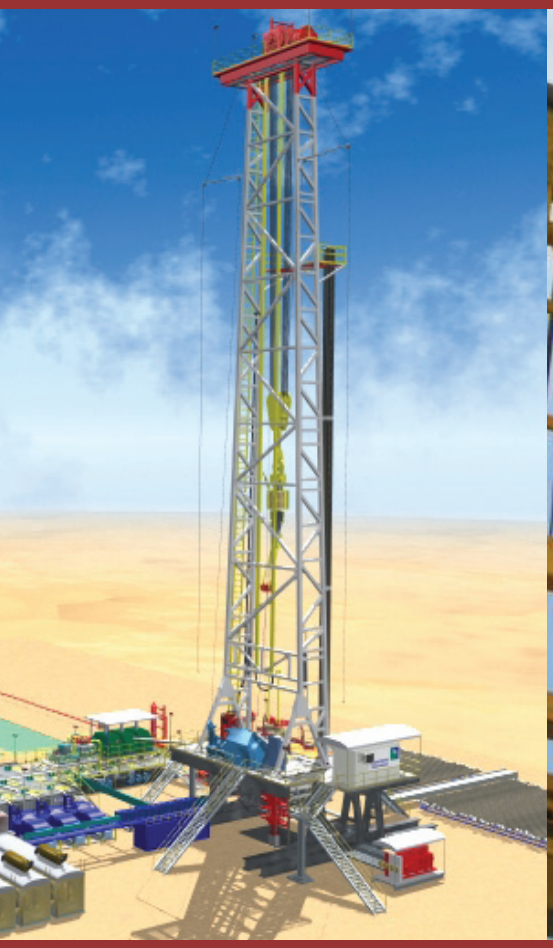
ارامكو السعودية
Saudi Aramco

Instructor Guide

INTRODUCTION TO DRILLING OPERATIONS



Module 5.4
State Installation Steps of Wellhead Equipment

D&WO HR Training & Competency Development Division
Published by T&D
August 2014

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Saudi Aramco

Trainee Handbook

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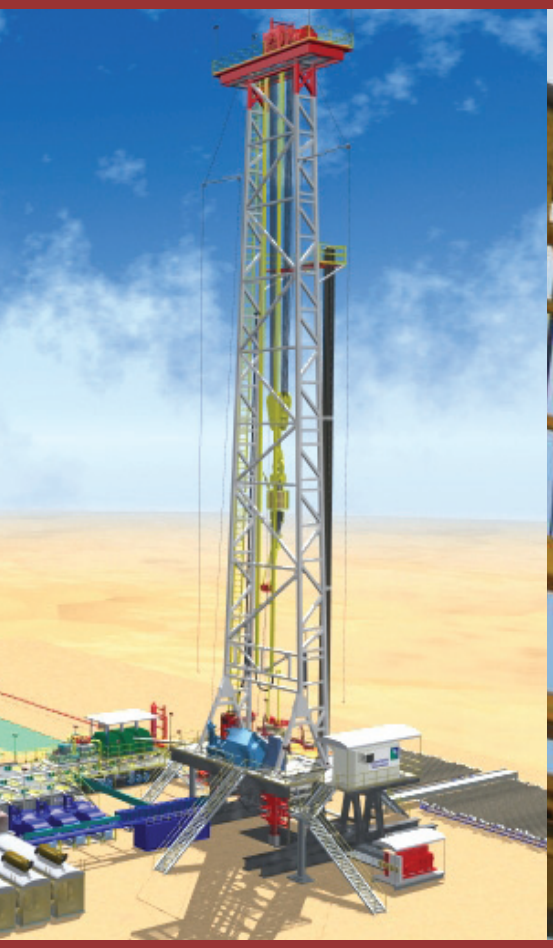

Module 5.4
State Installation Steps of Wellhead Equipment

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Unit 5: State the Function and Operation of Wellhead and Well Control Equipment

Module 5.4
State Installation Steps of Wellhead Equipment

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Unit 5: State the Function and Operation of Wellhead and Well Control Equipment

Module 5.4
State Installation Steps of Wellhead Equipment

TRAINEE HANDBOOK

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Item	Action	Aid	Time
PREPARATION	Before class, prepare the classroom. Distribute trainee handbooks.	Instructor Guide. Trainee Handbooks.	
INTRODUCTION	Identify and explain the module objectives. Explain new words.	Information Sheets. Glossary. Oil Industry Terms e-Glossary.	1 hr.
OBJECTIVE 5.4.1	Identify wellhead equipment installed during drilling and completion operations. Have trainees complete the exercise.	Information Sheets, part I. Exercise A.	3 hr.
OBJECTIVE 5.4.2	Identify installation steps for a landing base using a land rig. Have trainees complete the exercise.	Information Sheets, part II. Exercise B.	2 hr.
OBJECTIVE 5.4.3	Identify installation steps for casing and tubing spools using a land rig. Have trainees complete the exercise.	Information Sheets, part III. Exercise C.	4 hr.
OBJECTIVE 5.4.4	Identify installation steps for a production tree using a land rig. Have trainees complete the exercise.	Information Sheets, part IV. Exercise D.	2 hr.
RIG VISIT	Review the function and installation steps for the main wellhead equipment components.	Information Sheets.	5 hr.
REVIEW	Review objectives.	Information Sheets.	1 hr.
WRITTEN TEST	Administer the written test. Score and record the results. Counsel trainees whose performance is unsatisfactory and provide remedial training as required.	Test Sheets. Test Answer Key.	2 hr.
	Estimated time for a class of 8 trainees.		20 hr.

USING THIS MODULE

This module familiarizes trainees with the functions and installation procedures of wellhead equipment. Use the Saudi Aramco Oil Industry Terms e-Glossary and other online resources to explain new terms or concepts.

RIG VISIT

Use the training rig as much as possible to show your trainees the areas and equipment discussed in the module. Also, use demonstrations in place of lectures wherever possible. Keep the Information Sheets as the core reference material for trainees to review information on the equipment that they have been learning about.

KEY TO EXERCISES

EXERCISE A

1. The landing base or casing head.
2. A casing spool has 2 flanged side outlets.
3. A casing hanger or slips.
4. It has tie down or lock down bolts in the upper flange.
5. It provides an access to the well for servicing equipment, and directs the flow of oil or gas to a facility or pipeline.

