



From: Powell, Phillip A (TRD)
Sent: Thu Feb 18 16:03:55 2010
To: Daigle, Keith G
Subject: Module #4
Importance: Normal
Attachments: Phillip Powell Module 5.ZIP

Good Morning Keith,

Sorry it took so long to give you the feedback that you requested for the modules. First and foremost the modules are very well thought of for anyone that will have to work them. So here are my comments to them and if we need to discuss my comments then let me know.

Like me, I have been not on any floaters since the late 80's. Since I have been on the DW Horizon I have seen a lot of different equipment changes and also different name changes of that same equipment. So we will get started on the module comments.

The modules make a person think about what they need to focus on whether they are a new hire or an experienced person with a different back ground. For me it was very easy to find the answers on module #4. One thing is evident about these modules, they are rig specific. This means that just like me, since I have not been on floaters or drill ships I could not answer the questions. Once onboard and not trying to interfere with a lot of personnel I did fill out module #4. Since I am not very computer savvy, I will not be able to do some drawing like the question(s) ask for. Some of our younger personnel will be able to do that with ease.

While I did module #4 with no problems and when personnel were available it guided me in the right direction that our company would like to guide a new hire person. For me it was not problem to do this and I did understand the information that was given to me. As for new hires or very limited experience in our business it will not come as easy. I did help Nick, which is a young hand that has a very positive attitude but limited experience, with his module #4. He also gave me his viewpoints on the module #4 and this makes it easier to understand. You know that WSL's have limited time and sometimes it will be difficult to give them the attention required when operations are running smoothly much less when operations are not running smoothly.

All in all the modules are will be very productive, a challenge, and will give guidance to new or even experienced personnel. The only difference is that the experienced personnel will catch on much quicker because of the experience. You can not acquire experience overnight or in a couple of years. You can teach experience only over time and with hands on. As we both know, even we are still learning if we want to be good at our jobs and also be proud of the job we do.

Regards,
Phillip

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Module 5: Deepwater BOP and Riser Systems

LOCATION: Mississippi Canyon

Rig: DW Horizon

DATES OF OBSERVATION: Feb 9 – 22, 2009

CANDIDATE: Phillip Powell

MENTOR OR

WSL: _____
(if applicable)

COACH: _____

Module 5: Deepwater BOP and Riser Systems

Components of a BOP and Riser System

1. Provide a sketch or drawing of the BOP on your rig. Identify the rams, annulars, choke & kill outlet locations. Give pressure ratings of components and sizes of pipe that BOP can be closed in on for each element. Be sure to include the location of the pods that control the stack functions. Include any other pertinent information such as what parts comprise the Lower Marine Riser Package (LMRP).

The DW Horizon's 18 3/4" Stack from top to bottom consists of:

LMRP

Riser Adapter

10K Upper Annular

5K Lower Annular (Stripping element capability)

Choke / Bleed line inlet

15K Blind Shear rams (Capable of shearing 9-5/8" and smaller and will seal too).

15K Casing Shear rams (non sealing) cuts 13-5/8" and smaller csg.

Choke/Bleed line inlet

15K VBR (3-1/2" – 6-5/8")

15K VBR (3-1/2" – 6-5/8")

Choke/Kill line inlet

15K VBT (3-1/2" – 6-5/8") Installed upside down and are only test rams.

Vetco Super HD-H4 Connector

2. Does the stack on your rig have a "bleed" line outlet? What is the function of a "bleed" line?

There are five bleed line outlets located on the BOP / LMRP. The function of the bleed line outlet is to provide a means of removing possible trapped gas between BOP components which may have accumulated during a well control event. Prior to opening the riser the bleed outlets will remove any trapped gas which will migrate up the riser and cause significant problems. While the bleed line outlets will remove the vast majority of trapped gas from the BOP there will still be a small volume of approximately 1/2 bbl which will need to be removed. This is performed by filling the choke and kill lines with a lighter fluid (base oil, diesel, etc), closing the rams below the choke, and opening the BOP from above which will U-Tube any remaining gas into the choke and kill lines which are then displaced back to surface with kill weight mud or the regular drilling mud.

