Service Company Equipment Operator
Snubbing Well Control

Curriculum, Course Delivery Requirements,
and Related Learning Objectives

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Contents

1.0 Overview of Service Company Equipment Operator Snubbing Well Control

This course curriculum is designed for service company equipment operators who are primarily responsible for the snubbing operational processes of well control. This curriculum identifies a body of knowledge and a set of job skills that can be used to provide well control training for snubbing operations personnel.

This curriculum incorporates Core Training Modules, Sub-Modules, Learning Topics, and Learning Objectives and Assessments.

Recommended Attendees: IADC recommends that this course is attended by equipment operators who are primarily responsible for the snubbing operational processes that involve well control. Examples of these positions or job roles are listed in the table below.

Company Type	Positions
Snubbing Company Personnel	Supervisor
	Engineer
	Snubbing Operator

Acceptable Delivery Methods: Instructor-led training for the initial and repeat delivery of this course is required. Demonstration is required to be incorporated into the course content delivery. See the relevant cross-reference document regarding content delivery requirements for specific learning objectives.

To the maximum extent possible, use scenarios to bring attention to specific topics. IADC also requires a "blended" approach to (multiple strategies for) content delivery and a variety of techniques that appeal to different types of learners (e.g., visual, auditory, kinesthetic). These strategies will also help engage trainees in the learning process and will help improve learning and retention.

Minimum Course Length: Thirty-two (32) classroom hours are required for teaching the Snubbing curriculum. Course length excludes the knowledge assessment time (3.5 hours).

Course Curriculum Notes: The curriculum that follows includes five components: Training Modules, Sub-Modules, Learning Topics, AIM, and Learning Objectives and Assessment Guidelines.

AIM: The AIM letters indicate the level of knowledge and skills required at the job level:

A = Awareness of Learning Topic

I = Implements Learning Topic at this job level; needs an increased level of knowledge because they may have to take action of some task related to the topic.

M = Mastery of Learning Topics at this job level; needs a full knowledge because they have to take action, perhaps unsupervised, of some task related to the topic.

Learning Topics**:** This section provides guidance for instructors on what the trainee should learn.

Learning Objectives and Assessment Guidelines**:** This section defines what trainees should be able to do at the conclusion of the training and provides some examples of how to meet the objectives.

Assessment Notes: Questions on the Knowledge Assessment will be graded as a cumulative score. To pass the course, the trainee must earn at least a 70% score. There is no requirement for skills assessment.

2.0 Curriculum

2.1 Risk Awareness and Management

Module Name: 2.1 Risk Awareness and Management			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
Potential Impacts of a Well Control Event	A	Risks associated with completion and well intervention operations	Describe potential risks of pore pressure prediction being incorrect and resulting in well control risk (e.g., completing a new reservoir).
	I		Identify potential well control problems that could occur during completion and well intervention operations.
Live/Dead Well	M	Differences between 'live' and 'dead' well	Define 'live' well.
	M		Define 'dead' well.
Risk Management	I	Systematic risk management	List the four principles of systematic risk management (i.e., identify, quantify, mitigate and control risk).
Pre-job Communication	I	Pre-job communications	Explain the importance of communicating operational plan details, risks, and responsibilities.
Handover for Tour and Hitch Change	I	Handover for Tour and Hitch change to minimize risks	Explain the importance of a good handover for tour and hitch change.
	I		Identify key components that need to be addressed during a handover for tour and hitch changes (e.g., current well status, barrier envelope, and communication of responsibilities).
Safety Margin Selection	A	Safety Margin Risks a. Safety margins in Well Kill Operations b. Dangers of using minimal safety margins	Describe the criteria used to develop a safety margin.
	A		Explain the dangers of using minimal safety margins during a well kill (i.e., safety margins applied to tubular integrity, casing integrity, wellhead rating).
Bridging Documents	A	Purpose and Importance of Bridging Documents	Explain the purpose and importance of a well control bridging document (i.e., to assure all parties have the same information; to resolve well control issues between different parties (which well control practices will be followed); to handle specific issues in relation to a particular well/environment or legislative regime).

Module Name: 2.1 Risk Awareness and Management			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
Emergency Procedures	A	Purpose and Importance of Establishing and Following Emergency Procedures for Rig BOP	Determine situations that require emergency procedures be activated and action(s) to secure the well (if applicable) (i.e., an uncontrolled BOP leak; 'broaching' at surface; potential vessel collision; bad weather; drive-off; toxic gas; fire).
	A		Explain when a company should initiate the emergency action plan and assure crew members are aware of their roles and responsibilities for evacuation.
Pressure Control Equipment/Barrier Envelope Considerations	I	Equipment Requirements	Define Maximum Allowable Working Pressure (MAWP).
	I		Identify the working pressure of a system based on lowest working pressure component (e.g., schematic or description).
	I	Installation of rings, flanges and connections	Describe characteristics and best practice for installing a ring gasket.
	A	Load Bearing Considerations	Identify considerations when determining if a wellhead or tree bending integrity stress analysis is required.