EXERCISE B

1. To allow the water to drain from the casing.
2. The whole time the welder is working in the cellar.
3. A fire extinguisher.
4. The nuts can be tightened to level the casing head before it is welded.

5. Hydraulic hand pump.

6. To make sure they can hold pressure in the event of well control operations.

EXERCISE C

1. The area should be cleaned.

2. By lowering the casing string.

3. When the cut of casing has had all the sharp edges removed.

4. With a hydraulic hand pump.

5. A trained wellhead specialist.

6. Compress a seal around the tubing and the tubing spool.

7. Backpressure valve.

EXERCISE D

1. The tubing bonnet.

2. Once the tree is flanged to the bonnet.

3. Prevents the test pressure from going into the tubing and potentially damaging the tubing or the well.

4. Once the flange is tightened between the tree and the bonnet.

Date	Reason
August 2014	First Printing

Enabling Objectives

You will, correctly and without help, be able to:

5.4.1
Identify wellhead equipment installed during drilling and completion operations.

5.4.2
Identify installation steps for a landing base using a land rig.

5.4.3
Identify installation steps for casing and tubing spools using a land rig.

5.4.4
Identify installation steps for a production tree using a land rig.

Terminal Objective

State the installation steps of wellhead equipment.

INTRODUCTION

Special wellhead equipment attaches the bottom of the BOP to the top of the casing. Different types of wellhead equipment perform different functions. Once the well is complete, a pipeline or tank attaches to the wellhead equipment to recover the gas or oil.

In this module, you will learn about the components, function and installation of the wellhead equipment.

PART I OBJECTIVE 5.4.1

Identify Wellhead Equipment Installed During Drilling and Completion Operations

You learned previously that a BOP is installed on top of the casing. The BOP and choke manifold control a well by diverting the returns flow and regulating the wellbore pressure. After drilling has been completed, other equipment is installed on to the wellhead equipment to produce hydrocarbons from the well.

You will now learn about the types and functions of wellhead equipment.

THE WELLHEAD EQUIPMENT

The wellhead equipment is used as a connection base for the BOP, casing or tubing strings, and for the production tree. A production tree controls the flow of fluids from the well after the rig has moved. The well can also be shut in by using the production tree.

The wellhead equipment includes:

- ❏ landing base
- ❏ casing hanger
- ❏ casing spools
- ❏ tubing spools
- ❏ production tree

Landing Base

The landing base is the first connection between surface casing and any BOP equipment or wellhead equipment. The landing base is also called a casing head.

As shown in figure 1, the top of the landing base is a ***flanged*** connection. The bottom of the landing base is welded (it can also be threaded) on to the surface casing. There is usually a threaded side outlet on the landing base. This threaded side outlet is for draining the BOP after it is installed.

Figure 1
Landing Base/Casing Head

Casing Hanger

A casing hanger (see figure 2) is a two-piece slip and seal assembly inserted into a landing base. A casing hanger is also installed into every casing ***spool***.

The slips suspend the casing so that the top of the casing can be cut above the slips. The seal then installs onto the top of the slips. The seal part of the casing hanger prevents wellbore pressure from reaching the space below the seal. It seals between the outside of the casing, and the inside ***profile*** of the landing base or casing spool.

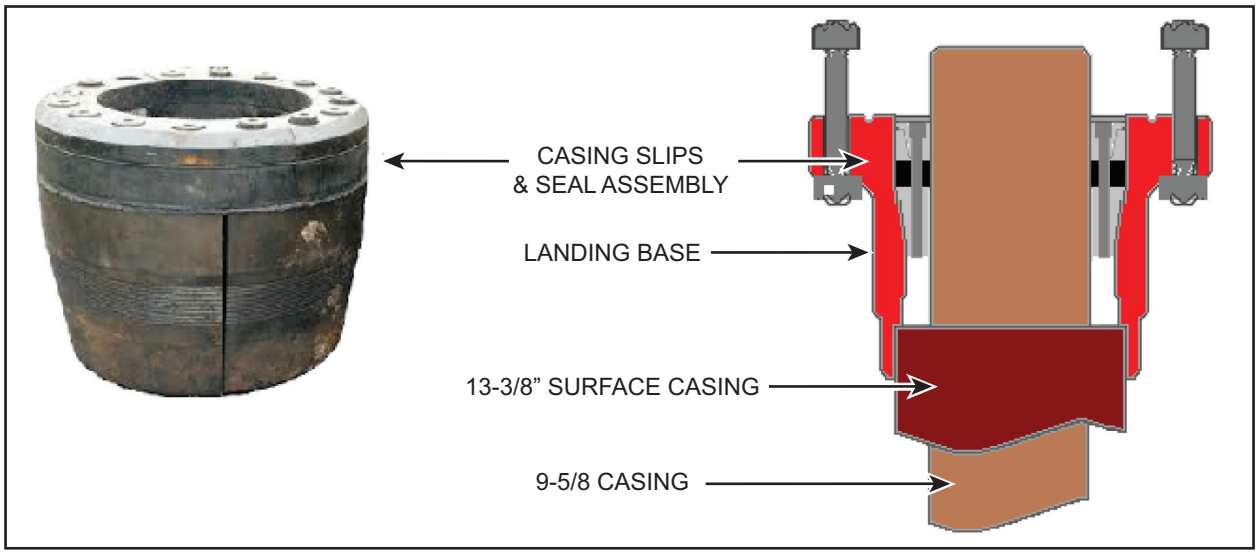

Figure 2
Casing Hanger/Slips and Seal Assembly

Casing Spools

A casing spool (see figure 3) is similar in design to a landing base. The casing spool has flanged connections instead of a welded connection. It is bolted to the top of the landing base after a string of casing has been run and cemented into the wellbore.

The casing spool will likely experience higher wellbore pressures, so the side outlets are flanges rather than threaded connections.

Figure 3
Casing Spool

The casing spool receives a casing hanger that supports the weight of the casing string. The casing spool seals off pressures between the different casing strings.

The casing spools are sized to the last casing that has been cemented into the well. The BOP and other well control equipment go on top and attach to the casing hanger with an ***adaptor***. A smaller and shorter BOP is often used as the well is drilled deeper.

The BOP is installed on the top of the casing spool.

Figure 4
Tubing Spool

TUBING SPOOLS

Tubing is run after the last casing string. The hydrocarbons flow up through the tubing to the surface when the well is ready to produce. The tubing spool is similar in design to the casing spool. It has lockdown screws for the tubing hanger in the upper flange, as shown in figure 4.