3. Does the stack have a ram cavity with casing shear rams installed? When would casing shear rams be needed?

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The Horizon has a set of casing shear rams located below the blind rams. They are capable of shearing 13 3/8" casing maximum. Casing shear rams become critical when running long strings of casing with possible inner strings. This is due to the amount of time that casing will be across the BOP. Casing Shear Rams may be used for one of two reasons:

- 1) In the event that well control is lost due to annular failure and the rig needed to be moved upcurrent of the wellhead. This would be only as a last option.
 - 2) The second and most likely use of the casing shear rams would be to provide a means of safely disconnecting from the BOP during a possible drive off, hurricane, or other extenuating circumstance.
4. Provide a sketch or drawing of a joint of riser complete with all dimensions and jewelry (choke, kill and boost lines, flotation, rigid conduit lines, etc.)
 5. You will notice that there are two basic types of riser joints, those with flotation installed and those without (commonly referred to as 'slick' joints). Where are the slick joints run in the string and where are the flotation joints run? Why are the slick joints run in this position?

The first ten joints above the LMRP are slick joints. This is due to the large surface area represented by the BOP / LMRP and the need to have minimal current interference while running riser. While the last 7 joints of riser at surface have flotation, they are at a reduced size of 42" diameter rather than 52". This is to reduce vortex induced vibration.

Vortex Induced Vibration (VIV) is caused when sea water contacts the riser upstream of the current and then meets again down stream in an energized state which causes the riser string to vibrate back and forth perpendicular to the flow of current. A reduction of VIV can be seen by staggering slick joints.

6. Riser joints with flotation installed are color coded to ease identification while running. What is the significance of the color codes used and list the dimensional and operational parameters for each type on your rig.

The color codes for the Riser flotation correlate to a depth rating for buoyancy and collapse requirements. The syntactic Foam is inter-bedded with glass beads require a specific strength to resist collapse at a given pressure. Deeper water requires a denser and stronger foam which in turn provides less flotation.

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The color codes for the Horizon are as follows:

1000' – Tan
2000' – Blue
3000' – Green
4000' – Yellow
5000' – Orange
6000' – Black
7000' – Red
8000' – Violet

7. While the choke and kill lines are self-explanatory, what is the purpose of the boost line and the rigid conduit line?

The boost line has several purposes associated with it.

1) It helps in move cuttings and debris to surface more effectively by increasing the low annular velocity between the DP and the 19.5" ID Riser.

2) It helps reduce rig time by decreasing the circulation time required to bring a BU to surface.

3) It allows you to circulate a possible gas influx out of the riser with the BOP / LMRP closed due to its entry point location above same.

The rigid conduit line acts as a vessel to transport hydraulic fluid from the surface located HPU to the desired blue or yellow subsea multiplex controlled pod.

8. The riser joints must handled with some type of equipment to move it from the riser bay on deck to the rig floor. What is the equipment used on you rig (also list any contingencies)?

On the Horizon the riser gantry crane places the joint directly on the riser skate, which then transfers the joint to the rig floor. A MPMA (Multi Purpose Manipulation Arm) guides the riser and centers in over the riser in the riser gamble above the rotary table.

9. The Riser Handling Skate is an important piece of equipment during the riser running operation. Is there any special equipment used on the skate during the running operation?

The riser skate on the Horizon is equipped with a resting place for the box end of the joint. This provides a means to stabilize the joint

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while a floorhand manipulates the skate to a position where it can engage the running tool. Once engaged the pin end of the joint is supported by a 'riser cart' which allows the joint to roll towards well center without being damaged while the Driller picks up the joint.

10. The BOP Transporter is used for storing and moving the BOP's around in the moonpool. What are some of the other uses for the transporter?

