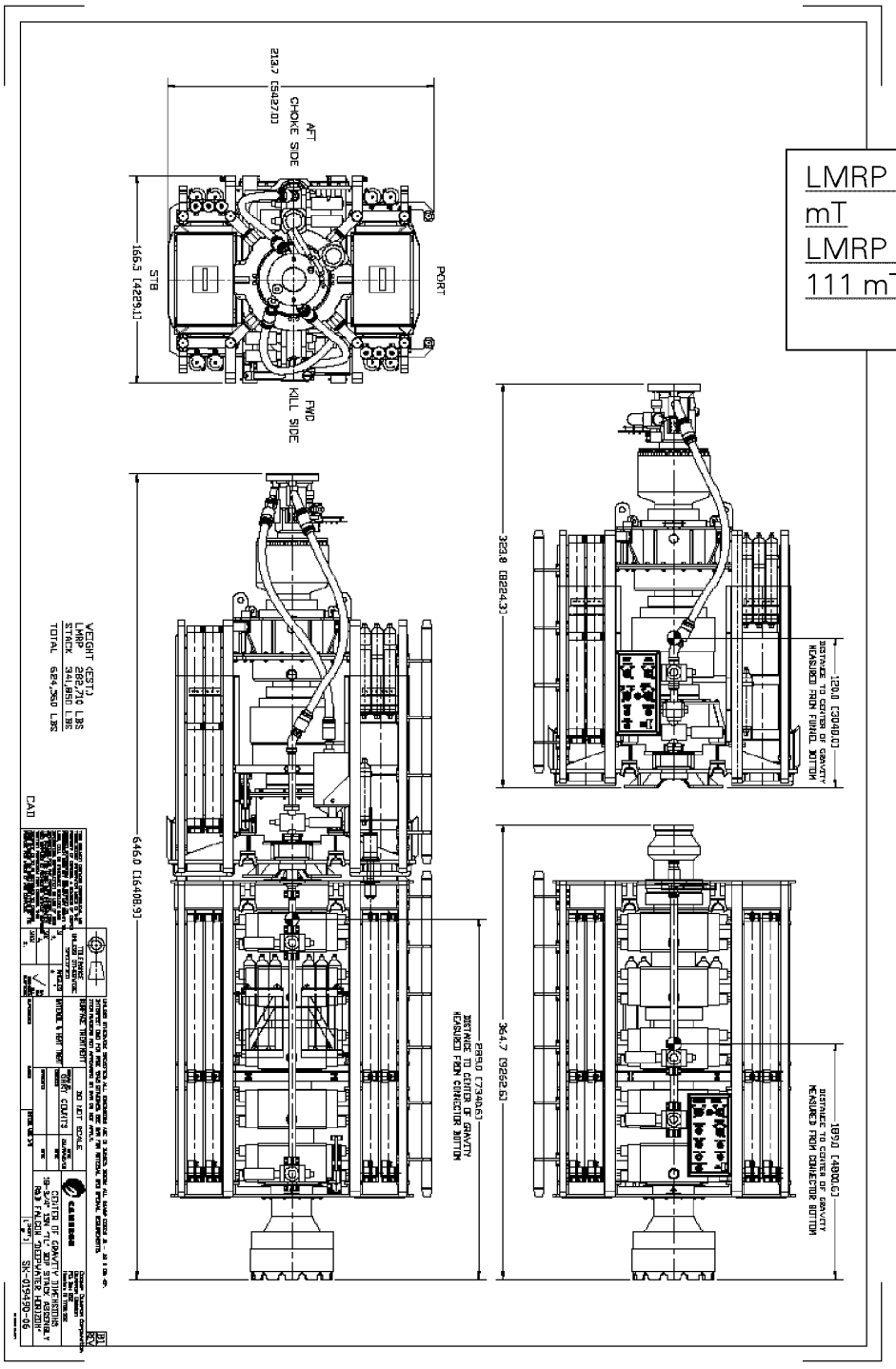
~~d.Check BOP/seafloor conditions.~~

~~18.Have VP ROV cut Drill Pipe if sticking above stack as per Diamond Wire Saw Cutting Procedure (Attached).~~

