International Well Control Forum

Well Control Training Syllabus

Drilling Level 2

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Version 3.0

Drilling Well Control
Written Test Syllabus Level 2

Surface & Subsea BOP Stack Standards and Performance Criteria

Syllabus Structure

Written Test Syllabus

The written test syllabus is divided into 2 sections;

- Principles and Procedures
- Equipment

Subsea requirements are prefixed by SS.

Old syllabus categories are listed in the second column. Where this is blank it indicates a new category.

	Surface Principles & Procedures	**Subsea Principles & Procedures**
Overview.	A.	SSA.
Introduction to Well Control.	B.	SSB.
Barrier Concept.	C.	SSC.
Risk Management.	D.	SSD.
Causes of kicks.	E.	SSE.
Kick Warning Signs and Indicators.	F.	SSF.
Circulating Systems.	G.	SSG.
Fracture Pressure and Maximum Surface pressure.	H.	SSH.
Influx Characteristics and Behaviour.	I.	SSI.
Shut In Procedures.	J.	SSJ.
Well Control Methods.	K.	SSK.

	Surface Equipment	**Subsea Equipment**
Blowout Preventers.	EQA.	SSEQA.
Associated Well Control Equipment.	EQB.	SSEQB.
Choke Manifold and Chokes.	EQC.	SSEQC.
Auxiliary Equipment.	EQD.	SSEQD.
Barriers.	EQE.	SSEQE.
Testing.	EQF.	SSEQF.
BOP Control Systems.	EQG.	SSEQG.

Standards

The standards in the syllabus are based on the practical skills and knowledge required for this level.

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.

Levels

The importance of each standard is indicated on a scale of 1 – 5 in each level.

Critical standards are given a 10.

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New syllabus category	Original Syllabus Category	Standard	Performance Criteria	Importance
PRINCIPLES AND PROCEDURES				
OVERVIEW				
Well Control Event				
A01.01		Understand the negative impact and effects of a well control event.	Identify the impact of a well control event on: - Personal wellbeing - Life and limb - Employment - Environment - Reputation - Society List some of the effects of a well control incident; - Capital loss - Over regulation - Moratorium on drilling - Limiting areas of operations e.g. Arctic	10
Well Control Training and Assessment				
A02.01		Understand the need for well control training and assessment.	Be able to discuss "why are we here?" including; - Trust of stakeholders - Avoiding over regulation - Recruitment of new personnel - Responsibility to colleagues - Competence	10

New syllabus category	Original Syllabus Category	Standard	Performance Criteria	Importance
INTRODUCTION TO WELL CONTROL				
Hydrostatic Pressure				
B01.01	F01.01	To understand what hydrostatic pressure is.	Be able to define hydrostatic pressure.	10
B01.02		Understand basic rig mathematics and principles and be able to apply them to basic well control calculations	Be able to follow the basic principles of equations and how they are applied to well control. Follow the basic mathematical principles to ensure that a calculator is not a black box and that answers derived from calculators are understood and make sense.	10
B01.03	F01.02 and F01.03	To understand what parameters affect hydrostatic pressure and how it is calculated.	Be able to identify the parameters that affect hydrostatic pressure and perform simple calculations.	10
Formation Pressure				
B02.01	F02.02	To understand what formation pressure is.	Be able to define formation pressure.	5
B02.02	F04.01	To understand what abnormal formation pressure is.	Be able to define abnormal formation pressure.	5
Fracture Pressure				
B03.01		To understand what fracture pressure is.	Be able to define fracture pressure in simple terms	5
Primary Well Control				
B04.01	F02.01	To know what primary well control is.	Be able to define primary well control i.e. to maintain hydrostatic pressure greater than formation pressure	5
B04.02	F02.03	To know what an influx is.	Be able to define an influx.	5
Secondary Well Control				
B05.01	F02.01	To know what secondary well control is.	Be able to define secondary well control pressure. i.e. closing in a well.	5
BOP Equipment				
B06.01		To know what BOP equipment is used for.	Be able to identify the uses of the main components of BOP equipment.	5