The BOP transporter's other uses include providing a means of working safely over water by supporting the MUX cable platform and they are also involved in riserless sections which include hanging off BHA's or supporting casing strings.

11. Where is the BOP stored when not in use on your rig (port side, starboard side, forward or aft)? In which direction(s) can the BOP be moved with this piece of equipment?

The BOP is stored on aft Port side. While in the BOP cart (transporter) it can be moved port to starboard. With the BOP crane it can be moved forward to aft and vice versa.

12. What is the safe working load (or rating) of this piece of equipment?

The BOP crane and cart (transporter) is rated to 310 ton.

13. This transporter is also used to place the BOP over a certain piece of equipment for stump testing purposes. What is this piece of equipment called?

BOP storage frame.

14. Some MODU's have a guide system installed in the moonpool to prevent swaying of the BOP while it is suspended. Name this system and give a brief description of how it works.

The BOP is protected while inside the BOP cart by a protective steel cage welded to the outside of its frame. While it is suspended in the BOP crane it is kept from swinging by the gripper arm. A second gripper arm is used to prevent the LMRP from swinging when it is placed on the BOP. While the BOP is in the splash zone it can be further stabilized by extendable hydraulic bumper arms which extend from the moon pool.

15. Rigs must have a means for individuals to work at heights and over the water. Name the devices and give a brief description of each.

A MUX cable working platform is installed on the BOP cart to allow a safe work area to install the MUX clamps. SRL's Fall arrest quick stop devices are suspended from the sub structure frame and provide a means of fall protection. Other fall protection included specifically placed pad eyes for safety harness tie in locations. When installing the drape hoses crew members are suspended with a seated harness attached to a man riding air hoist.

16. There is a combination of two tools used to provide a hang-off platform on the rig floor to support the BOP and riser string while making riser joint connections. Identify these two tools and in your own words give a description of their purpose.

The riser spider is secured to the top of the gimbal and contains hydraulically operated pistons which actuate a resting shoulder for the riser to land out on.

The Riser Gimbal is a device which allows the riser to remain stable even with moderate pitch and roll of the rig. This in turn reduces bending loads placed on the riser shoulder and distribute loads equally. It performs these tasks by transferring hydraulic fluid from cylinder to cylinder in a closed system. It has +/- 6 deg range of action and also reduces the impact force on the shoulder when landing out the riser.

17. List the maximum operating parameters of this tool combination.

The riser / spider combo is rated to 2,000,000 lbs.

18. A riser running tool is used to handle joints of riser and each locks into place either hydraulically or manually. Provide a drawing of each and describe how these tools 'lock' into place.

The primary running tool on the Horizon is a hydraulically actuated. It is functioned by an internal hydraulic cylinder which operates a piston. If the piston is driven up it will actuate 6 locking dogs which will engage in a grooved profile in the riser, when driven down it will release same. The RT cannot be released with a load placed on the dogs.

The backup mechanical running tool is secured in a similar fashion as a regular riser joint. It uses 6 same grade HMF riser bolts but with a lower MU torque of 1,000 ft-lbs.

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19. How is the running tool 'attached' to the block for hoisting and lowering the riser? What is the load rating of this equipment?

The running tool is attached to the block with a set of 1000 ton full shoulder elevators which are connected to a set of 1000 ton bails. For the riser running operations the TOP drive is hung off to reduce the total weight. To raise and lower the running tool into a position where it can be made up an air hoist is rigged up and removed as required.

20. These running tools also serve another purpose while running riser. What is that purpose and how is it accomplished?

The second purpose of the running tool is to assist in testing the choke-kill-boost and RCL. Two tests are performed at a time. For the lines being tested the RT acts as a means for Halliburton to tie into and pump through, for the other two lines the RT acts as a test cap.

21. A series of reels are located in the moonpool with lines installed on them that will be run with the BOP / riser. Identify each 'line' and describe what they are used for.

2 x MUX / Multiplex control lines are run and contain electric wires which transmit digitally encoded electric signals down from surface to the appropriate control pod, which then interprets the signal and trips an SPM valve allowing the desired BOP function to take place.