~~19.Check DWH and DDII BOPs for leaks using ROV.~~

Attachment 1:

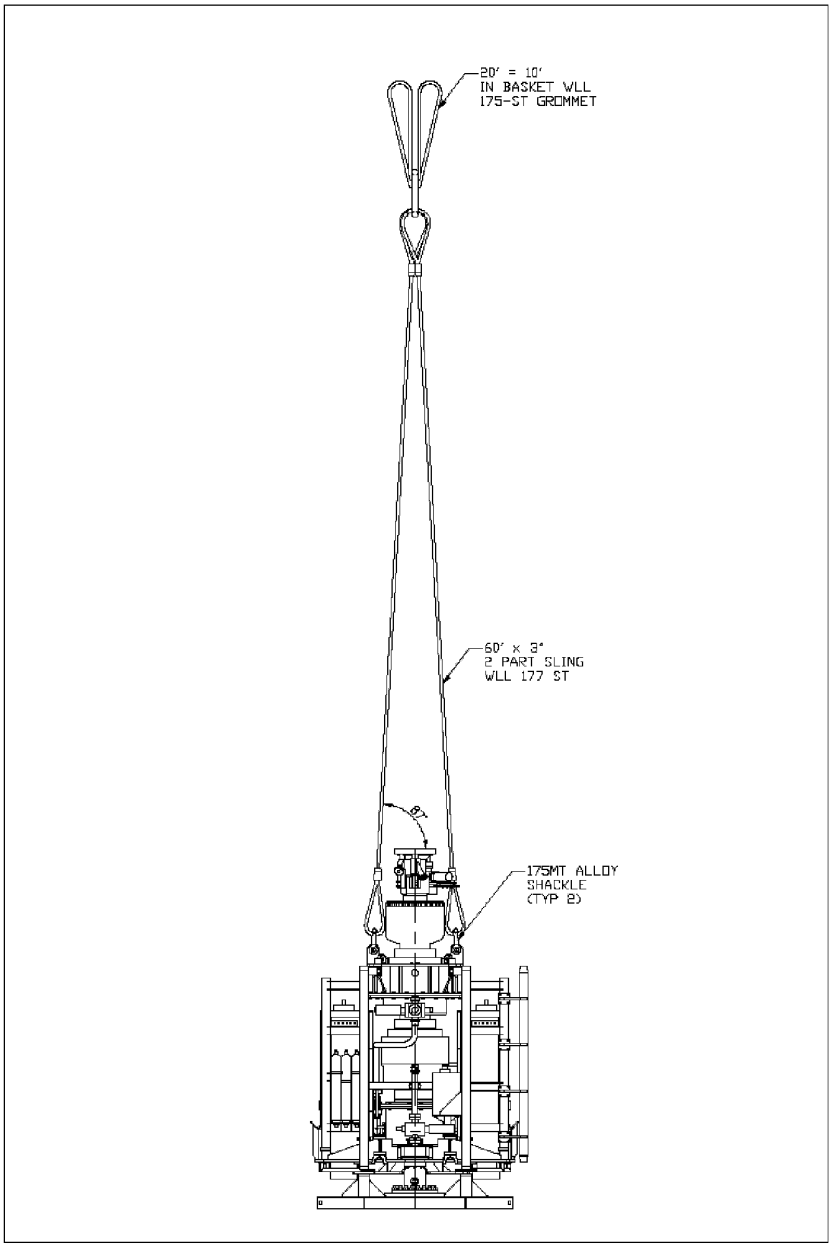
LMRP Drawings



LMRP Air Weight - 128 mT
LMRP Buoyed Weight - 111 mT

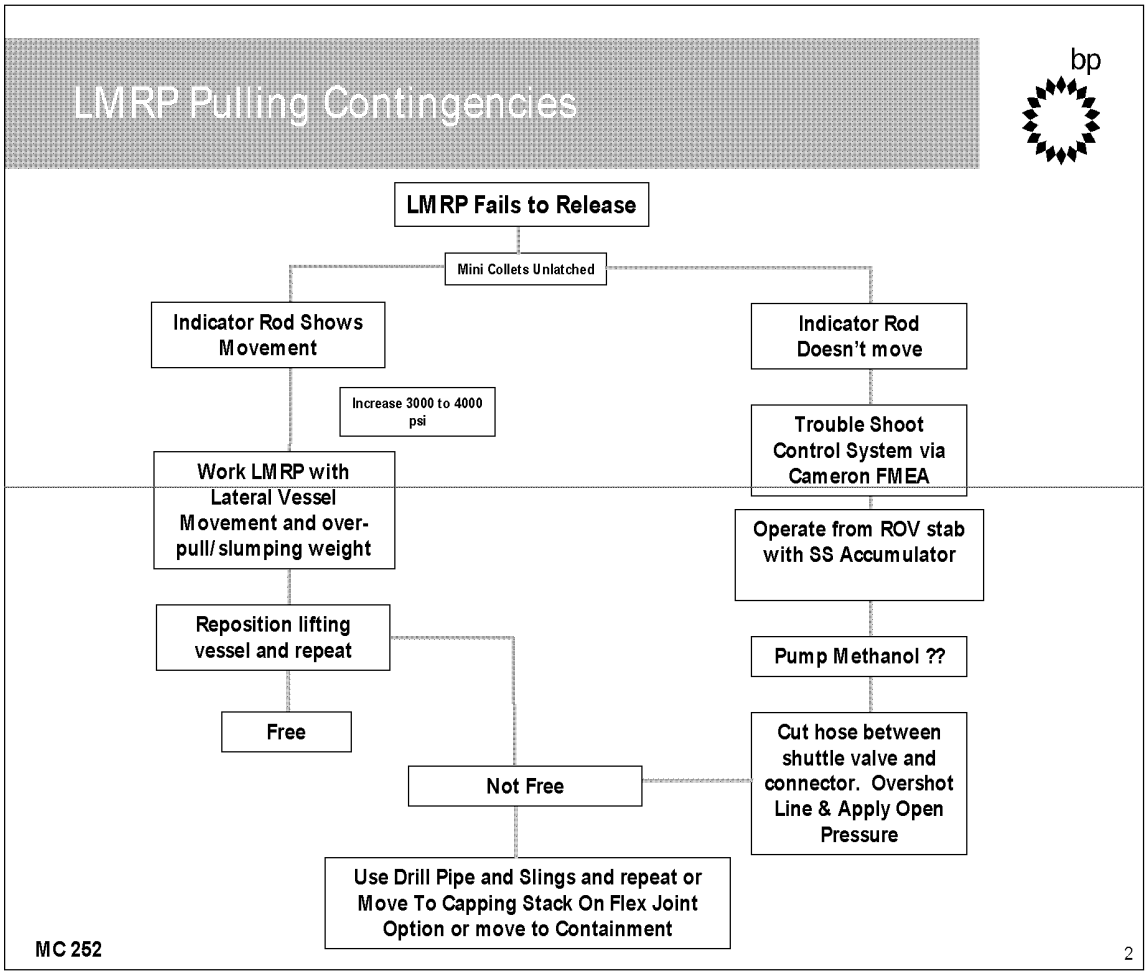
Attachment 2

LMRP Sling

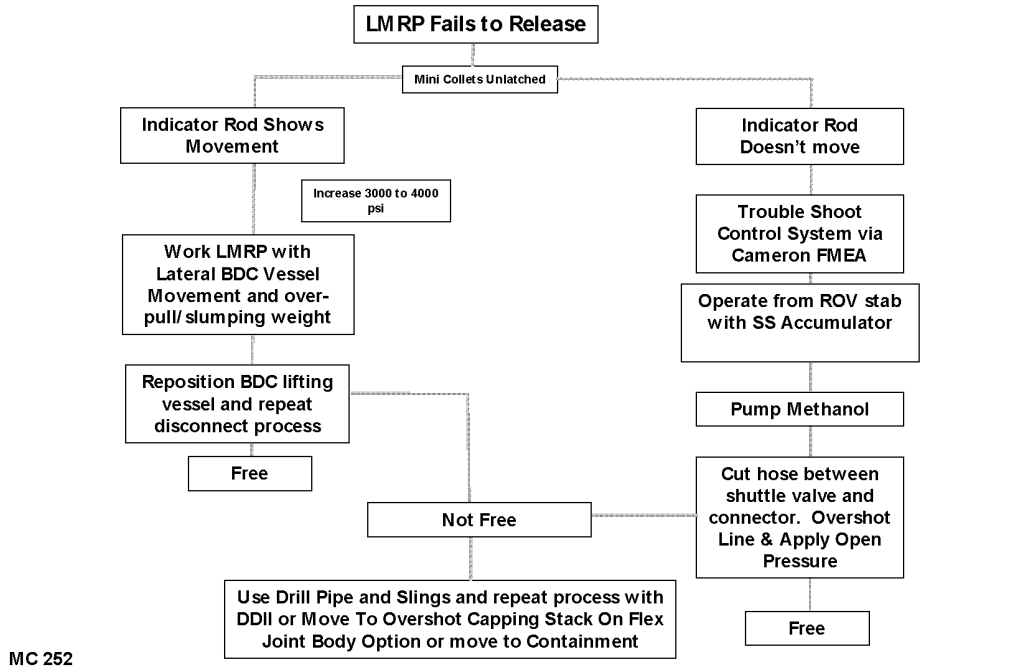


~~Arrangement~~

Attachment ~~13:~~
LMRP Pulling Contingencies



LMRP Pulling Contingencies



MC 252

2

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DEEPWATER HORIZON LMRP CONNECTOR
Failure Modes and Effects Analysis (FMEA)
Executive Summary
Dated: May 12, 2010

At the request of BP, Cameron conducted an FMEA (Failure Modes and Effects Analysis) on the function of unlatching the LMRP collet connector on the Horizon BOP stack in its current state. The analysis focused on three areas; the collet connector operating system, the unlatch function through the pod and the unlatch function through the ROV hot stab. The analysis is based