

The Roughneck Training Handbook



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The Roughneck Training Handbook

First Edition

by Ron Baker



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Foreword

Just as the military is made up of soldiers who carry out the orders of high-ranking officers, so the petroleum industry is made up of workers who carry out the drilling plans of corporate executives. These workers perform their duties not in climate-controlled offices on the upper floors of buildings in metropolitan areas but on rig floors around the world, from the Sahara Desert to north of the Arctic Circle. While such workers are now classified using a more generalized term—rotary helpers—they have traditionally been known as roughnecks or floorhands, as they are referred to in this handbook.

At PETEX, we are now filling a gap in our catalog. Although we offer many books that are popular and well-regarded throughout the industry, as well as a series of videos (*Roughneck Training, Parts I–V*) meant to be used as training tools for people beginning work as rotary helpers, we did not have a collection of key information in book format that could be used as a handy reference and workbook for new floorhands. Now we do. *The Roughneck Training Handbook* is meant to fulfill an increasing need in an industry that is currently flourishing with new floorhands and rig activity to address the massive energy needs of our current society.

With this new handbook, we hope to provide an easy-to-use text that upholds our standards as a worldwide leader of learning content for the petroleum industry. And we also hope to educate the next generation of floorhands (roughnecks), whose labors move the industry forward.

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Preface

Handling tubular goods such as drill pipe and drill collars on a drilling rig is one of the most important jobs rig crewmembers perform. It is vital that crewmembers carry out this job correctly and safely. Drill pipe and drill collars undergo a considerable amount of arduous use under normal conditions when a well is drilled. Failure to run and handle tubulars properly can drastically shorten their useful life, which results in unnecessary expense to the drilling contractor. Even more critically, running and handling tubulars improperly can result in injuries and even fatalities among the crew.

The main purpose of *The Roughneck Training Handbook* is to describe and explain drill pipe, drill collars, and the tools used to work with such pipe, as well as the proper use and maintenance of both pipe and tools. Although the book was intended primarily for rig workers who have little or no experience on the rig floor, it can also benefit experienced rig hands who want to find out more about the pipe and pipe-handling equipment employed on the rig.

Over the years, many important technological advances have made the job of handling drill pipe and drill collars safer and less laborious. Consequently, every attempt was made to ensure that this book covered the latest in pipe-handling equipment and methods. Moreover, because not every rig utilizes the newest tools, the manual also covers traditional equipment and methods.

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About the Author

Ron graduated from The University of Texas at Austin in 1962, earning a B.A. degree. In 1963, he joined the Petroleum Extension (PETEX) as a photographer. His job was to travel to drilling rigs and other oilfield facilities to take pictures for slide-tape training programs and training manuals. He also wrote and directed audiovisual scripts for slide-tape programs, films, and videos that PETEX produced for oilfield training. He worked extensively with drilling and production personnel all over the world, both on land and offshore. In 1985, he became director of PETEX, which required him to work closely with many industry training organizations, including the American Petroleum Institute (API), International Association of Drilling Contractors (IADC), and Association of Energy Service Companies (AESC). In the course of his work, he traveled to locations all over the world to disseminate PETEX training programs and to assist companies in establishing oilfield training programs. Ron retired in 2003 but continues to work with oil and gas companies wherever his oilfield training skills are needed.



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Units of Measurement

Throughout the world, two systems of measurement dominate: the English system and the metric system. Today, the United States is one of only a few countries that employ the English system.

The English system uses the pound as the unit of weight, the foot as the unit of length, and the gallon as the unit of capacity. In the English system, for example, 1 foot equals 12 inches, 1 yard equals 36 inches, and 1 mile equals 5,280 feet or 1,760 yards.

The metric system uses the gram as the unit of weight, the metre as the unit of length, and the litre as the unit of capacity. In the metric system, 1 metre equals 10 decimetres, 100 centimetres, or 1,000 millimetres. A kilometre equals 1,000 metres. The metric system, unlike the English system, uses a base of 10; thus, it is easy to convert from one unit to another. To convert from one unit to another in the English system, you must memorize or look up the values.

In the late 1970s, the Eleventh General Conference on Weights and Measures described and adopted the *Système International (SI) d'Unités*. Conference participants based the SI system on the metric system and designed it as an international standard of measurement.

The Rotary Drilling Series gives both English and SI units. And because the SI system employs the British spelling of many of the terms, the book follows those spelling rules as well. The unit of length, for example, is metre, not meter. (Note, however, that the unit of weight is gram, not gramme.)