As shown in figure 5, the tubing spool receives and locks the tubing hanger that supports the weight of the tubing. The production tree attaches to the top of the tubing spool.

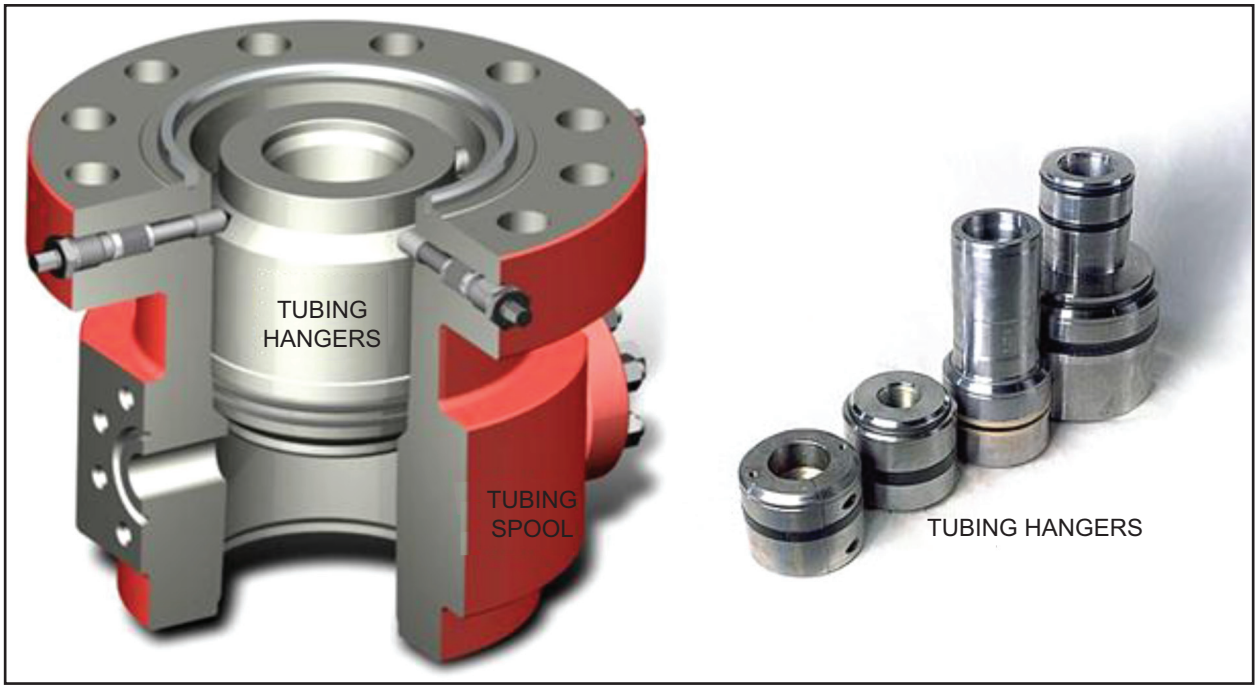

Figure 5
Tubing Hanger inside Tubing Spool

The tubing hanger has a seal that seals off against the tubing spool and tubing. This isolates the annulus below the tubing hanger. The side outlets on the tubing spool allow access to this annulus. The tubing hanger screws onto the tubing.

Production Tree

The production tree (also called Christmas tree or Xmas tree) uses heavy duty valves to control the flow of oil or gas out of the well (see figure 6). It also has an access point for equipment to service the well.

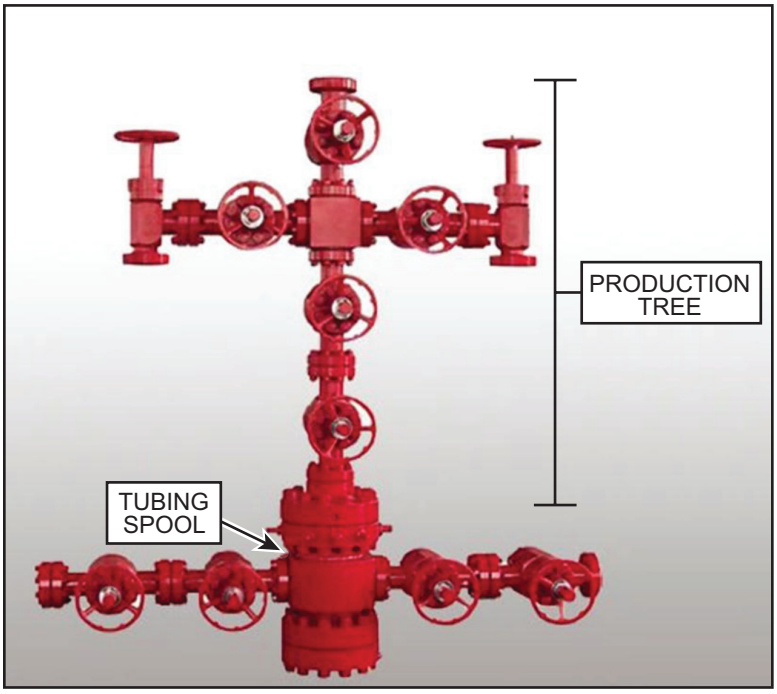

Figure 6
Production Tree

A pressure gauge is located on the top of the production tree. The pressure gauge lets the operator see if any gas passes up through the valves in the production tree.

When the well is ready to produce, and facilities are ready to receive oil or gas, the tree valves are opened. The formation fluids then flow through a flow line. The flow line leads to a processing facility, storage and/or other pipeline, eventually leading to a refinery or distribution center.

SUMMARY

You have learned about the main components of the wellhead equipment.

You know that the landing base is the first piece of wellhead equipment attached to the casing.

You know that the casing spool(s) get smaller as more casing strings are run into the hole.

The casing slips are inserted into the casing spool to hang off some of the weight of the casing.

The tubing spool holds the tubing hanger; and the tubing hanger holds the weight of the tubing in the hole.

The production tree controls the flow of oil or gas from the well towards the production facilities or pipeline. It also provides access to the well for servicing equipment.