New syllabus category	Original Syllabus Category	Standard	Performance Criteria	Importance
INTRODUCTION TO WELL CONTROL CONTINUED				
Subsea Factors and Complications for Surface Candidates				
B07.01		To understand the differences between sub sea and surface drilling operations and their implications	List the following aspects of subsea operations and why they complicate well control practices and that the same basic principles apply; - Vessel movement and weather (emergency disconnect) disconnect - BOP on sea bed, redundancy and configuration - Water depth - Riser above BOP (gas expansion) - Choke and kill line lengths and contents	2
BARRIER CONCEPT				
C01.01		To understand well barrier philosophy in drilling and work over operations.	Identify examples of primary and secondary barriers in given well situations. i.e. What kind of barriers are there and what are some examples - Procedural (monitoring), mud weight, BOP testing - Mud, cement, casing, pack-offs, BOPs, packers	5
RISK MANAGEMENT				
D01.01		To understand the basic concepts of systematic risk management and that risk is a factor of probability and severity.	Identify the main principles of risk and risk management.	3
D02.01	N01.01	To understand the importance of well control and emergency drills	List the main well control and emergency drills and why they are important in managing risk; - Pit drill. - Trip drill. - Strip drill. - Choke drill. - Diverter drill.	3

New syllabus category	Original Syllabus Category	Standard	Performance Criteria	Importance
CAUSES OF KICKS				
General				
E01.01	F03.01	To know the causes of kicks.	List situations which may cause a kick.	5
Abnormal Formation Pressures				
E02.01	F04.01	To know that abnormal and sub-normal formation pressures can occur	Distinguish between 'normal', 'abnormal' and 'sub-normal' pressures	2
Loss of Hydrostatic Pressure				
E03.01		To know the consequences of not filling the hole and how it may occur.	List the consequences of pulling pipe without filling hole and lost circulation due to drilling into sub normal pressure or fracturing the formation.	3
E03.02	F08.02	To understand the importance of maintaining fluid density, how it is measured and what may reduce it.	List the possible causes of fluid density reduction, the impact on primary well control and the checks to be carried out. - Water addition, centrifuges, gas cut mud. - Use of the mud balance	4
SSE03.03	*SF01.01*	*To understand the potential effect of riser disconnect.*	*Describe the effect on Bottom Hole Pressure (BHP) when the riser is disconnected.* *Define 'Riser Margin'.*	3
Gas Cutting				
E04.01	F05.01	To understand the potential effects on hydrostatic pressure when drilling through gas bearing formations.	Describe the effects of gas cut mud on hydrostatic pressure and the reasons for and use of the vacuum degasser.	4
SSE04.02		*To understand the additional complications with a subsea BOP.*	*List the potential effects of gas in the marine riser.*	4
Swab and Surge Effects				
E05.01	F07.01	To understand the causes of swabbing and surging in a well and its impact on bottom hole pressure	List the causes of surging and swabbing and its impact. Losses, formation breakdown, influx, etc.	5
E05.02		To know the effect of wireline and tool movement has on the bottom hole pressure in an open reservoir.	Identify the potential effect of wireline movement on bottom hole pressure.	3
SSE05.03		*To understand the causes of down-hole swabbing resulting from the heave effect on floating rigs.*	*Describe the consequences of surging and swabbing due to heave effects.*	3