2.2 Well Control Principles & Calculations

Module Name: 2.2 Well Control Principles & Calculations			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
Pressure Fundamentals	M	Pressure	Define pressure.
	M	Types of pressure a. Hydrostatic pressure b. Applied Pressures 1. Surface pressure a. SITP b. Annulus Pressure 2. Pump Pressure 3. ECDs (Equivalent Circulating Densities)	Define hydrostatic pressure.
	M		Calculate hydrostatic pressure.
	M		Explain the effects of fluid level change on hydrostatic pressure.
	M		Identify the different types of applied pressures.
	M		Explain shut-in pressures.
	M		Explain equivalent circulating densities (ECD).
	M		Explain the effects of trapped pressure (e.g., above and below the packer or plug).
	M		Explain the differences between swab and surge.

Module Name: 2.2 Well Control Principles & Calculations			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	M	4. Trapped Pressure 5. Swab/surge c. Formation pressure d. Differential pressure e. Fracture pressure f. Bottomhole pressure 1. Balanced 2. Underbalanced 3. Overbalanced	Calculate formation pressure.
	M		Discuss situations where differential pressure exists in the wellbore (e.g., across sliding sleeve; perforating; above/below packers; wireline plugs).
	M		Define fracture pressure.
	M		Define Bottomhole pressure (to include applied pressure).
	M		Explain the difference between overbalanced and underbalanced pressure.
	M		Calculate equivalent fluid weight equal to formation pressure (kill fluid).
	M		Calculate gradient for different density of liquid and gases.
	M		Calculate well gradient from formation pressure and surface pressure.
	M		Calculate bottomhole pressure with at least one well bore with two different densities and surface pressure.
	M	Maximum Anticipated Surface Pressure (MASP)	Define MASP (reference WellSharp Definitions document).
	M	Forces from Applied Pressure	Calculate the effective force with a given pressure over a certain area.
	M		Calculate net force effects due to trapped pressure.
	M	Equivalent circulating density a. Definition b. Frictional pressure loss effects on downhole pressure c. Surface pressure effects d. U-tube principles	Define equivalent fluid density.
	M		Explain circulating frictional pressure losses and effects on pressure and equivalent circulating density for forward and reverse circulation.
	M		Calculate equivalent circulating fluid density.
	M	Kill Mud Weight (Equivalent static fluid density) a. Definition b. Pressures expressed as an equivalent fluid weight	Define kill mud weight (equivalent static fluid density).
	M		Calculate kill mud weight (equivalent static fluid density) with temperature effects.
	M	U-tube principles	Demonstrate understanding of the U-tube concept.
	M	Buoyancy a. Pipe light	Define buoyancy.
	M		Calculate buoyancy effects to string weight.

Module Name: 2.2 Well Control Principles & Calculations			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	M	b. Pipe heavy c. Balance Point	Calculate the balance point to transition from snubbing to stripping operations while going in hole.
	I		Describe forces that must be overcome to push/pull workstring into/out of a pressured well.
Calculations	M	Volume/Displacement calculations	Calculate tubing volumes using given data.
	M		Calculate strokes using given data.
	M		Calculate displacement volumes using given data.
	M		Calculate annular volumes using given data.
	M		Calculate usable volume of fluid in a pit/tank.
	M	Pre-job calculations	Calculate the snub force (tubing body and tubing collar/pipe upset).
	M		Calculate the effective buoyancy weight per foot in the hole.
	M		Calculate balance point (with and without fluid in the string).
	A		Calculate the stripper drag force.
	M		Explain the importance of accounting for the stripper drag in the snubbing calculations (i.e., accepted industry standard of 30%).
	I	Snub force as a result of cross sectional area	Describe how changes in snubbing cross sectional area affects snub force (e.g., BHA vs. tubing body).
Principles	A	Tubing Collapse and Casing Burst	Explain why applied casing pressure is needed (e.g., prevent packers from unseating, seal units from being pumped out of Polished Bore Receptacle (PBRs), basis point for monitoring, limit differential pressure, prevent failures).
	A		Explain why applied casing pressure can lead to tubing collapse or casing burst.
Pre-recorded Well Information	I	Well configuration a. Top and bottom of perforations b. Packer/Tool locations c. Tubing dimensions, lengths and strengths	Demonstrate how to document pre-recorded data significant to well control situations (e.g., perforation interval, packer locations, tubing strengths, safe working pressures).
	I		Given a well and equipment scenario, determine pump rates to circulate, pump, or kill the well.