EXERCISE A

Directions: *Answer the following questions.*

1. What is the first piece of wellhead equipment installed on a new well?

2. What is the main difference between a landing base and a casing spool?

3. What piece of equipment holds some of the weight of the casing and seals off different casing strings?

4. How does a tubing spool look different from a casing spool?

5. What is the function of the production tree?

PART II **OBJECTIVE 5.4.2**

Identify Installation Steps for a Landing Base Using a Land Rig

You have learned about the wellhead equipment. In this part, you will learn about the procedure steps to install a landing base (also called casing head).

INSTALL A LANDING BASE ON A LAND RIG

After the surface casing has been cemented into the wellbore, the landing base is installed onto the casing. The landing base is the first connection between the casing and the BOP. The procedure for installing a landing base includes:

- ❏ cut the casing
- ❏ position the landing base
- ❏ weld the landing base
- ❏ pressure test the weld

Cut the Casing

Before the landing base can be installed on top of the casing, the casing needs to be cut. The casing is cut near the bottom of the cellar as shown in the typical wellhead example in figure 7.

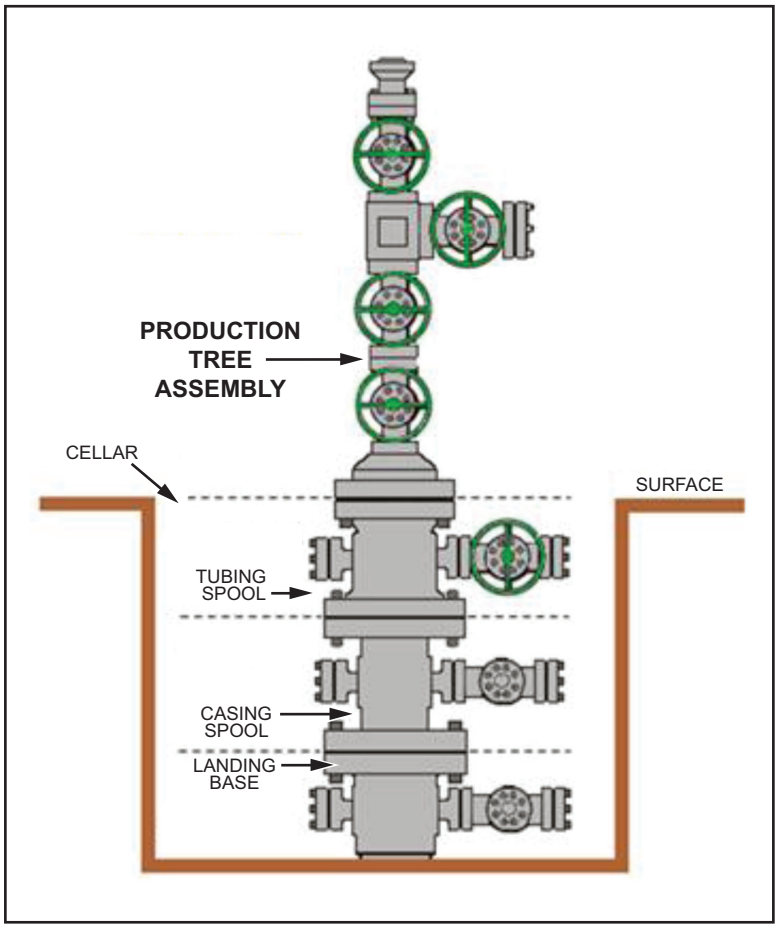

Figure 7
Typical Wellhead Assembly

A certified welder makes a rough cut on the casing. To do the rough cut, he measures the height he needs to weld the landing base onto the casing. Then he cuts the casing above that mark. He makes a small cut first to let any water drain from the casing.

When all the water has drained, rigmen use a pump to remove the water from the cellar. The water must be removed so that the welder can work on the landing base.

The welder completes his rough cut, and the cut off piece of casing is removed from the cellar. He then makes a final cut mark on the casing and cuts it to that height.

After the welder makes the final cut, he uses a grinder to clean off the casing and prepare it to be welded.

A rigman is required to serve as a fire watch for the welder. He must have a fire extinguisher and be with the welder while he cuts or welds.

Position the Landing Base

Once the casing has been cut and prepared, rigmen help position the landing base over the casing. This requires several rigmen and a hoist, usually from the rig floor, through the rotary table.

The landing base is picked up with a bolt chain sling. The bolts are placed on opposite sides of the flange. This allows the nuts to be tightened to adjust how level the landing base sits.

The welder makes sure the landing base is at the right height, and levels it before he welds.

Weld the Landing Base

The welder welds the landing base onto the casing on the outside and the inside as in figure 8.

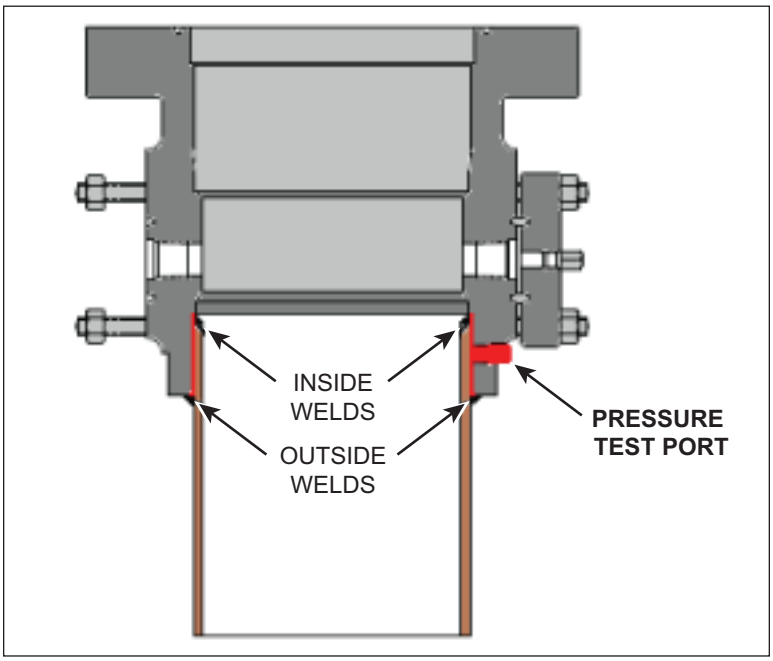

Figure 8
Weld Locations of Landing Base to Casing

Pressure Test the Weld

After the landing base is welded onto the casing, it is allowed to cool. The welder then connects a hydraulic hand pump to the landing base. The pump is used to pressure test the welds by pumping hydraulic oil in the space between the welds and holding pressure in the cavity (figure 8).