1 x Hotline which performs the same duties of a Rigid Conduit Line. The advantage of running a 'Live' Hotline is that it allows the rig to have control of the BOP / LMRP while running the stack. This allows us to keep components open and having them self fill.

22. How are these lines paid out and reeled in during running or pulling of BOP / Riser?

The 2 x MUX lines and the Hot line are reeled on umbilical's and are allowed to freely rotate as the riser is being run. Care must be taken that riser running speed is not excessive and that the tension in the lines is sufficient to prevent slack when making up the MUX Clamps. While POOH the reels must be hydraulically operating and reeled in to prevent entanglement of the lines.

23. Is there any specialized monitoring equipment used on the BOP / riser for your rig? If so, list and describe this equipment.

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Two x 'Bullseye' indicators are installed for riser running. The ROV is also used to monitor the running of the bop's and riser.

24. The top joint of riser is referred to as the telescopic or 'slip' joint. Provide a detailed drawing of the telescopic joint on your rig along with a list of the various functions it provides.

The basic function of the telescopic joint is to compensate for movement between the rig and riser due to heave, tidal changes, and possible stretch or compression in the riser itself while maintaining leak proof integrity. The telescopic joint is made up of:

Crossover assembly which connects to the flexjoint below the Diverter. This assembly also has a locking mechanism which locks the inner and outer barrels together which allows the telescopic joint to support its full tensile rated load. The inner barrel is released once the stack has been landed.

Inner barrel which allows the rig to move independently without placing excessive stress on the riser.

Dual Packer Housing which consists of an upper element rated to 100 psi that is air operated provided the primary seal against leaks while drilling. The housing also contains a lower packer element which is hydraulically operated, rated to 500 psi, and used mostly as a contingency.

Outer Barrel with a primary purpose of transferring the tension placed on the riser from the tensioners.

Fluid Assist Bearing which contains an annular chamber which can be pressurized to help reduce the friction caused torsional loads associated with the rig making a heading change. The fluid assist bearing chamber is the slip joints landing point in the SDC load ring.

25. There is a system on the rig referred to as the tensioner system that supports the weight of the riser. How does it attach to the riser? Give a description of the tensioner system and how it works. Why is it important to keep the riser in tension? Will this riser tension change throughout the well? If so, why?

The Horizon's tensioner system is connected to the riser via the SDC Riser Tensioning Ring. It is attached to the fluid assist bearing which is secured to the outer barrel of the telescopic joint. The SDC ring is a conduit to apply tension from the 6 x Direct Acting Hydraulic tensioners.

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The tensioners possess a ball and socket assembly which is bolted to the SDC ring. The SDC ring can open and close and be skidded along with the tensioners when needed. It is secured while running the telescopic joint and has a tension rating of 3,000,000 lbs.

The Horizon has a direct acting tensioner system consisting of 6 hydraulic rod and piston assemblies. The tensioners are adjusted using air pressure acting on a hydraulic piston. It is important to keep tension on the riser to prevent it from buckling and to ensure that its shape remains as close to vertical as possible as curves in the riser would create bending loads which place high stress on connection points. Possible reasons for adjusting riser tension include changes in MW, tidal changes, or wave / environmental issues.

26. While the tensioning system suspends most of the weight of the riser, it is tied back to the rig floor via the diverter. In addition to tying the riser system back to the rig floor, what other functions does it provide?

The Diverter system provides a means of diverting an influx in the riser safely away from the rig. It is mounted to the rig floor via rotary beams and has one flow line which returns fluid back to the mud pits and has two diverter lines (one starboard and one port) to divert an influx downwind.

27. The above is a basic list of BOP / riser components used. While observing the riser running operations, keep a list of additional tools used along with a brief description of these tools.

Termination joint: Is the joint below the Slip joint and provides a means of connecting the rig to the choke / kill / boost and RCL lines with drape hoses.