Module Name: 2.2 Well Control Principles & Calculations			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	I		Demonstrate how to document the wellbore profile including depths (MD/TVD), lengths, strengths, capacities, displacements, and safe working pressures.
	I	Maximum safe pressures a. Casing burst rating b. Tubing collapse and burst ratings	Calculate safe working pressure for casing for a given safety factor.
	I		Calculate casing pressure limit to prevent tubing collapse.
	I		Calculate casing pressure limit to prevent casing burst.
	I	Fluid density(ies) in well	Calculate the equivalent fluid gradient for given formation and surface pressures, true vertical depth (TVD).
Secured Well Conditions	I	Wellhead/Well Control Stack/Christmas tree valves	Explain the purpose of functioning the casing valve prior to Intervention operations.
	I		Explain the purpose of functioning the tree wing valve prior to Intervention operations.
	A		Explain the importance of a procedural lock-out on a remote actuated tree valve.
	I		Explain the importance of closing the tree master valve last.
Snubbing/Buckling	I	Overcoming frictional forces	Explain the consequences of exceeding the tubing integrity due to frictional forces (i.e., buckling pipe, parting pipe, necking/ballooning).
	I		Identify factors that contribute to upward forces.
	I		Identify factors that contribute to downward forces.
	M		Calculate anticipated forces required for snubbing.
Pre-job Considerations	I	Well Control Process Safety preparation	Identify information required to successfully execute snubbing operation.
Reduction of Tensile under Collapse Loading	A	Conditions causing collapse or parting of tubulars	Recognize how tensile strength of the tubular is reduced when subjected to differential pressure (greater pressure outside the tubing than inside).
	I		Identify how to mitigate the risk of collapsed tubing due to excessive tensile load in relation to differential pressure.
	I		Identify pressure differential conditions and tubular properties, which could lead to parting.
Reduction of Pipe Strength	I	Conditions causing twist-off of pipe	Describe how well pressure and string weight affects the torque limit on the pipe.

2.3 Barriers

Module Name: 2.3 Barriers			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
Philosophy and Operation of Barrier Systems	M	Barriers and barrier envelope	Define the term “barrier” (reference WellSharp Definitions document).
	M		Define the term “barrier envelope” (reference WellSharp Definitions document).
	M		List the requirements for a component to be considered a barrier (i.e., once it is tested; when it is in contact with well fluids).
	M	Purpose of barriers during completions and well interventions	Explain how barriers are used to maintain well integrity for completions and well interventions.
	M	Operational Shut-in Hierarchy	Discuss the hierarchy of operations for Pressure Control Equipment (PCE).
	M	Barrier Hierarchy	Explain the action to take upon detection of a failed primary barrier.
	M		Explain the action to take upon detection of a failed secondary barrier.
	M		Explain the action to take upon detection of a failed emergency closure.
Types of Barriers	M	Mechanical barriers	Define mechanical barrier.
	M		List examples of mechanical barriers.
	M		Explain the validation needed to be a mechanical barrier.
	M	Fluid barriers	Define fluid barrier.
	M		Explain what is required for a fluid to be considered a barrier (i.e., continuously observe the height and the ability to add fluid).
	M		List the types of fluid barriers.
	M		Explain the limitations of fluid barriers (e.g., It is only a barrier for a certain period of time after circulation stops).
Levels of Barriers	M	Primary and Secondary Barriers and Emergency Closure	Explain what primary barriers are.
	M		Explain what secondary barriers are.
	M		Explain what emergency closures are.
	M	Minimum number of barriers required for safe operations	Explain why a minimum number of barriers are required for safe operations. (Refer to industry recommendations for minimum number of barriers to be in place for specific operations).
Barrier Management	M	Testing mechanical barriers	Explain positive pressure and negative/inflow pressure barrier tests (e.g., increase differential pressure across a barrier in either direction).

Module Name: 2.3 Barriers			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	I		Identify the reference sources for mechanical barrier test criteria (e.g., the well program, operations manuals, industry standards, technical specifications from equipment manufacturers, integrity testing, and regulatory agency).
	M		Explain the importance of documenting mechanical barrier testing.
	M		Explain the importance of the test pressure and time period to validate mechanical barrier.
	M		Explain the action to take if there is a test failure of a mechanical well barrier/element (i.e., retest, reinstall, or install additional barrier).
	A	Validating fluid barriers	Explain the importance of monitoring the fluid volume at surface (e.g., open top tanks).
	M		Identify the reference sources for fluid barrier test criteria (e.g., the well program, industry standards, and technical specifications from company manufacturers).
	M		Explain the importance of fluid density measurements as it applies to well design.
	A		Identify conditions that would lead to settling of solids in the fluid.
	M		Explain how crystallization affects a fluid barrier (e.g., changes fluid density).
	M		Explain the action to take if there is a test failure of a fluid barrier/element (e.g., shut-in well, change out fluid, install mechanical barrier).
	M	Detecting a failed barrier	Explain how a failed primary barrier can be detected (e.g., from the flow from the well; through losses to the well; an increase in surface pressure when shut in).
	M		Explain how a failed secondary barrier can be detected (e.g., pressure loss; detectable leaks at surface).
	M		Explain how a failed emergency closure can be detected (e.g., blowout, uncontrolled flow).

