International Well Control Forum

Introduction to
Rotary Drilling Well Control

Surface & Subsea BOP Stack
Certification Syllabus

1st April 2009
Version 2.1

Introduction to Rotary Drilling Well Control - Written Test Syllabus

Surface & Subsea BOP Stack Standards and Performance Criteria

Syllabus Structure

This syllabus has been designed for Floor-hands and Derrickmen, and covers those aspects of Well Control with which these persons should be familiar.

There is no 'practical assessment exercise' on a simulator in this certification programme.

The Written test section is divided into Surface BOP operations and Subsea BOP operations.

Candidates being tested to this syllabus may take a Surface BOP Operations test or a Combined Surface BOP and Subsea BOP operations test.

Written Test Syllabus

Surface Equipment

A. Blowout Preventers.
B. BOP Control Systems.
C. Chokes and Manifolds.
D. Auxiliary Equipment.

Surface Principles & Procedures

E. Shaker House Operations, Mud Pit Management, Trip Tank Management. Leak-Off Test/MAASP.
F. Primary Well Control, Causes of Kicks, Normal & Abnormal Pressures, Gas Cutting, Lost Circulation, Kicks as a result of Surface Initiated Actions.
G. Kicks while Drilling: -
Early Warning Signs, Positive Kick Signs, Kicks while Tripping.
H. Shut in Procedures
K. Well Control Methods.
L. Kill Sheet Exercises.
N. Well Control Management.

Subsea Equipment

SA. Blowout Preventers.
SB. BOP Control System.
SC. Chokes and Manifolds.

Subsea Principles & Procedures

SE. Slow Circulating Rates.
SF. Causes of Kicks.
SG. Kicks while Drilling.
SH. Shut in Procedures.
SK. Kill Handling Methods.
SL. Kill Sheet Exercises.

Standards

The standards in the syllabus are based on the practical skills and knowledge required when drilling wells of all known geometries.

Performance Criteria

Performance criteria have been developed for each of the standards contained in the syllabus. The criteria indicate how each standard is to be tested, and is the basis on which written test questions are developed.

The importance of each standard in the syllabus is indicated by a ranking number of 1 – 5. This number appears in the Value column of the syllabus.

Written Examination

The Written Examination is available as a Surface BOP or Combined Surface/Subsea BOP programme. And each programme consists of two papers; Equipment and Principles & Procedures.
Initially, candidates will be allowed one hour to complete the Equipment Papers and one and a half hours to complete the Principles & Procedures paper.

Certification

Successful candidates in the written test programme will receive an IWCF certificate with a validity period of six years.

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	Standard	Performance Criteria
BLOWOUT PREVENTERS		
	Connections	
A 01.01	To know the different types of flanges, hub connections and ring gaskets	From diagrams or descriptions identify different types of connections and ring gaskets and their purpose.
	Ram type preventers	
A 02.01	To be able to distinguish between sealing elements and know how to instal them correctly.	From a diagram recognise the different types of sealing elements and describe correct installation procedure.
A 03.01	To be able to recognise BOP ram type preventers.	From a diagram or description identify BOP ram type eqipment and components.
A 04.01	To know the basic operating principles of BOP ram type equipment.	Identify basic operating principles of BOP ram type equipment.
	Blind/shear preventers	
A 05.01	To be able to recognise the BOP blind/shear ram equipment.	From a diagram or schematic drawing identify the different components of BOP blind/shear ram equipment..
A 05.02	To know the basic operating principles of BOP blind/shear equipment.	Identify basic operating principles of BOP Blind/Shear equipment.
	Annular preventers	
A 06.01	To be able to distinguish between different sealing elements and know how to install them correctly.	Recognise different types of sealing elements on schematic diagrams and describe correct application.
A 07.01	To be able to recognise the BOP annular equipment.	From a diagram or schematic drawing identify the main components.
A 07.02	To know the basic operating principles of BOP annular equipment.	Identify basic operating principles of BOP Annular equipment.
	Side outlet valves	
A 08.01	To know the correct locations for remotely operated side outlet valves, check valves and other valves.	From a piping layout diagram, indicate the position of certain valves.