Preparations and Considerations Prior to Running BOP / Riser

28. As with any job, the proper amount of HSE planning must take place prior to commencing. Are there any Control of Work issues involved in running riser? If so, what are they?

Control of Work is begun with the subsea engineer until the bops are in the water below the splash zone.

Then **Control of Work** is in the hands of the driller when running the riser and bop's.

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29. Is it necessary to review or write and JSEA's (or equivalent) prior to commencing the riser running operations? Lists hazards identified and mitigations in place for each of the JSEA's.

Writing and reviewing JSEA's is critical to the safety of the riser running operation as it helps identify the possible hazards associated with each step.

The JSEA's identifies, discusses and executed will ensure that all personnel understand how and what hazards are mitigated, identifies possible injuries that can happen, and how to execute the task safely.

The JSEA's for riser running focus on ensuring that each step is 100% complete and that all personnel are ready for the next step, hand and body placement, and stopping the job should anything not look right.

Also if the job or task changes then to re-visit, communicate before and if needed to update existing JSEA before continuing the job.

30. Where is the rig positioned during riser / BOP running operations? What is the reasoning for this?

The rig is positioned 500' away from well center for riser running operations. This is to prevent dropped objects from possibly damaging the WH. The reason in is not positioned further is due to the stress and time associated with a long move with the riser / stack in the water.

31. As with any operation, the most critical part of a successful riser running operation is clear and effective communication. How is this accomplished with personnel working on the deck, in the moonpool and on the rig floor?

Effective communication is first established during the pre-job safety meeting. Here everyone's role and responsibilities are clearly defined about the possible hazards, complications when running the riser and are identified. Also established in the safety meeting are the steps which require verbal communication upon completion and prior to starting the next step. Steps which must be announced over radio are as follows:

Floorhands to communicate that Riser Skate control box has been shut off, which allows Riser Gantry crane operator to move.

Roustabout to inform Gantry crane operator of which joint has been inspected and ready to use.

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Roustabout / Gantry crane operator / Floorhand to communicate when riser joint is in riser skate and ready to be lowered.

Driller to communicate to floorhand that the running tool is in gauge and to verify that the riser skate is in correct position.

Driller and rig floor crew to communicate as joint is lowered and stabbed correctly, as well as when connection is made.

Moonpool to inform driller when clamps have been installed.

Driller to inform rig crew that string is ready to be moved and ensure that all stations can handle this movement safely without damage to equipment.

32. Just like when running other tubulars in a well, a tally must be generated to calculate how many and which joints of riser will be run. Who is responsible for generating this tally? Who is responsible for approving or 'signing-off' on this tally? List the data included on a riser tally. Also list what parameters are monitored and recorded while running the riser. Another consideration that should be made is the present and forecasted current/weather conditions for the area in which you are working. What are the current/weather limitations for running riser on the rig to which you are working?

The Senior Sub Sea Engineer is responsible for generating the riser running tally. The OIM and WSL are responsible for ensuring that it correct and can be run safely without damaging equipment. The riser tally includes type of foam, wall thickness, expected weight in air, expected weight in water, expected cumulative weight, and actual weight in water. The bullseye is watched by the ROV and the ROV also does riser inspections to ensure all MUX cables, connections, and flotation are in good order.

Weather conditions are also monitored that could effect this operation.

33. Although the BOP is thoroughly maintained prior to running, it must be stump tested prior to running. To what pressure will the stack be pressure tested? On what OD sizes is the stump test performed? Which pod is used for testing? **Both pods are used in surface testing bops, one while testing and the other pod is functioned to ensure that all functions work.** When is this tested performed and who is responsible for properly conducting the test?

The BOP is tested to:

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Blind shear – 15K

Upper / middle Pipe Rams – 15K for 5 ½" DP and 6 5/8" DP

Test rams – 15K.