Module Name: 2.3 Barriers			
Sub-Modules	AIM	Learning Topics The instructor will impart knowledge on:	Learning Objectives and Assessment Guidelines The attendee will be able to:
PCE Equipment	I	Hoses and Connections	Identify different types of connections (e.g., NPT vs high pressure fitting, high pressure swivel joint-other operations).

2.4 Influx Fundamentals

Module Name: 2.4 Influx Fundamentals			
Sub-Modules	AIM	Learning Topics The instructor will impart knowledge on:	Learning Objectives and Assessment Guidelines The attendee will be able to:
Influx	I	Causes of an influx	Explain why reduction in hydrostatic pressures can cause an influx.
	I		Explain why failure to keep hole full can cause an influx.
	I		Explain why swabbing the well can cause an influx.
	I		Explain why lost circulation can cause an influx.
Influx Detection	I	Possible Indicators of an Unplanned Influx	Identify possible indicators of an influx (e.g., decrease in pump pressure/increase in pump rate, volume displacement change during tubular movement, change in surface pressures, changes in string weight, oil or gas shows during circulation, and changes in fluid density).
	I		Identify the necessity of timely response to one or more possible influx indicators.
	M		Identify or describe potential consequences of improper or untimely response to influx indicators (e.g., extreme changes in operating pressures, possible release of gas, pollution, potential for fire, loss of life, equipment resources).

2.5 Gas Characteristics and Behavior

Module Name: 2.5 Gas Characteristics and Behavior			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
Pressure and Volume Relationship (Boyles Law)	M	Relationship between pressure and volume of a gas in the wellbore	Explain the relationship between gas pressure and gas volume (e.g., the Boyle's Law concept to explain the pressure/volume relationship with most expansion close to surface).
	M		Calculate new volume or pressure from original volume or pressure change using Boyle's Law.

2.6 Completion and Workover Fluids

Module Name: 2.6 Completion and Workover Fluids			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
Completion and Workover Fluids	I	Purpose of fluid	Describe the purpose and characteristics of fluids that make them suitable for workover and completions (e.g., compatibility with the zone; pressure control).
	I	Purpose of packer fluid	Describe the purpose of packer fluid in a completion.
	I	Fluid loss	Explain why fluid loss control is an important characteristic of workover/completion fluid.
	I		Explain why fluid loss control is difficult to achieve when using workover/completion fluids.
	I		Explain the types and methods used in fluid loss control (e.g., pills, multiple fluids, plugs).
	A	Formation damage	Explain why formation damage is an important consideration of workover/completion fluid.
	A	Corrosion	Explain how corrosion is inhibited through the use of workover/completion fluids.
	A	Environmental concerns	Describe how the composition of the workover/completion fluid could affect the environment.

Module Name: 2.6 Completion and Workover Fluids			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	A		Explain the importance of managing the returns and assessing possible well fluids prior to discharge.
	I	Rheology of Fluids	Describe properties required to enable workover/completion fluids carrying capacity and their effect.
	I		Explain the effect of pump rates on fluid carrying capacity.
Liquids	I	Brine requirements	Explain why a different brine combination may be needed based on density requirements.
Fluid Properties	I	Density	Define density.
	I	Viscosity	Define viscosity.
	I	pH	Define pH.
	I		Describe pH in relationship to density and viscosity (e.g., direct effect on viscosity, no effect on density).
	I	Crystallization point	Define the low temperature point of brine and describe how it is related to crystallization (e.g., ambient temperature to downhole temperature, density).
	I	Saturation	Describe brine saturation and how it relates to crystallization and maximum fluid weight.
	I	Temperature and pressure	Discuss the effects of temperature on brine weight (e.g., surface temperature vs downhole temperature).
Fluid Flow Behavior	I	Viscosity	Define the relationship between viscosity and frictional pressure losses.
	I	Flow rates	Describe frictional pressure loss changes due to flow rate.
	I	Frictional pressure losses	Describe frictional pressure loss changes due to downhole restrictions.
	I	Fluid flowpath geometry (wellbore/coiled tubing)	Describe frictional pressure loss changes due to well geometry.
	I	Flowpath restrictions (wellbore, downhole tools)	Describe frictional pressure loss changes due to downhole tools.
Fluid Types	A	Oil based fluids	Describe the applications where oil based fluids may be used.
	A	Base oil	Identify an application where base oil is used in a completion.