	Standard	Performance Criteria
BLOWOUT PREVENTERS		
	Inside BOP's & kelly cocks	
A 09.01	To be able to check that Full Open Drill Pipe Safety Valves (DPSV) and inside BOPs (IBOP) have compatible thread connections with the tubulars in use.	Given specific information of tubular thread connections in use, identify compatibility with the Full Opening Drill Pipe Safety Valves (DPSV) and inside BOPs (IBOP) and possible crossovers required to make up an assembly.
A 10.01	To be able to describe and recognise the elements of Inside BOP and Drill Pipe Safety Valves.	Identify components from a schematic drawing or an equipment specification.
A 11.01	To understand the purposes of the Inside BOP and Drill Pipe Safety Valves in use on the rig.	Identify the use and installation of Inside BOPs and Drill Pipe Safety Valves.
	Diverters	
A 12.01	To be able to describe and recognise the components of a diverter.	Identify components parts from a diagram or schematic drawing.
A 12.02	To understand the purpose of a diverter.	From a specific equipment layout, list the operating principles and the sequence of opening and closing the different components.

	Standard	*Performance Criteria*
BOP CONTROL SYSTEMS & REMOTE CONTROL PANEL		
B 01.01	To be able to recognise the main components of a BOP Control System.	From a diagram or description, identify the main components of a BOP Control System..
B 01.02	To understand the basic operating principles of the BOP Control System.	From a diagram or description, identify and describe the operating principles of a BOP Control System.
B 02.01	To understand the general operating principles of the remote control panel when drilling with a surface installed BOP.	From a diagram or description, identify and describe the operating principles of the remote control panel.
B 03.01	To know the normal operating pressures in the system	From a diagram or description, describe the normal operating pressures for all circuits in the control system.

	Standard	Performance Criteria
CHOKE MANIFOLDS & CHOKES		
	Routing of lines	
C 01.01	To know what alternative circulating paths exist from the pump through the choke manifold to the disposal system.	From a simple diagram of the piping system for the choke and standpipe manifold with valves, indicate possible valve status for a specific circulating path.
	Adjustable and fixed chokes	
C 02.01	To understand the difference between adjustable chokes and fixed chokes.	Describe the operating principles and use of adjustable chokes and fixed chokes.

	Standard	Performance Criteria
AUXILIARY EQUIPMENT		
	Mud/gas separators	
D 01.01	To understand the operating principles of Mud/Gas Separators.	From a diagram of a Mud/Gas Separator configuration, indicate the flow-paths and describe the function of each connected line.
	Vacuum degasser	
D 02.01	To understand the application of a Vacuum Degasser.	Describe the application of Vacuum Degassers.
INDICATORS		
	Mud flow indicators	
D 03.01	To understand the purpose and use of a mud flow indicator.	Describe the application of a mud flow indicator.
	Mud pit level indicators	
D 04.01	To understand the purpose and use of a mud pit level indicator.	Describe the application of a mud pit level indicator.

	Standard	Performance Criteria
SHAKER HOUSE OPERATIONS		
E 01.01	To understand the importance of accurately recording of the return mud weight from the well.	Demonstrate understanding of the affect that return mud weight has on bottom hole pressure.
E 01.02	To understand the importance of monitoring flow rates.	Demonstrate understanding of monitoring flow rates..
E 01.03	To understand the importance of environmental concerns.	Demonstrate understanding of environmental concerns.
E 02.01	To understand the importance of identifying changes in cutting size and shape.	Demonstrate understanding of the effects of changes in cutting size and shape.
E 02.02	To understand the importance of gas cut mud.	Demonstrate understanding of gas cut mud.
E 02.03	To understand the importance of mud cleaning equipment.	Demonstrate understanding of mud cleaning equipment.
MUD PIT MANAGEMENT		
E 03.01	To understand the circulating system.	To be able to list the mains sections of the mud circulation system.
E 03.02	To understand the importance of a proper line-up for the current operation.	Given the description of an operation, demonstrate a proper line up on a diagram.
E 03.03	To understand the importance of communication in relation to the transfer of mud, which will affect the active pit voume.	Demonstrate understanding of the importance of communication in relation to the transfer of mud, which will affect the active pit voume.
E 03.04	To understand the importance of communicating any changes to mud properties, e.g density, viscocity.	Demonstrate understanding of the importance of communicating any changes to mud properties.
E 04.01	To understand why accurate recording of mud pit density is important.	Demonstrate understanding of mud density influence on bottom hole pressure.
E 04.02	To understand why accurate recording of mud pit levels is important.	Demonstrate understanding of the importance of recording mud pit levels.