on Cameron Control system hydraulic schematic diagrams used to manufacture the POD's and route hoses on the BOP stack at the time of delivery.

PROBLEM:
What could prevent the collet connector from unlatching thru the ROV and POD?

TEAM RECOMMENDATIONS:
Unlatching the connector

- Prior to attempting to unlatch the connector, it is Cameron's recommendation to apply 1500psi to the latch circuit. This is to ensure correct positioning of all shuttle valves in the circuit.
- If connector will not unlatch with max rated working pressure of 3000psi it is acceptable to apply up to 4000psi unlatch pressure for emergency situations (POD is limited to 3000psi).
- If hydrates are believed to be present and it is possible, circulate glycol into the connector.
- If connector still does not unlatch, cut the latch circuit hose between the shuttle valve and connector. Confirm plumbing configuration with Cameron prior to cutting.

Unlatching connector thru ROV Hot Stab

- Recommended to visually inspect Hot Stab receptacle for debris/obstruction, wash out if possible.
- If it is believed that shuttle valves are in the interflow position, it is Cameron's recommendation to increase flow rate and pressure as necessary to shift shuttle valve to proper position. NOTE: Max allowable pressure is 4000psi.

Unlatching connector thru POD (actuation)

- Prior to reinstalling the Yellow POD, visually inspect the riser receptacle on LMRP structure and stack receptacle on lower stack. Clean as necessary.

The FMEA team members are:

Matt Givens – BOP Stack Engineering Manager
John Corkhill – BOP and Connector Engineering Manager
Ian Todd – Controls Engineer
Nick Arteaga – BOP and Connector Engineer
Cody Earhart – Controls Engineer
Steve Walker – Technical Manager
Dianna Dobek – Six Sigma Black Belt
Alex Afonso – Six Sigma Black Belt
Kathy McNair – Six Sigma Master Black Belt