Upper annular = 10K

Lower Annular – 5K

MMS regulations requires a surface BOP test on the all diameter of DP to be run in the hole that is not a part of the BHA. While only 6-5/8" DP will be used for drilling, a 5-½" DP inner string will be used for running 16" Liner. These tests are performed prior to running the stack with both pods, and are supervised by the Senior Sub Sea engineer.

Running BOP and Riser

34. As you will observe, things get pretty busy when it is time to start rigging up the equipment necessary for running the BOP and riser. What are the three areas where rigging up of equipment takes place and what is the major task performed in each area? Does this rigging up happen simultaneously or is some of it done offline?
1. Rig Floor – RU 1000 ton bails, PU and store riser bolts, MU Riser handling tool to Pipe Handler, RU Spider / Gimble, RU Hydraulic Running tool, Install hand rails on spider / gimble.
 2. BOP Area – Lift and secure LMRP on BOP and test same, Lift and secure BOP / LMRP onto BOP Cart and move same to well center.
 3. Riser Bay – RU riser gantry crane with appropriate grippers to transport riser, RU riser skate as required.

For this particular well we had to wait for a good BOP test prior to us being allowed to continue. So Steps 1 and 3 were done offline. In situations where the rig is drilling surface hole then steps 2 and 3 will be done offline with the rig waiting on step 1.

35. The Subsea Engineers typically have a 'pre-splash' checklist prior to actually getting the BOP 'wet'. List the steps involved in this checklist.

There are 62 items on the pre-splash checklist. Listed is a few of the checklist items:

Valve alignment, pod selection, Conduit supply selection, Mud Boost Valve, LMRP stab and stinger selection, LMRP Accumulator Charge and Dump readings, Stack selection, Choke/Kill selection and isolation, Stack Accumulator Charge and Dump readings, LMRP and Stack Articulated Arm selection, Well Head Connector selection, Autoshear and Deadman.

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36. Each of the three areas where riser operations are conducted will require a specific number of people. List the people involved in each area (job title and function they will perform during the operation).

Horizon

The Riser Bay: The Gantry Crane operator will transport the joints of riser to and from the Riser Bay to the Riser Tray, A roustabout banks man will assist in ensuring there is a clear route as well as keep personnel out of the area, a floorhand will manipulate the Riser skate to receive joints of riser from the Gantry Crane.

The Rig Floor: The Driller has the most safety critical role during this operation and must ensure that all steps have been 100% completed and that all personnel are ready prior to moving on to the next step. These include insuring that the running tool is made up properly, that the riser joint connection is made up properly, that the MUX/IWOC lines have been properly clamped, and that the reels are ready for string movement. He must also communicate with the ROV should there be any issues sub sea. The drill floor crew is responsible for operating the MPMA and safely guiding the riser joint to well center. At well center they help direct the driller so the joint is stabbed in properly and then MU the connection as per program.

The Moon Pool: There subsea engineer is operating the three umbilical's (2 x MUX, 1 x hotline), there are 2 x floorhands in bop cart installing cable MUX clamps, and one fire watch overseeing them.

37. Although the WSL and the OIM/Supt are accountable for successfully running the riser, who is the responsible individual on your rig for this operation (PIC)?

The Senior Sub Sea Engineer is the PIC for the riser running operation.

38. To minimize the amount of time the BOP spends in the 'splash zone', how many joints of riser are made up together prior to engaging the BOP?

Due to a different grade flex joint on top of the riser (Grade G), a slick 37' G to H XO was run first. This was then made up to a full slick joint of riser. After this the BOP/LMRP was skidded over and the XO joint was stabbed in place. Torque wrenches were lowered through the rotary and the connection was made up as per program. The stack was then lowered out of the splash zone. If the XO did not need to be run then 2 x riser joints would be made up to the stack.

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39. The bolts that connect the joints of riser have a recommended make-up torque that coincides with a specific thread lubricant. What is the recommended make-up torque and thread lubricant used on your rig?

There are 6 x 3.75" 4 Stub ACME bolts used for each riser connection and they are torqued up to 22,500 ft-lbs with the power torque wrench. NEVER SEEZ thread lubricant is used.