Module Name: 2.6 Completion and Workover Fluids			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	A	Water based fluids	Identify acceptable types of water based fluids that may be used in a workover/completion fluid (e.g., clear brines, muds, salt saturated brines, gels/gel pills, stimulation fluids – acids, calcium carbonate systems, packer fluids).
	A	Gases	Identify acceptable types of gases that may be used in a workover/completion fluid (e.g., CO_2, N_2).
Measuring Techniques	A	Fluid properties	Explain how fluid density is measured (i.e., use of mud balance).
	A		Identify the conditions where a pressurized mud balance may be used.
	A		Explain how fluid viscosity is measured (i.e., Marsh funnel).

2.7 General Overview of Surface and Subsurface Wellbore Equipment

Module Name: 2.7 General Overview of Surface and Subsurface Wellbore Equipment			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
Christmas Tree	I	Components	Identify the key Christmas tree components.
	M	Purpose and Function of the Christmas Tree	Explain the function of the Christmas Tree and how they work with particular emphasis on: • Master, swab and flow line valves • The Surface Safety Valve (SSV) • Control line pressure versus tubing pressure
Blowout Preventer Stacks	M	Barrier Elements a. Annular Type Blowout Preventer (BOP) b. Ram Type BOP	Identify barrier elements used in snubbing operations.
	M		Explain advantages and disadvantages of each type of equipment used in snubbing operations as a barrier element.

Module Name: 2.7 General Overview of Surface and Subsurface Wellbore Equipment			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
	I	1) Strippers (see sub-module lubricator/stripper assemblies for more learning objectives) 2) Pipe/Multiple string 3) Blind 4) Blind/Shear 5) Shear 6) Slip 7) Variable bore c. Valves	Identify criteria used in the selection of the barrier element for different operating environments (e.g., pressure, safety margins, operational objectives of the job, operating limits of the elements).
	I	Operating Environment	Verify operating limits of BOP equipment (e.g., pressure and space out limits).
	I	Configurations	Identify flow path(s) used in well control operations.
	I		Identify locations for choke and kill line valves.
	M	Stripping rams (HWO)	Explain the functionality and limitations of stripping rams (HWO).
	I	Tapered strings	Identify proper ram selection for tapered strings.
Auxiliary Well Control Equipment	I	Downhole check valves	Explain the necessity of redundancy regarding internal application of downhole check valves to prevent flow up the string (i.e., where or why are we redundant).
	I	Full open safety valve (FOSV) a. Floor stabbing valves b. Tubing safety valves	Describe the function and use of the full open safety valve.
	I		Identify the location of the FOSV when not in use.
Accumulators	M	Accumulator Drawdown test	Identify reasons and procedures for an accumulator drawdown test.
	M		Identify the accumulator drawdown test frequency as per API STD 53.
	M		Calculate the usable fluid volume for a given BOP stack applying a safety factor.
	M		Describe the accumulator system function.
	M		Define pre-charge pressure relative to usable fluid volume test.
	M		Define minimum system pressure relative to accumulator drawdown test.

Module Name: 2.7 General Overview of Surface and Subsurface Wellbore Equipment			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	M		Define normal regulated operating pressure relative to accumulator drawdown test.
	M		Define maximum system pressure relative to accumulator drawdown test.
	I		List conditions which would cause an adjustment to the regulated annular operating pressure (e.g., change in OD, change in well pressure, and worn elements).
	M	Closing time test	Identify the reasons and procedures for a closing time test, per API STD 53.
	I	Adjustment of operating pressure a. Manifold pressure regulator b. Annular pressure regulator	Explain the function of the manifold pressure regulator and bypass valve.
	I		Explain the function of the annular pressure regulator.
	I		Describe the accumulator system functions, including an explanation of the consequences of losing nitrogen pre-charge pressure.
	I		List the reasons for adjusting regulated annular operating pressure.
	M	Operating purpose of main and remote control panels	Describe the purpose of main and remote control panels.
	M	Operating functions of the remote BOP control panel	Describe how to operate the BOP from the remote control panels.
	M		Describe the consequences of lost rig air used for functioning the remote BOP control panel.
Chokes and Choke Manifolds	I	Manual adjustable chokes	Define the function of manual adjustable choke.
	I	Remote adjustable chokes	Define the function of remote adjustable choke.
	I		Explain how back-up system(s) to remotely operate chokes work.
	I	Choke manifolds	Define the function of choke manifold.
Fluid Measuring	I	Pump stroke counter	Define the function of pump stroke counter in relation to calculating volumetric rate.
Workstring and Production Tubing	I	Tubular Integrity	Identify tubing ratings (e.g., burst, collapse, torsion, tensile, buckling, connection type).
	I	Operational Hazards	Identify possible tubing failure (e.g., washouts, corrosion, H_2S).