To aid U.S. readers in making and understanding the conversion system, we include the table on the next page.

English-Units-to-SI-Units Conversion Factors

Quantity or Property	English Units	Multiply English Units By	To Obtain These SI Units
Length, depth, or height	inches (in.)	25.4	millimetres (mm)
		2.54	centimetres (cm)
	feet (ft)	0.3048	metres (m)
	yards (yd)	0.9144	metres (m)
	miles (mi)	1609.344	metres (m)
		1.61	kilometres (km)
Hole and pipe diameters, bit size	inches (in.)	25.4	millimetres (mm)
Drilling rate	feet per hour (ft/h)	0.3048	metres per hour (m/h)
Weight on bit	pounds (lb)	0.445	decanewtons (dN)
Nozzle size	32nds of an inch	0.8	millimetres (mm)
Volume	barrels (bbl)	0.159	cubic metres (m ³)
		159	litres (L)
	gallons per stroke (gal/stroke)	0.00379	cubic metres per stroke (m ³ /stroke)
	ounces (oz)	29.57	millilitres (mL)
	cubic inches (in. ³)	16.387	cubic centimetres (cm ³)
	cubic feet (ft ³)	28.3169	litres (L)
		0.0283	cubic metres (m ³)
	quarts (qt)	0.9464	litres (L)
	gallons (gal)	3.7854	litres (L)
	gallons (gal)	0.00379	cubic metres (m ³)
	pounds per barrel (lb/bbl)	2.895	kilograms per cubic metre (kg/m ³)
barrels per ton (bbl/tn)	0.175	cubic metres per tonne (m ³ /t)	
Pump output and flow rate	gallons per minute (gpm)	0.00379	cubic metres per minute (m ³ /min)
	gallons per hour (gph)	0.00379	cubic metres per hour (m ³ /h)
	barrels per stroke (bbl/stroke)	0.159	cubic metres per stroke (m ³ /stroke)
	barrels per minute (bbl/min)	0.159	cubic metres per minute (m ³ /min)
Pressure	pounds per square inch (psi)	6.895	kilopascals (kPa)
		0.006895	megapascals (MPa)
Temperature	degrees Fahrenheit (°F)	$\frac{°F - 32}{1.8}$	degrees Celsius (°C)
Mass (weight)	ounces (oz)	28.35	grams (g)
	pounds (lb)	453.59	grams (g)
		0.4536	kilograms (kg)
	tons (tn)	0.9072	tonnes (t)
	pounds per foot (lb/ft)	1.488	kilograms per metre (kg/m)
Mud weight	pounds per gallon (ppg)	119.82	kilograms per cubic metre (kg/m ³)
	pounds per cubic foot (lb/ft ³)	16.0	kilograms per cubic metre (kg/m ³)
Pressure gradient	pounds per square inch per foot (psi/ft)	22.621	kilopascals per metre (kPa/m)
Funnel viscosity	seconds per quart (s/qt)	1.057	seconds per litre (s/L)
Yield point	pounds per 100 square feet (lb/100 ft ²)	0.48	pascals (Pa)
Gel strength	pounds per 100 square feet (lb/100 ft ²)	0.48	pascals (Pa)
Filter cake thickness	32nds of an inch	0.8	millimetres (mm)
Power	horsepower (hp)	0.75	kilowatts (kW)
Area	square inches (in. ²)	6.45	square centimetres (cm ²)
	square feet (ft ²)	0.0929	square metres (m ²)
	square yards (yd ²)	0.8361	square metres (m ²)
	square miles (mi ²)	2.59	square kilometres (km ²)
	acre (ac)	0.40	hectare (ha)
Drilling line wear	ton-miles (tn•mi)	14.317	megajoules (MJ)
		1.459	tonne-kilometres (t•km)
Torque	foot-pounds (ft•lb)	1.3558	newton metres (N•m)



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Introduction

Because this manual is intended for readers who might not have a great deal of knowledge about the process, it explains many terms that are unique to *rotary drilling*. It also describes the tools the rig crew uses to handle *pipe*, as well as the functions of various tools and the procedures during which such tools are required.

A rotary drilling rig is a complex assembly of tools and equipment that requires skilled personnel to operate. Although many capable people are needed for every drilling project, the members of the rig crew who are especially vital to the operation are those who work on or near the *rig floor*. The next chapters describe the various roles and responsibilities of the drilling crew and the important equipment they handle on the drilling rig on a daily basis. Each of these job roles plays an important part in the overall process of drilling a well, from setup to job completion. Today's roughnecks—a slang term for those rig crewmembers more commonly referred to nowadays as floorhands—are the backbone of the drilling operations. This text gives a firsthand account of the key tasks of floorhands and how their hard work integrates with the laborious process of successfully tapping underground targets of oil and gas.