	Standard	Performance Criteria
MUD PIT MANAGEMENT		
E 04.03	To know the volume of drilling mud returned to the active pits when the pumps are shut down.	Demonstrate the knowledge of what to do if permissable flow-back / drain-back volumes are exceeded when the pumps are shut down.
E 04.04	To know the affect on mud pit volumes of pumping a slug into the drill pipe.	Demonstrate the ability to calculate the volume of mud returns due to a pumped slug U-tubing.
E 04.05	To know how to calculate tank volumes, and level change versus volumes.	Demonstrate the ability to calculate tank volumes and the effects of volume changes.
E 05.01	To know how to calculate pump pressures.	Demonstrate the ability to calculate pump pressures for a given system.
E 05.02	To know what affects pump pressure: - SPM - Mud Properties	To be able to identify from a list of criteria the effect on pump pressure of SPM and Mud Properties.
E 05.03	To be able to calculate the effects of changes in pump pressure: - - SPM - Mud Properties	Demonstrate the ability to calculate pump pressures following changes in SPM and Mud properties.
TRIP TANK MANAGEMENT		
E 06.01	To understand the importance of a proper line-up for the trip tank.	Given the description of an operation, demonstrate a proper line up on a diagram.
E 06.02	To understand why accurate recording of the trip tank level while tripping is important.	Demonstrate an understanding of the importance of recording trip tank levels.
KILL RATE CIRCULATING PRESSURE		
E 07.01	To understand the principles of using a kill rate circulating pressure (KRCP).	Demonstrate an understanding of the principle of using Kill Rate Circulating Pressure.
E 07.02	To know where to read the standpipe pressure when recording Kill Rate Circulating Pressures (KRCP).	Demonstrate ability to accurately read standpipe pressure at the appropriate gauge (choke panel) when recording Kill Rate Circulating Pressures.

	Standard	*Performance Criteria*
LEAK-OFF TEST/MAASP		
E 08.01	To know the principles and general operating procedures of a Leak-off test.	Demonstrate the ability to know and understand the principles and general operating procedures of a Leak-off test.
E 08.02	To understand the reasons for correct well conditioning to ensure accurate Leak-off test results.	List the well conditions required for accurate Leak-off tests.

	Standard	Performance Criteria
CAUSES OF KICKS		
F 03.01	To know the causes of kicks in general terms.	List the main causes of kicks.
NORMAL & ABNORMAL PRESSURES		
F 04.01	To understand the difference between normal and abnormal formation pressures.	To be able to distinguish between Normal and Abnormal pressures.
GAS CUTTING		
F 05.01	To understand the effects on hydrostatic pressure when drilling through gas bearing formations.	Given well conditions with a reduction in drilling fluid density, recognise the appropriate reduction in hydrostatic head.
LOST CIRCULATION		
F 06.01	To understand the possible effects of a drop in the level of driling fluid in the annulus on the hydrostatic pressure.	From details of the well condition and drilling fluid density, be able to calculate hydrostatic head at a given depth.
F 06.02	To know the actions to be taken in the event of a total or partial loss of returns.	To be able to describe the actions required to keep the well full of fluid.
KICKS AS A RESULT OF SURFACE INITIATED PRACTICES		
	Swab and Surge Effects	
F 07.01	To understand the causes and consequences of swabbing and surging in a well.	Identify the causes and consequences of swabbing and surging.
	Hydrostatic Effects	
F 08.01	To know the possible effects of a drop in the level of drilling fluid in the annulus due to failure to fill the hole.	From well data and fluid density, calculate hydrostatic head.
F 08.02	To know how to recognise the causes of fluid density reduction in the drilling fluid processing and storage systems, e.g. centrifuge removing barite, water dilution.	List the possible causes of fluid density reduction, and the checks to be carried out.
HYDROSTATIC AND FORMATION PRESSURES		
F 01.01	To understand the concept of hydrostatic pressure.	Demonstrate and understanding of hydrostatic pressure.