40. How are these bolts made up on your rig and how is the torque verified?

They are made up using a hydraulic power torque wrench which has a pressure indicator to verify the correct make up torque of 22,500 ft-lbs for 1500 psi of pressure on the hydraulic unit.

41. There is usually a specified sequence of making up these riser bolts. Describe the sequence when a) 2 wrenches are used and b) 1 wrench is used (use a drawing to help explain if necessary).

There are two wrenches that are used. They each MU bolts that are 180 degrees apart from each other and rotate counter clockwise.

42. Once the BOP has been moved to well center, the initial joint(s) are made up to the top of the BOP in the moonpool. Some rigs identify the joint immediately above the BOP with a specific name. What is it called on your rig?

The first joint of riser we ran was a XO joint. This is temporary because the Horizon riser string is class H and is being repaired.

43. The MUX cables and Hot Line must be attached to the riser joints in the moonpool area below the rig floor. How are the attached and how often?

The 2 MUX cables are attached in one clamp, the hot line is attached in another clamp, and the IWOC line is attached on a third clamp. Each of these are attached to the MUX clamp bracket at the middle of each joint and at the connection point of each joint.

44. List any special considerations to be taken on start up, especially when lowering the BOP into the water (referred to as 'splash' zone). Why is this critical?

Weather considerations play a pivotal role when lowering the BOP through the splash zone as large wave heights, and high ocean currents pushing against the large surface area of the BOP could cause the BOP to contact the hull and damage the vessel or BOP components. Therefore it is critical to space out the running string

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to allow for moving the BOP as quickly through the splash zone as possible.

45. In what position are the different valves on the BOP, choke, kill, boost and RCL left in while running riser? Why?

All BOP / LMRP components, choke, kill, and boost lines are left open. This is so they will be self filling and prevent a pressure differential that would lead to collapse. The RCL is left closed, it is a normally closed operating valve position.

46. What equipment will require filling while running the riser and what equipment will fill automatically?

The riser ID, choke, kill, and boost lines are all open and allowed to self fill. This is possible because the hot line allows for pressure to keep these valves open. The RCL is filled with fresh water from surface.

47. As discussed above, some lines will be tested during the riser running operations. Which lines will be tested, to what pressure will they be tested and how often will they be tested?

The choke / kill lines are tested to 250 / 10,000 psi, and boost / RCL lines are tested to 250 / 4800 psi for 5 minutes straight line on each test. They are tested after the first two joints are connected to the stack and ran in hole, half way, and prior to landing the stack.

48. What final checks are made to the riser joints once on rig floor just prior to making them up is string?

While the next joint of riser is resting against the gimble/spider (to avoid any crush points) the rubber gasket type mud seal is inspected for damage. The choke, kill, boost, and RCL connections are all checked for seals, damage, cleaned, and checked with a NO-GO wrench to ensure that they will fit into their connection.

49. After the BOP is a sufficient depth below the water level the ROV will dive and monitor the BOP while running riser. What function does the ROV play while running the riser?

The ROV is there to ensure that the MUX lines / clamps and flotation are remaining in their designed locations and are not coming loose.

50. What data is monitored and recorded from the time the BOP is picked up off the transporter until just prior to latching up to the wellhead?

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The string weight that is expected is compared to the actual string weight for every joint. The hotline pressure is also monitored to ensure that it remains at its desired levels.

51. At what depth above the mudline is the BOP repositioned back over the well?

The rig is repositioned over well center at 60 ft above mud line.

52. Once the BOP is landed and latched to the wellhead, what steps are taken to insure that the wellhead connector is properly latched?

Once landed there is 100k set down on WH. The WH connector is then actuated and the gallon count recorded, which was 16.1 gallons. This needs to be accurate in a +/- 1 gallon range. A 75 k overpull test is then recorded. Afterwards the two bullseye gauges are checked and there is a pressure test of 250 psi / 2500 psi performed on the connector, riser, casing.