A pressure test ensures that there is a good seal on the landing base to the casing. After the BOP is installed, the landing base/casing head may be required to hold pressure during well control operations.

Once the test proves good, the welder removes the test pump and his tools. The landing base is now ready for installing a valve into the threaded outlet on the side. Then the BOP can be flanged to the top of the landing base.

SUMMARY

In this part of the module, you learned the procedure for installing a landing base onto the casing.

You learned that the casing has to be cemented into the ground. Then a hole is cut to drain the water from the casing. The water is removed from the cellar before cutting.

A rigman must be on fire watch duty, with a fire extinguisher, while the welder is working.

When the casing has been prepared, the landing base is picked up with a special sling and the rig floor hoist and positioned over the casing.

The welder makes sure the casing head is level before he welds it to the casing. There are two welds on the landing base, one on the outside and one on the inside.

The welds are pressure tested after they cool to make sure they can hold pressure. The pressure test is performed with a hydraulic pump.

EXERCISE B

Directions: *Answer the following questions.*

1. Why does the welder make a small hole in the side of the casing?

_____

_____

2. How long does a fire watch have to stay with the welder?

_____

_____

3. What safety tool must the fire watch have while working with the welder?

_____

_____

4. Why does the casing head get picked up with a bolt and chain sling?

_____

_____

5. What does the welder use to pressure test the welds on the casing head?

_____

_____

6. Why are the welds on the casing head pressure tested?

PART III **OBJECTIVE 5.4.3**

Identify Installation Steps for Casing and Tubing Spools Using a Land Rig

You have learned about the wellhead equipment and the procedure for installing a landing base. In this part you will learn about the procedures to install a casing spool, a tubing spool, and a tubing hanger.

INSTALLING A CASING SPOOL

After the intermediate string of casing is run and cemented into the wellbore, the next step is to install a casing spool on top of the landing base. To do this, the BOP has to be removed from the landing base. Once the casing spool is installed on the landing base, the BOP is installed on the casing spool.

The procedure for installing a casing spool includes:

- ❏ nipple down BOP
- ❏ set casing hanger/slips
- ❏ cut the casing
- ❏ nipple up casing spool
- ❏ nipple up BOP

NIPPLE DOWN BOP

Nipple down means to remove all the bolts on a flanged connection. When the bolts are removed, the BOP is lifted with the BOP hoist to access the inside of the landing base.

Set Casing Hanger/Slips

Once the BOP is lifted, a pressure washer is used to clean the inside of the landing base around the casing hanger profile as shown in figure 9.

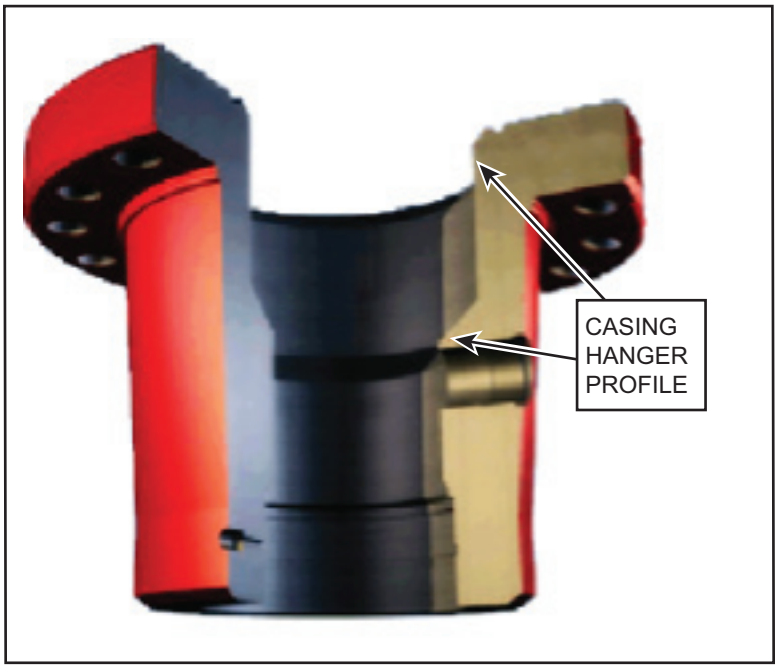

Figure 9
Clean the Casing Hanger Profile

The casing hanger slip assembly (see figure 10) has two hinged slip dies for gripping the casing.

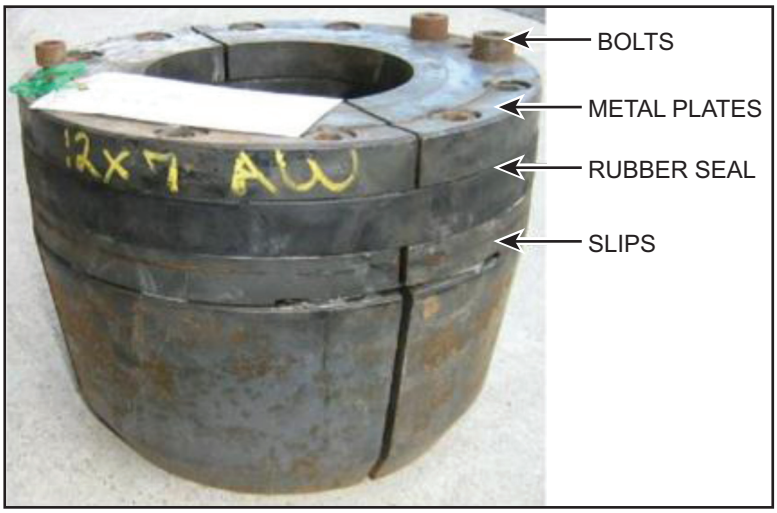

Figure 10
Casing Hanger

Once the hanger is lowered into the landing base profile, the driller lowers the casing string. This makes the slip assembly bite into the casing.

Cut the Casing

Once the slips are set and the casing is suspended by the hanger in the landing base, then a welder cuts the casing that is sticking up as in figure 11.

Figure 11
Casing Slip Assembly Set into Landing Base

The cut off piece of casing is removed using the rig floor hoist and a sling.

The welder removes all sharp edges from the casing that stick out of the slip assembly. A rubber seal is then installed over the casing and set into the profile of the casing hanger. The seal is expanded outward by tightening the bolts above the seal against metal plates (see figure 10).