	Standard	Performance Criteria
HYDROSTATIC AND FORMATION PRESSURES		
F 01.02	To be able to perform hydrostatic pressure calculations using pressure gradient.	Perform appropriate calculations from given data.
F 01.03	To be able to perform hydrostatic pressure calculations using mud density.	Perform appropriate calculations from given data.
F 02.01	To understand what is meant by "Primary" and "Secondary Well Control".	Be able to define Primary and Secondary Well Control.
F 02.02	To understand what is meant by "Formation Pressure".	Be able to define "Formation Pressure".
F 02.03	To understand what happens when "Primary Well Control" is lost.	Be able to identify the consequences when "Primary Well Control" is lost.

	Standard	Performance Criteria
KICKS WHILE DRILLING		
	Early Warning Signs	
G 01.01	To know the possible warning signs that a well MIGHT be going under-balance, and how to respond correctly.	Be able to identify and recognise the parameters that might indicate that a well is going under-balance, and inidicate actions to be taken in the event of kick warning signs. i.e. - Rate of penetration changes. - Cuttings size and shape. - Drilling fluid property changes, e.g. Chlorides. - Drilling fluid temperature changes. - Connection and background gas.
	Positive Kick Signs	
G 01.02	To know the positive indications of a kick: - - Flow from well (pumps off). - Increase in flow from well (pumps on). - Pit volume gain.	Recognise positive kick indicators from rig and well data.
KICKS WHILE TRIPPING		
	Kicks while Tripping	
G 02.01	To understand incorrect fill or return volumes and diagnose if an influx may occur.	Given well data, calculate the correct fill up and describe possible remedial steps.

	Standard	*Performance Criteria*
SHUT IN PROCEDURES		
H 01.01	To understand the need to react as quickly as possible to kick indicators.	To be able to analyse the consequences of a quick or slow reaction to kick indicators.
H 01.02	To know how to line up for hard or soft shut-in procedures.	Given a diagram or description, identify open or closed elements according to the selected procedure.
H 01.03	To understand the steps taken to shut in a well using the hard or soft shut-in method (as described in API Recommended Practice No. 59), in different operational situations.	List the steps that need to be taken to shut a well in, in accordance with the hard or soft shut-in method, in the following situations: - - Drilling on bottom. - Tripping in/out of the hole. - Running casing. - Cementing. - Wireline operations.

	Standard	*Performance Criteria*
WELL CONTROL METHODS		
K 01.01	To understand the principles and objectives of well control methods.	Demonstrate knowledge of the principles and objectives of well control methods.
K 02.01	To know the difference between the "Wait and Weight Method" and the "Driller's Method".	To be able to describe the difference between the "Wait and Weight Method" and the "Driller's Method".

	Standard	Performance Criteria
KILL SHEET EXERCISES		
	Perform calculations	
L 01.01	Drill string volume.	To be able to complete the relevant parts of a Kill Sheet.
L 01.02	Annular volume.	To be able to complete the relevant parts of a Kill Sheet.
L 01.03	Pump stroke calculations: - Surface to bit. - Bit to shoe. - Bit to surface.	To be able to complete the relevant parts of a Kill Sheet.
L 01.04	Circulation times.	To be able to complete the relevant parts of a Kill Sheet.
L 01.05	Kill mud density.	To be able to complete the relevant parts of a Kill Sheet.