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What Does a Roughneck Do?

In this chapter:

- Drilling crewmembers
- Crewmember tasks
- Types of tubulars

Drillers are in control of the rig. Their responsibilities include operating the rig's equipment and supervising the *floorhands* (also known as *roughnecks*). Floorhands are an essential working component of the drill crew. They take care of tasks associated with maintaining and cleaning the drill floor and all the drilling equipment, without which drilling would not—and could not—occur. The floorhands work on the rig floor during pipe-handling operations. During tripping operations, floorhands assist with safely and efficiently making up and breaking out the *drill string*. The senior floorhand usually maintains and monitors the important equipment that controls the solids, along with other activities onboard the rig.

Derrickhands are also supervised by drillers. They monitor and maintain the special fluid and related equipment required to drill a *well* with a rotary rig. In addition, derrickhands handle the upper end of the drill string when the crew removes pipe from, or puts pipe in, the *hole*.

The owner of the rig, typically a *drilling contractor*—a company that specializes in drilling oil and gas wells—expects crewmembers to use and properly maintain the tools required to carry out assigned tasks. These crewmembers include:

- *Driller*
- *Derrickhand*
- Floorhands (usually three), sometimes also called *rotary helpers*

The Drilling Crew



Drilling a Well in Stages

In this chapter:

- Steps of drilling a well
- Tools and devices for handling pipe
- Pipe delivery systems
- Walking rigs

Rig personnel do not normally drill a well in one step; in other words, they do not start the hole at the surface and drill it without stopping until they reach the targeted rock formation. Instead, primarily because of the characteristics of the rock formations that the wellbore penetrates, they drill the hole in steps or stages, including:

- Drilling the hole to a predetermined diameter and depth
- Stopping drilling temporarily when a section of hole is completed
- Removing the entire string of pipe from the hole
- Making up and lowering joints of relatively large diameter pipe, called *casing*, into the hole.
- Cementing the casing in place
- Running instruments called *logging tools* into the hole to check hole conditions

Casing lines the entire hole and, when properly *cemented* in place, it protects and isolates the rock formations behind it. After the casing is set and cemented, the crew can resume drilling or, after the final string of casing is run, begin completing the well.

Logging tools are electrical, acoustical, mechanical, or radioactive instruments that measure and record characteristics of the well itself and of the formations the hole penetrates. The logging tools create a *log*, which is a record of the tool's measurements. Knowledgeable personnel can examine and interpret logs to obtain vital information about the well's condition and the formations it has penetrated.

For reasons related to the type of rocks and the fluids the rocks might contain, the crew typically drills a well in three or more stages. They might drill, case, and cement three or more sections of hole until it bottoms out—in other words, until it reaches the formation of interest, which is usually the formation that the oil company believes contains *hydrocarbons* (oil, gas, or both).

Pipe Handling

Drilling a well in stages requires many pipe-handling tools to pull the drill string out and run it back into the hole. Pipe-handling tools include:

- Pipe makeup and breakout devices
- Rotating machines
- Pipe lifting tools
- Pipe suspension devices
- Pipe racking devices
- Pipe conveyors
- Vehicles

Pipe makeup and breakout devices include *tongs* or automated spinning and torquing equipment known as an *iron floorhand* (fig. 1). An iron floorhand is a large, self-contained machine mounted on the rig floor. When activated, it moves into position around the pipe joint to be made up or broken out. The device's built-in power tongs spin up and make up, or *break out* and spin out the joint.

It is important to note that, in the industry, iron floorhands are commonly known as *Iron Roughnecks*TM. However, because the term *Iron Roughnecks*TM is a trademarked name and refers to a specific product, the term iron floorhands is used throughout this book.



COURTESY OF BANDERA DRILLING COMPANY, INC.

Figure 1. Iron floorhand

Some crews use manual tongs (fig. 2) instead of an iron floorhand to *torque* the pipe. Tongs are large heavy-duty wrenches that floorhands use to make up and break out pipe. Floorhands manually handle and attach such tongs when making up and breaking out pipe. Even rigs with an iron floorhand usually maintain a set of manual tongs either as backup, should the iron floorhand malfunction at a critical time, or in case tongs are required in special situations.