Module Name: 2.7 General Overview of Surface and Subsurface Wellbore Equipment			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	I	Inside BOPs (IBOPs)	Identify IBOP options and safety considerations for each.
	A		Describe the function and use of IBOP.
	I		Identify the location and position of the IBOP when not in use.
Completion Equipment	I	Tubing hanger	Describe the function of tubing hangers: Seal off annulus Support tubing weight Provide locking or threaded profile for Tubing Hanger Profile (TBH)
	I	Surface Controlled Sub-Surface Safety Valve (SCSSV)	Explain the functionality and how a failure of a Surface controlled sub-surface safety valve (SCSSV) can contribute to a well control incident.
	I		Recognize and describe the advantages/disadvantages of retrieving methods for surface controlled sub-surface safety valves (SCSSVs).
	I		Explain how a failure of the lock-out device in a surface controlled Sub-Surface Safety Valve (SCSSV) can result in a well control incident.
	I	Sub-surface safety valves (SSSVs)	Describe the difference between the sub-surface safety valves (SSSV) and the surface controlled sub-surface safety valve (SCSSV).
	I	Landing nipples and tubing plugs	Describe the primary function, types, restrictions, applications and positioning of landing nipples and tubing plugs.
	I	Sliding sleeves and ported nipples	Describe the primary function and design of the sliding sleeves as communication devices (e.g., production, circulation).
	I		Describe the primary function and design of the ported nipples as communication devices (e.g., production, circulation).
	I	Gas Lift Valve	Describe the primary function of side pocket mandrels, either with a working valve (gas lift, circulation and chemical injection) or with a dummy valve installed.

2.8 Procedures

Module Name: 2.8 Procedures			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
Set/Check Alarm Limits	M	Return flow sensor	Explain the purpose for setting flow sensor levels.
	A	H_2S and flammable/explosive gas sensors	Describe the purpose of H_2S and explosive mixture gas sensors.
	A		Identify the locations of H_2S and explosive mixture gas sensors.
Shut-in	M	Non-shearable or Non-sealable equipment across the Well Control Stack	Explain the well shut-in complications when non-shearable or non-sealable equipment is across the Well Control Stack (e.g., sand screens, cables, control lines, Bottom Hole Assembly (BHA), packers, gas lift mandrels, and tubing hangers).
	M		Explain the importance of having an emergency procedure to address non-shearable and non-sealable elements across the Well Control Stack (i.e., tapered strings, gravel pack screens, gas lift mandrels, slotted liners, packers).
	M	Roles and Responsibilities	Explain the importance of the crew knowing their specific well control responsibilities related to detection, well shut-in, and control.
Verification of Shut-in	M	Annular	Identify the valves/BOP equipment to be closed to establish a shut-in at the BOP with the use of flow line and trip tank (if applicable) to monitor.
	I	Wellhead/BOP/Xmas tree	Identify the valves/BOP equipment to be closed to establish a shut-in (e.g. Casing valve, Crown, wing, master valves).
	I	Manifold	Identify the valves/BOP equipment to be closed to establish a shut-in (Manifold valves (standpipe/rig floor), Choke(s) (manual and/or remote).
Monitoring and Recording During Shut-in	I	BOP Stack/Wellhead Choke and Kill Lines, Manifolds, Riser Spool, Accumulator Hoses and Connections	Explain the importance of regular intervals of visual checks for leaks.
	M	Accumulator	Identify what needs to be monitored for integrity (e.g., check accumulator and manifold pressure, valve line up, and check status of power sources).
Stripping operations	I	Importance of strip/trip tank and line up	Explain the importance of a strip/trip tank.
	I		Demonstrate valve line up to trip tank.

Module Name: 2.8 Procedures			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
	I	Stripping procedure for BOP	Describe the purpose and procedure for stripping operations (with and without volumetric control).
	I	Measurement of volumes bled from the well	Explain the purpose and importance of using a bleed chart, with or without gas migration.
	M	Calculations relating volumes and pressure to be bled for a given number of tubing or workstring stands run in the hole	Perform calculations for bleed volumes or pressures as method requires.
	A	Stripping with or without volumetric control	Describe possible situations where stripping with or without volumetric control is important.
Preparing for Well Entry	I	Verification prior to well entry	Identify well conditions and equipment that need to be verified prior to well entry (e.g., equipment in the well, equipment ratings, type of fluid and fluid level, restrictions, and maximum anticipated well head pressure).

2.9 Snubbing Equipment

Module Name: 2.9 Snubbing Equipment			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**

Snubbing Equipment	I	Types of snubbing unit:
		a. Stand-alone
		b. Rig Assist (Space Saver)
			Identify and describe stand-alone snubbing units:
			• Jack based snubbing unit
			  • Short stroke
			  • Long stroke
			  • Hydraulic Drilling Unit

	I		Identify and describe a rig assist snubbing unit: • Conventional space saver • Mini space saver (remotely operated) • Mechanical
Snubbing Barriers	M	Hierarchy of barriers	Identify internal (inside the tubulars) barriers (e.g., primary, secondary).