New syllabus category	Original Syllabus Category	Standard	Performance Criteria	Importance
CAUSES OF KICKS CONTINUED				
Tripping				
E06.01		Understand the correct use of a trip sheet.	From given trip sheets recognise if there is any discrepancy that might indicate a well control event.	10
E06.02		To understand the requirements and contents of a trip sheet and their correct use	With given data in the form of a trip sheet, interpret what is happening and the appropriate actions to take.	5
E06.03	G02.01	To understand incorrect fill or return volumes and diagnose if an influx may have occurred.	Given well data, calculate the correct fill up, calculate impact of not filling the hole and describe possible remedial steps.	10
KICK WARNING SIGNS AND KICK INDICATORS				
Definitions				
F01.01	G01.01	To know what is meant by the term kick warning sign.	Be able to define the term kick warning sign and give examples e.g. Increased penetration rate, increased background gas,	3
F01.02	G01.02	To know what is meant by the term kick indicator.	Be able to define the term kick indicator and give examples e.g. increased flow rate, pit level increase	3
Kick warning signs and first actions				
F02.01	G01.01	To know the possible warning signs that a well MIGHT be going under-balance, respond correctly and the importance of early detection.	Be able to identify and recognise the parameters that might indicate that a well is going under-balance and the importance of early detection, lag time and reporting i.e. - Rate of penetration changes - Cuttings size, density and shape - Drilling fluid property changes, e.g. chlorides - Drilling fluid temperature changes - Connection and background gas - Trip gas - "Pumps off" gas - Connection gas	5
F02.02		To know the purpose, reasons and procedure for conducting a flow check.	Be able to list the reasons for a flow check and the basic steps to conduct one.	5
Kick indicators and first actions				
F03.01	G01.02	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. State the correct first action in a given circumstance.	10
SSF03.02	*SG01.01*	*To understand the effect of heave, roll, pitch and deck operations on pit level, flow rate and flow check monitoring.*	*List the problems associated with monitoring the well on a floating rig and the means to minimise them*	10

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TOP HOLE DRILLING				
Shallow Gas				
F05.01		To know what is meant by the term shallow gas.	Define what shallow gas is and the hazards it represents	5
SSF05.02		*To understand the advantages and disadvantages of drilling top hole with or without a riser.*	*Analyse the basic principles only;* *- move off quickly* *- no gas directly to the rig* *- avoid collapse of riser*	5
CIRCULATING SYSTEM				
Basic Principles				
G01.01		To understand what the circulating system is.	Be able to describe sections of a circulating system.	5
G01.02		To understand pressure losses around a circulating system and how they affect pump pressure and bottom hole pressure.	Identify the causes of pressure losses in a circulating system and how increased pressure is exerted on the system and well. - pump pressure - bottom hole pressure - BHCP	3
SLOW CIRCULATION RATES				
G02.01		To understand the need to conduct well control operations in a slow and controlled manner	To list the reasons why well control needs to be undertaken in a slow and controlled manner: - to control bottom hole pressure - choke control.	5
SSG02.02	*SE01.01*	*To understand the differences in the circulating system when using a subsea BOP.*	*Recognise how the system changes once the BOP is closed.*	3
FRACTURE PRESSURE AND MAXIMUM SURFACE PRESSURES				
H01.01		To understand what fracture pressure is.	Be able to define fracture pressure.	5
H01.02		To understand why leak off tests are undertaken, why they are important and the difference between a leak off test and a formation integrity test.	Define what a leak off test or FIT measures and identify instances when a leak off test result is unacceptable.	2

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INFLUX CHARACTERISTICS AND BEHAVIOUR				
Principles				
I01.01		To know the different types of influx and the hazards they present.	Identify the different types of influx fluids and the related hazards; - gas (hydrocarbon, H_2S, CO_2) - oil - water	5
I01.02		Understand how an influx may change as it is circulated up a well.	Describe the changes which may take place as different types of influx are circulated.	5
I01.03		Understand basic gas law and why it is important. Gas Laws P1V1 = P2V2	Describe how gas behaves as it is circulated up the well. Ignore temperature and compressability.	5
I01.04		Understand influx migration.	Describe what may happen when an influx migrates; - in an open well - in a shut in well.	5
SHUT IN PRODECURES				
General Principles				
J01.01	H01.01	To understand what is meant by the term shut in procedure and why it is important to do it quickly.	Be able to define what a shut in procedure is and understand the empowerment of the driller in taking the right action	10
J01.02	H01.02	To understand the importance of proper equipment line up and purpose before drilling or tripping.	From a diagram identify correct simple line ups of standpipe and choke manifolds before a) drilling and b) tripping	5
J01.03	H01.03	To know how to shut in the well during drilling, tripping and wireline operations.	Identify the correct steps to shut in the well.	5
J01.04		To understand that the well must be monitored after shut in.	List the checks made to ensure the well is secure.	10
SSJ01.05	*SH01.01*	*To understand the differences between shut in procedures on a surface BOP versus a subsea BOP.*	*List the additional measures to be taken when shutting in a well on a subsea BOP.*	5
Interpretation				
J02.01		To know why pressures must be recorded once the well is shut in.	Be able to describe why pressures are recorded after the well has been shut in.	5
J02.02		To know how shut in pressures relate to formation pressure.	Explain the reason for differences between SIDPP and SICP.	5
Influx Migration				
J03.01		To know what is meant by the term gas migration.	Be able to define gas migration.	2
J03.02		To understand the possible causes for a pressure increase with time in a shut-in well.	Describe the causes of pressure changes in a shut in well.	2