On rigs with manual tongs only, crewmembers might use a *spinning wrench* or, in rare cases, a *spinning chain*. Before a joint can be *bucked up* (tightened), it must first be rapidly rotated, or *spun up*. A spinning wrench is a pneumatic or hydraulically powered device crewmembers use to rapidly rotate (spin) the male threads of one joint of pipe into the female threads of another joint of pipe. Air or *hydraulic* fluid drives hardened steel rollers that, when the wrench is latched around the pipe and actuated, contact and rapidly spin up the pipe.

A spinning chain is a length of chain that, when wrapped around a joint of pipe and rapidly pulled off the joint by a device on the rig called an *automatic cathead*, spins up a joint. Regardless of the tool used, crewmembers must spin up joints of pipe when they trip pipe and make connections.



COURTESY OF BANDERA DRILLING COMPANY, INC.

Figure 2. Manual tongs

Summary

- Drilling a well occurs in multiple steps or stages, including drilling to a predetermined depth and diameter, stopping drilling, removing the string of pipe from the hole, making up and lowering casing into the hole to protect its sides, cementing the casing in place, running logging tools to check hole conditions, and then resuming drilling.
- To make up and break out pipe from the hole, floorhands use tongs or, more commonly, automated spinning and torqueing equipment known as iron floorhands with built-in power tongs. Rigs with iron floorhands often maintain a set of manual tongs as backup or for special situations.
- Top drives are used by most of today's rigs, because they directly rotate the drill string using a powerful motor without requiring the swivel, kelly, and other rotating machinery of the rotary table.
- Delivering pipe joints from where they are stored in horizontal stacks to their vertical positions in the rig's derrick can be performed manually or automatically using an iron derrickhand and hydraulic catwalk. Both are remote-controlled devices that allow pipe to be raised from the pipe rack to the rig floor and vice versa, using moveable arms and a slanting catwalk.
- Crewmembers use a variety of tools to suspend the pipe in the hole while making up or breaking out pipe. These include manual slips, a rugged wedge-shaped device with three segments with handles, and pneumatically or spring-operated power slips. They also use elevators, a set of hinged clamps attached to bails.
- Joints of drill pipe and drill collars are stored on horizontal pipe racks at the rig's location. They can be moved from one place to another on the rig location using a forklift driven by a qualified, certified crewmember.
- Walking rigs are increasingly common because they can be remotely controlled to walk from one hole to another on hydraulic feet, instead of needing to be disassembled and reassembled between holes.

About the Drill String

In this chapter:

- Making a connection
- Procedure for making a trip
- Laying down pipe
- Drill string joints and stands
- Kelly rotating systems and components

Making a connection occurs as the hole is drilled deeper and involves adding a joint or joints of pipe to the string of pipe to deepen the hole. Rig crews use top drives (or conventional swivels and kellys), iron floorhands, tongs, iron derrickhands, hydraulic catwalks, and slips to make a connection and to *make a trip*. In addition, top drives also rotate the drill string and bit drill when the bit is *on bottom* and drilling.

Making a trip entails *hoisting* the drill string out of the hole and then running it back into the hole. To trip pipe, crewmembers use iron floorhands or tongs to make up and break out joints of pipe while the slips suspend the drill string in the hole. As pipe comes out of the hole, they break it out; as pipe goes back in, they make it up.

One of the most common reasons to make a trip is to change the drill bit (fig. 16). It can become dull, or the characteristics of the rocks being drilled can change so that using a different type of bit becomes necessary. In either case, the crew performs the following procedure:

1. Pull the pipe out of the hole.
2. Remove the old bit.
3. Put a new bit on the drill string.
4. Run the assembly back into the hole to continue drilling.

Tripping



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Figure 16. Drill bit

Laying Down Pipe

When the crew finishes drilling a well, they lay down pipe. They pull pipe from the hole and place it on a pipe rack one joint at a time. On land rigs, the rack supports the joints of pipe to keep them off the ground. Once the pipe is on the rack, workers can use a forklift to load it onto trucks and move it to a new drilling location. On offshore rigs, racks keep the joints of pipe off the deck, and cranes load it onto work boats to move it to a new drilling location. On large offshore rigs, the pipe remains stored on the rig as it is moved to a new drilling location.

Drill String

Joints

A typical drill string consists of several joints of drill pipe and drill collars. For example, a well 10,000 feet (3,000 metres) deep could have over 300 joints of drill pipe making up most of the drill string. The remainder would consist of the thick-walled drill collars to put weight on the bit to make it drill. A drill string usually also includes several joints of *heavyweight drill pipe* that the crew makes up in the string between the stiffer drill collars and the more limber drill pipe. By placing heavyweight drill pipe in this area of the drill string, the crew can prevent the failure of regular drill pipe. Heavyweight pipe provides a flexible transition between the drill collars and the drill pipe, which reduces drill pipe failures as it is rotated.