Nipple Up the Casing Spool

Nipple up means making up all the bolts on a flanged connection. The casing spool attaches to the landing base with a flanged connection. The casing spool is lowered into place by using the bolt and chain sling and a hoist line through the rig floor.

The seal areas of the casing spool and landing base have to be cleaned thoroughly and a new seal ring installed. The bolts are tightened and the sling removed.

Pressure Test the Casing Spool

As shown in figure 12, the casing spool has a port on the side of the flange. The port allows the seals between the casing spool, hanger and the landing base to be pressure tested with hydraulic oil.

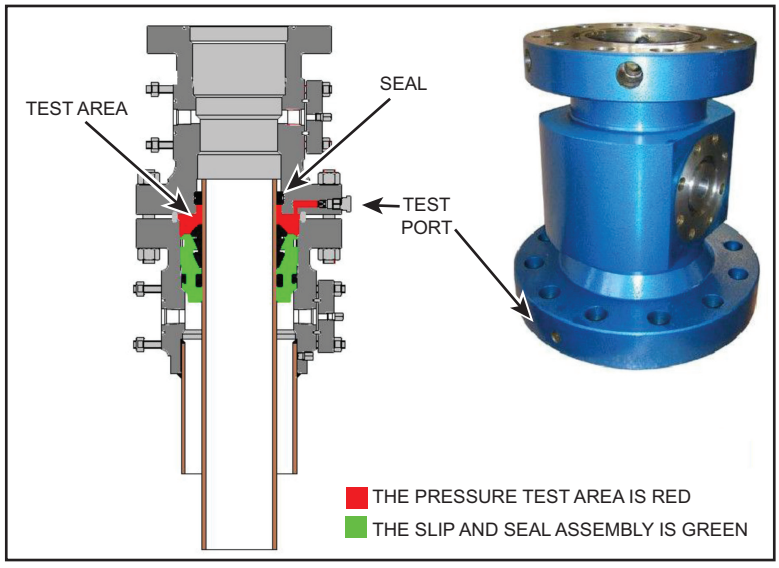

Figure 12
Pressure Test the Casing Spool

The flange between the casing spool and the landing base is tightened. A wellhead specialist, tests the seals on the flange, casing head and spool. He attaches a hydraulic pump to the port on the side of the flange. Then the space between the casing head and spool is pressurized and held for 15 minutes to observe for leaks.

Nipple Up the BOP

The BOP needs to be flanged to the top of the casing spool. Once the BOP has been tightened to the casing spool, the flanged connections are pressure tested before drilling operations can begin.

INSTALLING A TUBING SPOOL

The tubing spool installs onto the top of the casing spool. This is done after the last string of casing has been run into the wellbore and cemented.

Drilling then continues to the target depth. The production tubing is then installed into the tubing spool using the tubing hanger. The procedure for installing a tubing spool is similar to installing a casing spool, as listed in table 1.

INSTALLING A TUBING SPOOL
Nipple down BOP.
Set casing hanger/slips.
Cut the casing.
Nipple up tubing spool.
Nipple up BOP.
Pressure test flanged connections.

Table 1

The drilling operations continue after all the connections have been pressure tested.

INSTALL A TUBING HANGER

Production tubing is run into the well after it has been drilled to the planned depth. The tubing is installed into the tubing spool using the tubing hanger.

The main procedure for installing a tubing hanger includes:

- ❏ land the tubing hanger into tubing spool
- ❏ lock the tie-down bolts
- ❏ nipple down the BOP

Land the Tubing Hanger Into Tubing Spool

The tubing hanger is usually screwed onto the top of the tubing on the rig floor when the last joint of tubing is to be run into the hole. A short joint of tubing (called the landing joint) is screwed into the top of the tubing hanger but it is not fully torqued. The landing joint is used to lower the tubing and hanger into the tubing spool.

A rigman goes down into the cellar and opens a drain valve on the tubing spool. This allows the mud inside the BOP to drain below the profile in the tubing spool. The driller then lowers the tubing and hanger assembly (hanging by the landing joint) through the rotary table and the BOP.

Lock the Tie-Down Bolts

When the tubing hanger is landed in the tubing spool, rigmen tighten the tie down bolts on the top of the tubing spool.

The tie-down bolts hold the tubing hanger in place inside the tubing spool. They prevent the tubing hanger from coming out of the spool due to any high pressure pushing on the tubing from downhole.

When all the tie-down bolts are tightened, the landing joint is removed from the top of the tubing hanger. The landing joint is unscrewed with a chain tong on the ***stump*** sticking out of the rig floor.

Nipple Down the BOP

Once the landing joint is removed, a back pressure valve (BPV) is screwed into the top of the tubing hanger. This check valve can be pumped through in an emergency if a kick is encountered while removing the BOP.

Once the BPV (see figure 13) is installed, the BOP can be removed and stored for the next well. With the BOP removed, the tubing spool is ready to receive the production tree.

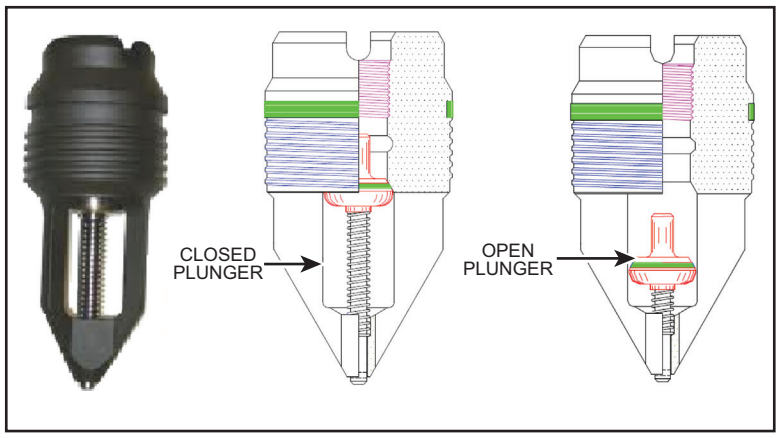

Figure 13
Back Pressure Valve

SUMMARY

In this part of the module, you have learned about the procedures to install casing spools and tubing spools.

You also learned about installing casing and tubing hangers.

You learned that the casing hanger is installed and the casing is cut before the casing spool is placed onto the landing base.

You learned that the connection between casing hanger, spool and the landing base are pressure tested to confirm that the seals are good. Then the BOP can be installed.