	Standard	*Performance Criteria*
DRILLS		
N 01.01	To understand the importance of well control and emergency drills.	List the purpose, and the steps and generic procedures for well control and emergency procedures: - - Pit drill. - Trip drill. - Strip drill. - Abandonment drill.

	Standard	Performance Criteria
BLOWOUT PREVENTERS		
	Lower Marine Riser	
SA01.01	To understand the function of the Lower Marine Riser Package (LMRP).	From a diagram, identify the main components of the LMRP and state their function.
	Ram Type Preventers/Valves	
SA02.01	To know the function and operating principles of Ram Locks.	Describe the operating principles of Ram Locks, and indicate when and how Ram Locks are used.
	Diverters	
SA03.01	To understand the operating mechanisms of common types of diverters used on floater operations.	From a specific layout, list the sequence of opening and closing the different elements and the operating principles.

	Standard	*Performance Criteria*
BOP CONTROL SYSTEMS		
SB01.01	To know the general operating principles of the BOP control system when drilling with a subsea BOP installed.	From a diagram or description, identify and describe the operating principles.

	Standard	*Performance Criteria*
KILL RATE CIRCULATING PRESSURES		
SE01.01	To know how the subsea circulating sytem differs from a surface BOP: -	To be able to identify these components from a diagram: - - BOP position. - Choke and Kill lines. - Marine riser. - Slip joint. - Diverter.
SE01.02	To know what fluid is normally kept in choke and kill lines.	Be able to identify possible fluids and reasons for use.
SE02.01	To know how frequently choke and kill lines should be circulated.	Be able to state the correct time scale.
SE02.02	To know how to record pressure losses in the choke and kill lines at kill rate circulating pressures when drilling with a subsea BOP stack.	Demonstrate the ability to record or analyse pressure losses in the choke and kill lines and determine the affect on bottom hole pressure.

	Standard	*Performance Criteria*
CAUSES OF KICKS		
SF 01.01	To know how a lost marine riser affects bottom hole pressure.	Describe what happens to bottom hole pressure when the riser is disconnected.

	Standard	Performance Criteria
KICKS WHILE DRILLING		
	Positive Kick Signs	
SG01.01	To understand the effect of rig heave on pit level, flow rate and flow check monitoring.	List the problems associated with monitoring the well on a floating rig.

	Standard	*Performance Criteria*
SHUT IN PROCEDURES		
SH01.01	To understand the steps taken to shut in a well from a floating vessel using the hard or soft shut-in method (as described in API Recommended Practice No. 59), in different operational situations.	List the steps that need to be taken to shut a well in, in accordance with the hard or soft shut-in method, in the following situations: - - Drilling on bottom. - Tripping in/out of the hole. - Running casing.

	Standard	Performance Criteria
ACTIONS PRIOR TO OPENING THE BOP		
	Choke Line Friction	
SK01.01	To understand the effect of trapped gas below the BOPs.	Describe what could happen if trapped gas is not removed before opening the BOPs.
SK01.02	To recognise that the riser must be displaced prior to opening the BOPs.	To be able to describe what happens if the riser is not displaced.

	Standard	*Performance Criteria*
KILL SHEET EXERCISES		
	Perform calculations	
SL 01.01	Annulus / Chokeline volume.	To be able to complete the relevant parts of a Kill Sheet.
SL 01.02	Pump stroke calculations: - - Surface to bit. - Bit to shoe.	To be able to complete the relevant parts of a Kill Sheet.
SL 01.03	Circulation times.	To be able to complete the relevant parts of a Kill Sheet.
SL 01.04	Kill mud density.	To be able to complete the relevant parts of a Kill Sheet.
SL 01.05	Volume / strokes to displace kill fluid in the riser.	To be able to complete the relevant parts of a Kill Sheet.