In directional drilling, instead of drill collars, the rig crew typically places heavyweight drill pipe below regular-weight drill pipe to put weight on the bit. Heavyweight pipe is more flexible than drill collars and can therefore go through curved-hole sections easier than drill collars can.

Stands

The crew typically *pulls out* (removes) and *runs in* (inserts) drill pipe and drill collars in stands. On large offshore rigs, a stand might consist of four joints, whereas on small- or medium-sized land rigs, a stand might be made up of only two joints. Traditionally, a typical stand consists of three joints of Range-2 drill pipe, which is 27 to 30 feet (8.2 to 9.1 metres) long. Therefore, such a stand is 81 to 90 feet (24.7 to 27.4 metres) long. Usually, however, for convenience, personnel simply consider a three-joint stand to be 90 feet (27.4 metres) long. Many rigs still run pipe in three-joint stands; however, many do not, so bear in mind that stand length varies. However, regardless of the stand's length, pulling drill pipe and drill collars in stands means crewmembers can run pipe in and out of the hole more quickly than running it in and out one joint at a time.



How a Rig Drills

In this chapter:

- Structures of a rig's hoisting system
- Tong components
- Slip types
- Proper usage and inspection of slips

To understand how rig crews handle pipe on a rig when they make a connection or trip pipe in and out of the hole, it is necessary to know more about how a rig drills. For example, when tripping pipe or making a connection, the rig's hoisting equipment comes into play. A rig's *hoisting system* is somewhat like a vertical version of a horizontal construction crane you see at a building site. Just as a crane uses a *block and tackle* to raise and lower heavy loads, so does the rig's hoisting system.

A rig's hoisting system (fig. 21) consists of the following:

- Drawworks—a large hoist usually driven by powerful electric motors
- Drilling line—strong, thick wire rope that is spooled around a *drum* in the drawworks
- *Mast* or derrick—the tall steel structure that is so distinctive on drilling rigs
- *Crown block*
- Traveling block