You also learned the BOP is lifted to install a casing hanger, but the tubing hanger is installed through the BOP.

You know that the BOP is installed on the casing hanger.

You also know a backpressure valve is installed in the tubing hanger before the BOP is removed.

EXERCISE C

Directions: *Answer the following questions or complete the statement.*

1. What should be done to the casing hanger profile before installing the casing hanger?

_____

_____

2. How does the driller make the slip assembly bite into the casing?

_____

_____

3. When is the seal assembly placed onto the casing hanger?

_____

_____

4. How are the seals on the casing spool tested?

_____

_____

5. Who tests the seals between the casing spool and the casing head?

_____

_____

6. What is the purpose of the tie down bolts, other than holding down the tubing hanger?

_____

_____

7. What equipment must be installed in a tubing hanger before the BOP can be removed?

_____

_____

PART IV **OBJECTIVE 5.4.4**

Identify Installation Steps for a Production Tree Using a Land Rig

You have learned about the wellhead equipment and the basic procedures for installing a landing base, casing and tubing spools.

In this part, you will learn about the procedure to install a production tree.

INSTALLING THE PRODUCTION TREE

After the tubing has been landed in the tubing spool, a backpressure valve is installed, and the BOP is removed. The production tree can then be installed onto the top of the tubing spool. The main procedure for installing a production tree includes:

- ❏ install the tubing bonnet
- ❏ lift the production tree
- ❏ install the production tree
- ❏ pressure test the production tree

Install the Tubing Bonnet

The tubing bonnet is a seal assembly that seals the top of the tubing hanger to the tubing spool. It is also the adapter that allows the production tree to be installed on the well.

The tubing bonnet is flanged to the tubing spool. The seals are pressure tested through a port in the flange (see figure 14). A hydraulic pump is used in the same way as testing the seals on the casing and tubing spools.

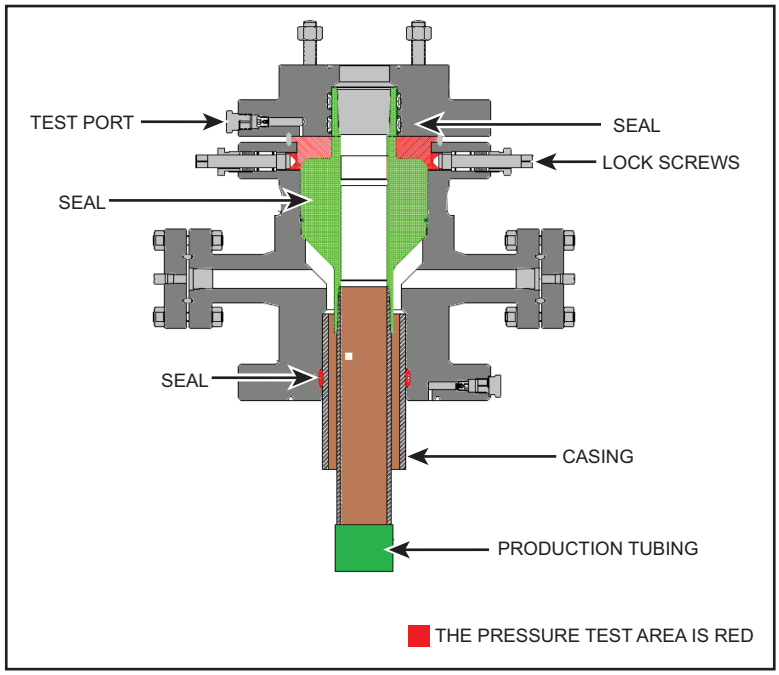

Figure 14
Pressure Test the Bonnet

Lift the Production Tree

The production tree (if installed when the rig is over the well) has to be installed using the rig floor hoist and slings. Because of the shape of the tree, more than one lift may be required to position the tree so that it hangs level.

When the tree is lifted and ready to be installed, the seal area on the tubing bonnet must be cleaned thoroughly and a new seal ring installed.

Install the Production Tree

When the seal areas are clean and a new seal ring is installed on the top flange of the tubing bonnet, the tree is lowered onto the bonnet. Once it is tightened to the bonnet the slings are removed.

Pressure Test the Tree

Once the tree flange is tightened to the bonnet, the production tree is pressure tested. The wellhead specialist removes the back pressure valve and installs a two way check valve (TWCV) as in figure 15. The TWCV prevents pressure from the pressure test from going through the valve and into the tubing, potentially damaging the string or the well.

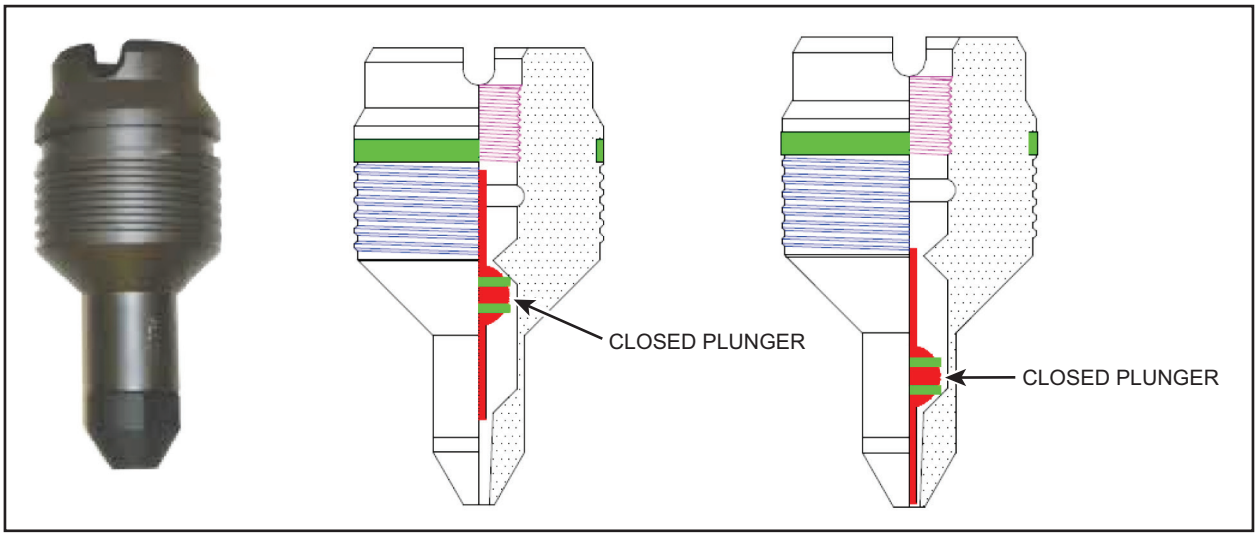

Figure 15
Two Way Check Valve

The wellhead specialist attaches the hydraulic test pump to a valve on the tree and pressure tests the tree. The pressure is held for about 15 minutes to check for any leaks. If the pressure stays constant over the test, the pressure is bled off and the test pump put away. All the valves on the tree are put into the closed position.