Module Name: 2.9 Snubbing Equipment			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
	M		Identify external (annular) barriers (e.g., primary, secondary).
	M		Explain how to maintain barrier(s) when changing a sealing element during intervention and give examples of barriers.
Stripper Assemblies	I	Sealing elements	Identify different types of sealing elements (e.g., stripping annular, ram type).
	I		Identify critical seals that have the potential to fail through wear and explain why they need to be replaced.
Dynamic Stripping BOPs (Main Stripping Stack)	M	Annular	Describe equipment limitations (e.g., rule of thumb 2,000 psi surface pressure).
	M	Stripping rams	Describe operating principles and limitations of stripping rams.
	M		Describe closing and operating sequences to strip and/or snub pipe into the well.
	I		Describe components that may be well pressure assisted to affect a seal on closure.
	I	Equalizing Loop and Bleed-off Line	Explain what equalizing loops and bleed-off lines are.
	I		Explain the purpose of using the equalizing loop and bleed-off line.
	M	Safety Ram	Describe operating principles and limitations of safety rams.

2.10 Well Kill in Preparation of Well Intervention

Module Name: 2.10 Well Kill in Preparation of Well Intervention			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
Objective of Well Control Techniques	I	Live Well intervention (without killing the well): a. Relies on pressure containment through surface well control equipment	Identify the objectives of well intervention well control techniques in a live well where well is allowed to flow.
	I		Identify the objectives of well intervention well control techniques in a live well where well is **not** allowed to flow.
	I	Dead Well intervention (killing the well): a. Circulate formation fluid out of	Identify the objectives of circulating formation fluid out of the well as a well control/well intervention technique.

Module Name: 2.10 Well Kill in Preparation of Well Intervention			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
	I	wellbore or bullhead fluid back into formation b. Establish hydrostatic well control c. Avoid excessive surface and downhole pressures so as not to induce an underground blowout or lose kill fluids to formation	Identify the objectives of displacing formation fluid back into formation as a well control/well intervention technique.
	I		Identify the objectives of reestablishing hydrostatic control.
	I		Identify well intervention techniques which may induce downhole fracturing and fluid loss.

2.11 Special Situations

Module Name: 2.11 Special Situations			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
Blockages and Trapped Pressure in Tubing/Wellbore	I	Effect of blockages in retaining trapped pressure	Identify types of blockages (i.e., sand bridges, paraffin, tubing plugs).
	I		Identify potential well control complications with trapping pressure below blockages.
Blockages and Restricted Access in Tubing/Wellbore	A	Effect of blockages in impeding the ability to run tool string in or out of the wellbore	Describe where paraffin / asphaltenes / scaling is encountered and problems caused (i.e., commonly found in older oil producing wells; prevent tools from being run in to and out of the hole; plug up valves and surface equipment).
Hydrates	I	Effect of Hydrates while Circulating	Define hydrates.
	I		Explain how hydrates can complicate well control.
	I		Identify preventive measures to inhibit hydrate formation.
H_2S Considerations	I	Effect of H_2S on Well Control Methodology	Define H_2S and equipment limitations based on H_2S concentration (e.g., 0.00011-0.00033 ppm is typical background concentration).
	I		Describe additional procedures, precaution and supplemental safety equipment necessary, fluid scavengers, inhibitors while operating in an H_2S environment.

Module Name: 2.11 Special Situations			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
	I		Describe equipment addition, limitations, modification or replacement necessary to work in an H_2S environment (i.e., tubular or wireline embrittlement and seals).
	I		Explain safety considerations on safely bringing H_2S to the surface.
Operations with Specific Well Control Concerns	M	Pressure Calculation Exceeding MASP	Describe and discuss conditions where pressure calculations exceed MASP (e.g., perforating, fracturing, energized fluids).
Complication with Hydraulic Fracturing Operations	M	Pressure Limits Created by Hydraulic Fracturing Operations	Describe or discuss how MASP can be exceeded during well intervention operations being influenced by nearby hydraulic fracturing operations (e.g., SIMOPS).
Rig-Up	I	Special BOP Equipment	Describe when, where, and why a guide ram is used.
	I		Identify special situations that would use guide tubes in a BOP stack.
	I		Identify special situations when a telescoping tubing guide would be used in the jack.
Planned Responses to Anticipated Well Control Scenarios	I	Encountering Unexpected Pressure	Discuss actions to take when encountering unexpected pressure and what are the causes (e.g., unexpected increase in pressure, pipe buckling, piston effect, tri-axial pipe loading).
	M	Slip bowl failure	Explain preventative measures to take to prevent slip bowl failures.
	M		Given a scenario, explain the potential impact of slip bowl failure on the immediate operation.
	M		Explain or demonstrate the action to be taken in the event of a slip bowl failure.
	M	Power unit or hydraulic circuit failure while conducting snubbing operations	Explain emergency measures to take in relation to power unit or hydraulic circuit failure.
	I		Discuss the potential impact of power unit or hydraulic circuit failure on the snubbing operation (e.g., securing the pipe in slip bowls, securing suspended loads, pipe handling).
	M	Stripping annular element failure	Explain or demonstrate the action to be taken in the event of stripping annular element failures.
	A	Leak below BOP stack	Explain or describe the action to be taken in the event of a leak below BOP stack (internal and external).