Hoisting System

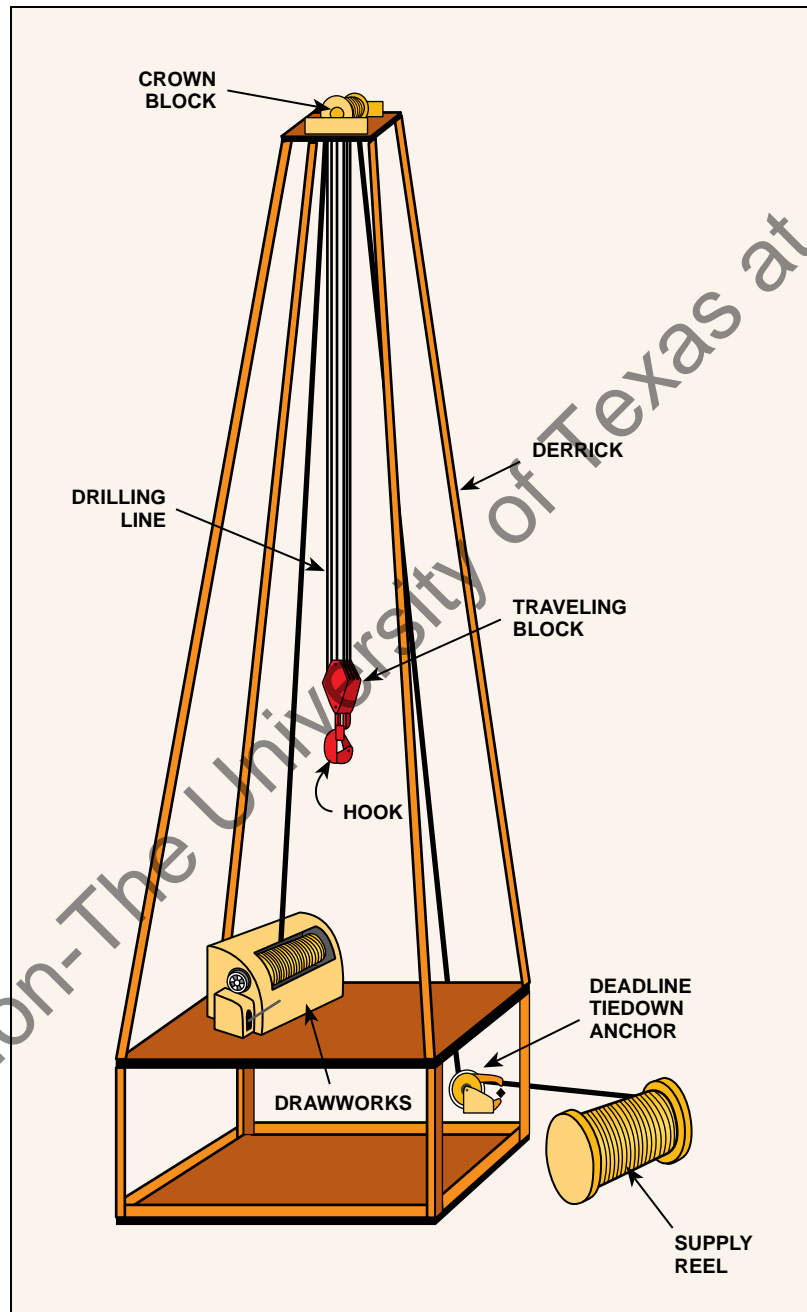


Figure 21. Rig boisting system



Making a Round Trip

In this chapter:

- Safety measures on a rig
- Preventing kicks and blowouts
- Making up and breaking out pipe
- Tripping in and out of the hole
- Components of bottomhole assemblies
- Drill bit types and tools

To understand how crewmembers employ the hoisting system, top drives, tongs, slips, and other equipment, consider a typical job of tripping the drill string out of and back into the hole (otherwise known as making a *round trip*). The rig crew should conduct a pre-job safety meeting before beginning the trip and monitor several factors during the procedure:

- Check tools and equipment.
- Monitor for kicks.
- Watch mud levels.
- Watch for swabbing in of fluid.
- Control flowing fluid.
- Monitor the trip tank.
- Keep the drill floor mud-free.

Pre-Job Safety Meetings

An important first step for all crewmembers is to conduct a pre-job safety meeting on the rig floor. The concept behind this safety meeting is that the rig crew—which typically includes the driller, the derrick-hand, and the floorhands—can discuss details of the upcoming job (in this case, tripping pipe). As the immediate supervisor on the floor, the driller should point out the duties required of each person involved in the task. He or she should explain exactly what each crewmember will do and what tools they will use to do it. If crewmembers have questions or comments, this meeting is the time for them to bring them up. A pre-job safety meeting prepares the crew for the upcoming trip and helps ensure that everyone knows what is expected of him or her during the job.

Checking Tools and Equipment

An equally important step is for crewmembers to check that all their tools and equipment are in good working condition and are lubricated as required. Furthermore, they should be sure that all the required tools and materials are available for the trip. For example, they should place a full-opening drill stem *safety valve* (fig. 44) near the rotary table.

The valve should be in its open position so that it can be inserted into the drill string when drilling fluid is flowing from the drill string. Its threads should also be compatible with the threads of the tool joints in use. A full-opening safety valve is a valve that, when stabbed into a drill pipe joint, made up, and then closed, stops the flow of drilling fluid from the drill string. Drilling fluid can flow out of the drill string if the hole has penetrated a rock formation that contains high-pressure fluids and if crewmembers fail to keep the hole full of drilling fluid during the trip.



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Figure 44. Safety valve on the rig floor

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Making a Connection

In this chapter:

- Procedure for making a connection
- Conventional and hydraulic catwalks
- Importance of the mousehole
- Top drives, kelly drives, and iron derrickhands

As previously mentioned, the floor crew makes a connection as the hole is drilled deeper. Making a connection can be defined as adding a joint (or joints) of drill pipe to the drill string as the hole is deepened. For example, if the rig is drilling with 30-foot (9-metre) joints of pipe, then, about every 30 feet (9 metres), the floorhands must add an additional joint of pipe for drilling to continue. In some cases, especially on large rigs with top drives, the crew can make up stands of pipe, set them back in the derrick (or place them on a hydraulic catwalk), and add them to the string as drilling progresses. Connecting stands instead of joints means the rig can, for example, drill down three 30-foot (9-metre) joints before making a connection, which is more efficient than adding one joint at a time.

To understand how to make a connection, it is necessary to learn about a few more tools and devices employed by crewmembers on a rotary rig. Drill pipe that the crew adds to the drill string to make a connection is usually stored on a pipe rack, which, in the case of land rigs, is set up on the ground near the rig. As mentioned earlier, a pipe rack consists of several steel tubes welded together to provide support for several joints of pipe. The crew positions the rack so that it is easy for them to roll a joint from the rack onto the rig's catwalk.