Rigmen can now begin rigging down the rig.

SUMMARY

In this part of the module, you have learned about the procedure for installing a production tree.

You learned that a bonnet seals to the top of the tubing hanger and the tubing spool. The bonnet is pressure tested before the tree is installed.

You also learned that a two way check valve is installed into the tubing hanger before the tree is pressure tested.

EXERCISE D

Directions: *Answer the following questions or complete the statement.*

1. What is the name of the adapter between the production tree and the tubing spool?

_____

_____

2. When does the back pressure valve get removed?

_____

_____

3. Why is a two way check valve used for pressure testing the tree?

_____

_____

4. When can you remove the lifting slings from the production tree?

_____

_____

Adaptor

A device that is used to connect two pieces of equipment that were not designed to be connected.

Flange

An edge that sticks out from the end of a pipe and is used to attach to another pipe.

Profile

A side view, or outline of an object or structure.

Spool

A fabricated section of a piping system that includes the pipe, fittings and flanges that are pre-assembled.

Stump

A part that remains after something has been removed.

MAXIMUM: 100

OBJECTIVE 5.4.1

Directions: *For questions 1 through 6, select the correct answer. (5 points each)*

1. The _____ is the first connection between the surface casing and any other wellhead equipment.

   a. blowout preventer

   b. production tree

   c. landing base

   d. tubing hanger

2. A _____ is inserted into the landing base and every casing spool.

   a. production tree

   b. casing hanger

   c. lockdown screw

   d. tubing spool

3. A _____ is bolted to the top of the landing base after the casing has been run and cemented.

   a. casing spool

   b. lockdown screw

   c. back pressure valve

   d. tubing hanger

4. The _____ has lockdown screws that hold the tubing hanger in place.

   a. casing spool

   b. tubing spool

   c. casing hanger

   d. production tree

5. The _____ uses heavy duty valves to control the flow of oil or gas out of the well.

   a. casing spool

   b. tubing hanger

   c. landing base

   d. production tree

6. The threaded side outlet on the landing base is used to drain the _____ when it is installed.

   a. BOP

   b. tree

   c. well

   d. tank

OBJECTIVE 5.4.2

Directions: *For questions 7 through 10, select the correct answer. (5 points each)*

7. The casing needs to be _____ before the landing base can be installed.

   a. removed

   b. cut

   c. painted

   d. filled

8. The landing base must be _____ before it is welded to the casing.

   a. level

   b. filled

   c. pressurized

   d. cut

9. The landing base is welded onto the casing in _____ locations.

   a. five

   b. one

   c. two

   d. four

10. A hydraulic hand pump is used to _____ the welds that hold the landing base on the casing.

    a. cool down

    b. heat up

    c. clean

    d. pressure test

OBJECTIVE 5.4.3

Directions: *For questions 11 through 17, select the correct answer. (5 points each)*

11. The _____ must be removed from the landing base before the casing spool can be installed.

    a. welds

    b. casing

    c. BOP

    d. flange

12. The intermediate casing hanger is set in the profile of the _____.

    a. tubing spool

    b. BOP

    c. landing base

    d. production tree

13. Once the casing in the landing base has been cut, and all the sharp edges removed, a _____ is installed over the casing.

    a. check valve
    b. back pressure valve
    c. hydraulic pump
    d. rubber seal

14. The casing spool is connected to the landing base with a _____ connection.

    a. push-fit
    b. threaded
    c. welded
    d. flanged

15. Production tubing is installed into the _____.

    a. tubing spool
    b. landing base
    c. production tree
    d. BOP

16. A _____ is used to lower the tubing and hanger into the tubing spool.

    a. landing joint
    b. casing joint
    c. drill bit
    d. drill collar

17. Once the _____ is installed into the tubing hanger, the BOP can be removed.

    a. production tree
    b. back pressure valve
    c. casing spool
    d. casing hanger

OBJECTIVE 5.4.4

Directions: *For questions 18 through 20, select the correct answer. (5 points each)*

18. The _____ seals the top of the tubing hanger to the tubing spool.

    a. landing base

    b. tubing bonnet

    c. production tree

    d. back pressure valve

19. The _____ is connected to the top of the tubing bonnet.

    a. casing spool

    b. blowout preventer

    c. landing base

    d. production tree

20. A _____ must be installed before the production tree can be pressure tested.

    a. TWCV

    b. BPV

    c. BOP

    d. BHA

Trainee name		Badge No.		Date		Score	

MAXIMUM: 100

OBJECTIVE 5.4.1

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   b. tubing spool
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   d. production tree

5. The _____ uses heavy duty valves to control the flow of oil or gas out of the well.

   a. casing spool
   b. tubing hanger
   c. landing base
   d. production tree

6. The threaded side outlet on the landing base is used to drain the _____ when it is installed.

   a. BOP
   b. tree
   c. well
   d. tank

OBJECTIVE 5.4.2

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7. The casing needs to be _____ before the landing base can be installed.

   a. removed
   b. cut
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8. The landing base must be _____ before it is welded to the casing.

   a. level
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9. The landing base is welded onto the casing in _____ locations.

   a. five
   b. one
   c. two
   d. four

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    b. heat up
    c. clean
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OBJECTIVE 5.4.3

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15. Production tubing is installed into the _____.

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16. A _____ is used to lower the tubing and hanger into the tubing spool.

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    b. casing joint
    c. drill bit
    d. drill collar

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    b. back pressure valve
    c. casing spool
    d. casing hanger

OBJECTIVE 5.4.4

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19. The _____ is connected to the top of the tubing bonnet.

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    b. blowout preventer
    c. landing base
    d. production tree

20. A _____ must be installed before the production tree can be pressure tested.

    a. TWCV
    b. BPV
    c. BOP
    d. BHA