Module Name: 2.11 Special Situations			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
	M	Pressure at surface inside the work string	Explain or describe the action(s) to be taken (stab-in safety valve, blind shear, pump) in the event of pressure at the surface inside the work string (e.g., hole in tubular; downhole check valve failure).
	M	Leak in the stripper BOP ram	Explain the action to take in the event of a leak in the stripper BOP ram.
	I	Buckling of tubulars	Define tubular buckling.
	I		Describe where tubular buckling may occur (e.g., supported and unsupported).
	I		Identify the preventive factors that are designed to avoid the impact of tubular buckling.
	I		Explain the action(s) to take to make the operations safe while maintaining control of the well during buckling of string (e.g., stroke length).
	I		Explain the operational factors that can impact buckling of string in BOP stack on the immediate operation.
	M	Parting of string	Explain the action to take to make the operation safe while maintaining control of the well should the string part causing a load reversal.
	I		Explain the impact of parting of string on the immediate operation.

2.12 Organizing a Well Control Operation

Module Name: 2.12 Organizing a Well Control Operation			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
Personnel Assignments	M	Roles and Responsibilities	Describe required personnel assignments during a well control operation.
Pre-Recorded Information	I	Pre-recorded information	Describe locations of pre-recorded information, collection process, and where supervisor will keep well documentation.
Plan Responses to Anticipated Well Control Scenarios	I	Emergency Response Plan	Explain the importance of the emergency response plan for all well operations.

Module Name: 2.12 Organizing a Well Control Operation			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
Communications Responsibilities	I	Planning and outlining routine well control responsibilities	Describe the lines of communication and the roles of personnel, including the importance of pre-job on site planning meetings and tour safety meetings.
	I		Describe how equipment and personnel would be organized to recover a situation, once the well is safely shut in.

2.13 Testing

Module Name: 2.13 Testing			
Sub-Modules	**AIM**	**Learning Topics** **The instructor will impart knowledge on:**	**Learning Objectives and Assessment Guidelines** **The attendee will be able to:**
Pressure and Function Tests	I	Purpose	Explain the reason for pressure testing equipment for integrity upon rig-up or when a system component is replaced, repaired, or decoupled.
	M	Maximum safe working pressures of well control equipment	Identify the maximum safe working pressure for a given set of well control equipment.
	I		List reasons for de-rating the maximum safe working pressure of well control equipment (e.g., temperature, erosion, corrosion).
	I	Low Pressure and High Pressure Testing	Discuss the importance of low pressure testing in advance of high pressure testing (e.g., API 53ST and 30 CFR 250.617).
BOP Testing	I	Requirements for pressure testing	Given details of specific equipment and operation, describe pressure testing procedures.
	I	Performing pressure tests	Demonstrate procedures to pressure test a valve or BOP function.
Testing of Completion Equipment	I	Packers	Discuss the negative pressure test of a packer.
	I	Deep-set Plug	Discuss the pressure test of a deep-set plug.

2.14 Government, Industry and Company Rules, Order and Policies

Module Name: 2.14 Government, Industry and Company Rules, Orders and Policies			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
Incorporate by Reference	A	API and ISO recommended practices, standards and bulletins pertaining to well control	Describe or identify appropriate industry standard or recommended practice pertaining to job being completed.
	A	Regional and/or local regulations where required	Describe or identify appropriate regional government regulations pertaining to job being completed.
	A	Company/operator specific requirements where required	Describe or identify appropriate company or operator specific requirements pertaining to job being completed.

2.15 Ancillary Considerations

Module Name: 2.15 Ancillary Considerations			
Sub-Modules	**AIM**	**Learning Topics**	**Learning Objectives and Assessment Guidelines**
		The instructor will impart knowledge on:	**The attendee will be able to:**
Gas Detection	A	Purpose and location	Describe the functions of gas detectors.
	A		Identify the location of gas detectors.
Fluid-Gas Separators	A	Purpose and location	Describe the functions of fluid-gas separators.
	A	Operating parameters	Explain the operating parameters (e.g., maximum operating pressure, vent line diameter, u-tube height; and potential dangers and action to take if overloaded).
Wellhead Control Panel	I	Operation of Control Panel	Describe the function of the emergency shutdown (ESD) on the control panel and accumulator requirements.