Conventional Catwalks

A conventional catwalk is a horizontal steel deck that rests at the base of a pipe ramp, or slide. One end of the pipe ramp is attached to the catwalk while the other end slants upward to the rig floor. The crew places the drill pipe joint onto the pipe ramp prior to making a connection.

The upper end of the pipe ramp rests at the base of the rig's *V-door*, a tall opening in a side of the derrick. Manufacturers build the derrick so that the girders and beams that the derrick is made of create an opening tall and wide enough to accommodate the joints of pipe and other tubulars that must pass through the derrick and to the rotary table. The V-door is on the opposite side of the rig floor from the drawworks. The name for the V-door comes from the fact that on the old standard derrick, the shape of the opening looked something like an inverted V.

Mousehole

Another feature on the rig floor related to making a connection is the *mousehole* (fig. 70), which is required on rigs that do not have an iron derrickhand-hydraulic catwalk arrangement. A mousehole is an opening in the rig floor, usually lined with relatively lightweight pipe, into which the crew lowers a joint of pipe that is to be made up in the string when it is time to make a connection. In short, the joint of pipe is stored in the mousehole until crewmembers are ready to connect it to the string.

As mentioned earlier, a rathole is also part of the rig floor. However, unlike the mousehole, which is usually flush with the floor, the rathole is usually lined with casing that projects a few feet above the floor. On rigs with a kelly drive, the crew stores the kelly and swivel in the rathole when they are tripping pipe.

Inserting Pipe into the Mousehole

To make a connection on rigs with a kelly-drive rotating system or a top drive, a joint of pipe should be in the mousehole where it is readily accessible to the crew when the kelly or a joint of pipe is *drilled down*. The kelly or joint is drilled down as the hole gets deeper. When almost the entire length of the kelly or the pipe approaches the top of the kelly bushing or, in the case of top drive rigs, when the pipe is close to the rotary table, it is time to make a connection.



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Figure 70. Mousehole

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Laying Down Pipe

In this chapter:

- Procedure for laying down pipe
- Using the hydraulic catwalk
- Other methods for laying down pipe

Laying down pipe is a job the crew performs when they have finished drilling the well and the rig is ready to be rigged down and moved to another drilling location. The job involves removing the drill string from the hole, one joint at a time, and placing each joint on the pipe rack where all the joints can be loaded on a truck for the move to the next location.

Before beginning the job, it is good practice to have a pre-job safety meeting. This provides an opportunity for the driller to explain exactly what the job entails and what actions are expected from each crewmember. Moreover, a meeting gives crewmembers a chance to comment on the upcoming job and to ask questions they might have.

Preparation

The crew should also ensure that the tools and materials required for the job are available and ready to use. For example, a bucket of good-quality pipe dope along with the brush needed to apply it should be available. In addition, the crew should place a drill pipe safety valve in the open position in a place on the rig floor that is easily accessible. Furthermore, it is good practice to have a container of *thread protectors* on the floor so that the crew can screw them onto the pin and box threads as they remove the pipe. A thread protector is a fitting that, when screwed onto the pin or box after a joint is pulled out of the hole, keeps the threads from being damaged as the pipe is handled (fig. 77).

Crewmembers should also check and lubricate equipment such as the top drive, tongs, slips, elevators, and rotary table to ensure they are in good working order. The crew should carry out any required maintenance on the tools and equipment and install a pipe wiper in the rotary table to remove any drilling fluid clinging to the outside of the pipe, as well. In addition, a freshwater hose should be available so a crewmember can hose down the outside of the pipe as it comes out of the hole. Lastly, if a joint of pipe remains in the mousehole, the crew should remove it and place it on the pipe rack.



Figure 77. *Thread protector on threads*

How to Lay Down Pipe

The crew begins laying down pipe on a kelly-drive rig or on a top-drive rig that does not have a hydraulic catwalk or an iron derrickhand as follows:

1. Crewmembers set the slips to suspend the pipe string in the rotary and break out the top drive or the kelly and swivel. On a rig with a kelly drive, the kelly and swivel are stored in the rathole.
2. The floorhands then dope the box threads of the pipe joint hanging in the rotary table and screw in a box thread protector.
3. The crew latches the elevators onto the tool joint in the rotary table, and the driller raises the string until the next tool joint clears the rotary.
4. A crewmember washes off the pipe's body with fresh water from a hose as the driller raises the joint.
5. Floorhands then set the slips and break out the joint, using an iron floorhand or manual backup and breakout tongs.
6. The driller then spins out the joint using the top drive motor or rotary table on rigs with a kelly-drive system.