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WELL CONTROL METHODS				
Principles				
K01.01	K01.01	To know what is meant by the term well control method.	The be able to describe the essential elements of killing a well : a) remove the influx b) control bottom hole pressure to avoid another influx or breaking down formation c) to regain primary control (fill well with right mud weight to overbalance formation pressure)	5
K01.02	K02.01	To understand the basic principles of different well control methods.	List the steps to perform the following; - the Drillers method - the Wait and Weight method - the volumetric method.	5
K01.03		To know understand the advantages and disadvantages of each method.	List the advantages and disadvantages of each method.	5
SSK01.04		*To understand the additional procedures when using a subsea BOP.*	*List the differences and describe the procedures to mitigate the effect of;* *- choke line friction* *- gas trapped in BOP* *- riser displacement*	5
KILL SHEETS				
Kill sheets				
K02.01		To know what a kill sheet is.	Recognise the basic elements of a kill sheet and how it is used.	5
Perform kill sheet calculations				
K03.01	L01.01 to L01.05	Be able to understand the basic principles and perform basic calculations for the key areas of the well and pressure environment and how they are applied to well control (surface BOP).	From given data, fill out a kill sheet to obtain the following information; a) Drill string volume b) Annular volumes c) Surface to bit strokes and times d) Bit to shoe strokes and times e) Bit to surface strokes an times	10
SSK03.02	*SL01.01 to SL01.05*	*Be able to understand the basic principles and perform basic calculations for the key areas of the well and pressure environment and how they are applied to well control (subsea BOP).*	*From given data, fill out a kill sheet to obtain the following information;* *a) Drill string volume* *b) Choke and kill line volume* *c) Surface to bit strokes and times* *d) Bit to shoe strokes and times* *e) Bit to surface strokes an times* *f) Kill mud density* *g) Riser volume and strokes to displace*	10

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WELL CONTROL DURING CASING AND CEMENTING OPERATIONS				
Running and Pulling Casing				
L01.01		To know the factors that increase the risk of kicks occurring when running and pulling casing.	Select the factors that increase the risk of kicks occurring when running and pulling casing and to understand that the principles are the same as those for drill pipe.	4
Cementing Casing and Liner				
L02.01		To know the effect on the bottom hole pressure during a cementing operation.	Identify changes that occur in bottom hole pressure during a cementing operation.	3
L02.02		To understand the importance of getting a successful cementing job and the potential consequences of failure.	Select the key attributes that define the quality of cement placement and indications of success that the cement has been installed as a confirmed barrier List the key indicators for a successful cement job: - No flow or losses - Right weight and quantity - Successful pressure test	2

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WELL CONTROL EQUIPMENT				
BLOWOUT PREVENTERS				
BOP Stack Configuration				
EQA01.01		To understand BOP configuration	Describe the main elements that provide flexibility and redundancy of BOP equipment	4
EQA01.02		To understand the overall pressure rating of a BOP stack.	Analyse the BOP stack rating according to the different components and their rated working pressures.	4
SSEQA01.03	*SA01.01*	*To understand the function and configuration of a subsea BOP and marine riser system.*	*Identify the functions of the main components of the marine riser, LMRP and subsea BOP*	4
Ram Type Preventers				
EQA02.01	A04.01	To know the operating principles of BOP ram type equipment.	Given data, analyse or describe operating principles of BOP ram type equipment , including: - sealing, - direction of pressure - different types, sizes, size of pipe - space out - testing.	4
SSEQA02.02	*SA02.01*	*To understand the requirement for ram locks on a subsea BOP.*	*List the reasons why ram locks are necessary.*	3
Blind/Shear Ram Preventers				
EQA03.01	A05.02	To understand the operating principles of BOP blind/shear equipment.	Describe the last resort principles of blind/shear rams a) Cuts the pipe in the hole (inside the BOP) b) Closes in the well	5
Annular Preventers				
EQA04.01	A07.02	To understand the operating principles of annular preventers.	Describe the simple principles of annular preventers and how they work a) Bag principle and one size fits all b) Pressure limitations compared to rams.	**5**
Side Outlet Valves				
EQA05.01	A08.01	To know the correct locations for remotely operated side outlet valves, and be able to state their basic function	From a piping layout diagram, indicate the position of the manual and hydraulically operated side outlet valves and state why they are positioned that way and state their basic purpose a) To pump in the well (kill Line) b) To circulate out of well (choke line)	2

New syllabus category	Original Syllabus Category	Standard	Performance Criteria	Importance
BLOWOUT PREVENTERS CONTINUED				
Diverters				
EQA06.01		To be able to describe the principles of operation of diverters.	List when diverters should and should not be used. i.e. for shallow gas, when drilling without a BOP and when unable to shut in a well	5
ASSOCIATED WELL CONTROL EQUIPMENT				
Inside BOP's and Kelly Cocks				
EQB01.01	A11.01	To understand the correct use of different drill pipe safety valves and factors affecting successful usage.	Identify the different types of valves available, their function, principles of use and compatability. Identify ctossovers required in a given situation. Describe a sequence of operations.	5
CHOKE MANIFOLDS AND CHOKES				
Routing of Lines				
EQC01.01	C01.01	To know what alternative circulating paths exist from the pump through the choke manifold to the disposal system.	To list the options for fluid disposal in a given circumstance.	4
Adjustable and Fixed Chokes				
EQC02.01	C02.01	To understand the mechanical operating principles of the adjustable chokes.	Describe operating principles and use.	1
AUXILIARY EQUIPMENT				
Mud/Gas Separators				
EQD01.01	D01.01	To know the operating principles and limitations of a mud gas separator.	List the principle requirements for mud gas separators and their limitations	3
Vacuum Degasser				
EQD02.01	D02.01	To understand the purpose of a vacuum degasser.	Describe the purpose of vacuum degassers and where they are used.	1

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BARRIERS				
Barrier Concept				
EQE01.01		To understand how the various equipment works as barriers.	Be able to define the terms; - barrier envelope - active barrier - passive barrier.	5
TESTING				
BOP and Equipment Testing				
EQF01.01		To understand the importance of certification for maintaining and testing well control equipment.	To be able to recognise the right certification, function and pressure testing requirements for well control equipment.	3
Inflow Testing				
EQF02.01		To understand what an inflow test is.	Be able to define an inflow test.	2
EQF02.02		To understand the importance of an inflow test	Select the important reasons why an inflow test is carried out.	2
BOP CONTROL SYSTEMS				
EQG01.01	B01.02 and B02.01	To understand the general operating principles of the BOP control system and the remote control panels (surface BOP).	Describe the operating principles of a BOP control system. E.g.: Panels, Hydraulics, accumulator bottles, collection of valves, pods, etc.	3
SSEQG01.02	*SB01.01*	*To understand the general operating principles of the BOP control system and the remote control panels (subsea BOP)*	*Describe the operating principles of a BOP control system.* *E.g.: Panels, Hydraulics, accumulator bottles, collection of valves, pods, etc.*	3