At this juncture, crewmembers can employ one of three methods for laying down pipe. Some rigs use a hydraulic catwalk, while others—mostly small land rigs—still use one of two traditional methods, which are more labor intensive in that the floorhands have to manually move the pipe from the rig floor to the pipe rack.

Conclusion

It is demanding work using top drives, iron floorhands, manual tongs, iron derrickhands, slips, and other rig equipment to make a connection, trip, and lay down pipe. It is crucial for all members of the drilling crew to understand how to use and maintain their tools safely and competently. A rig floor crew and the derrickhand (usually a five-person team) must work together to ensure that the tasks they perform go smoothly and without unreasonable delays. The key to achieving the goal of good teamwork depends on many things, including training, experience, and a willingness to do the job right. Therefore, crewmembers must learn as much as they can about the jobs they are expected to perform and the tools used to do them.

Glossary

air hoist *n*: a hoist operated by compressed air; a pneumatic hoist. Air hoists are often mounted on the rig floor and are used to lift joints of pipe and other heavy objects.

A

annular space *n*: 1. the space that surrounds a cylindrical object within a cylinder. 2. the space around a pipe in a well-bore, the outer wall of which may be the wall of either the borehole or the casing; sometimes termed the annulus.

annulus *n*: see *annular space*.

automatic cathead *n*: see *makeup cathead*.

backup tongs *n pl*: the tongs latched on the drill pipe joint hanging in the rotary by the slips, used to keep the pipe from turning as the makeup or breakout tongs (the lead tongs) apply torque to make up or break out the tightened tool joint connection. Compare *lead tongs*.

B

bail *n*: 1. a cylindrical steel bar (similar to the handle or bail of a bucket, only much larger) that supports the swivel and connects it to the hook. Sometimes, the two cylindrical bars that support the elevators and attach them to the hook are called bails or links. 2. the U-shaped handle on a nozzle used to close a valve that shuts off water flow when pushed forward. *v*: to recover bottomhole fluids, samples, or drill cuttings by lowering a cylindrical vessel called a bailer to the bottom of a well, filling it, and retrieving it.

BHA *abbr*: bottomhole assembly.

bit *n*: the cutting or boring element used in drilling oil and gas wells. The bit consists of a cutting element and a circulating element. The cutting element is steel teeth, tungsten carbide buttons, industrial diamonds, or polycrystalline diamonds (PDCs). These teeth, buttons, or diamonds penetrate and gouge or scrape the formation to remove it. The circulating element permits the passage of drilling fluid and utilizes the hydraulic force of the fluid stream to improve drilling rates. In rotary drilling, several drill collars are joined to the bottom end of the drill pipe column, and the bit is attached to the end of the drill collars. Drill collars provide weight on the bit to keep it in firm contact with the bottom of the hole. Most bits used in rotary drilling are roller cone bits, but diamond bits are also used extensively.

bit breaker *n*: a special device that fits into a bit breaker adapter (a plate that goes into the rotary table) and conforms to the shape of the bit. Rig workers place the bit to be made up or broken out of the drill stem into the bit breaker and lock the rotary table to hold the bit breaker and bit stationary so that they can tighten or loosen the bit.

Review Questions

- _____ 1. The slang term *roughnecks* refers to—
- tubulars.
 - trainers.
 - floorhands.
 - backups.
- _____ 2. A set of hinged clamps called _____ make it possible to raise and lower pipe in the derrick.
- pipe racks
 - hooks
 - forklifts
 - elevators
- _____ 3. Which of the following is a pipe-related task that drilling crewmembers perform?
- Handling the tubulars needed to drill a well
 - Monitoring for kicks
 - Erecting the derrick or mast
 - Moving the rig to a new location
- _____ 4. _____ is the practice of coating pipe threads or slips with a good-quality anti-seize lubricant.
- Casing
 - Doping
 - Fitting
 - Cementing
- _____ 5. The length of a standard drill collar joint ranges from—
- 18 to 22 feet (5.5 to 6.7 metres).
 - 25 to 27 feet (7.6 to 8.2 metres).
 - 30 to 31 feet (9.1 to 9.5 metres).
 - 40 to 42 feet (12.2 to 12.8 metres).
- _____ 6. Which statement about drilling a well is true?
- The types of rock and the fluids the rock may contain do not affect the process of drilling the well.

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