WellCAP®
IADC WELL CONTROL ACCREDITATION PROGRAM

DRILLING AND WORKOVER/COMPLETION OPERATIONS
CORE CURRICULUM AND RELATED JOB SKILLS

FORM WCT-2DWI

INTRODUCTORY LEVEL

The purpose of the core curriculum is to identify a body of knowledge and a set of job skills, which can be used to provide well control skills for drilling operations (including well testing and initial completion). The curriculum is divided into three course levels: Introductory, Fundamental, and Supervisory. *The order in which the instruction is given is at the discretion of the school* – it does not have to be given in the order presented here.

The suggested target students for each core curriculum level are as follows:

INTRODUCTORY: Floorman, Derrickman
(May also be appropriate for non-technical personnel)

FUNDAMENTAL: Derrickman, Assistant Driller, and Driller

SUPERVISORY: Toolpusher, Superintendent, and Drilling Foreman

Upon completion of a well control training course based on curriculum guidelines, the student should be able to perform the job skills in italics identified by a "■" mark (e.g., ■ *Identify causes of kicks*).

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I. PRESSURE CONCEPTS AND CALCULATIONS

TRAINING TOPICS	*JOB SKILLS*
A. Types of pressure 1. U-tube concept and hydrostatic column 2. Hydrostatic pressure 3. Bottomhole pressure 4. Surface pressure	■ *Demonstrate understanding of u-tube concept and hydrostatic column.* ■ *Demonstrate understanding of hydrostatic pressure.* ■ *Demonstrate understanding of bottomhole pressure.* ■ *Demonstrate understanding of surface pressure and describe its effect on downhole pressures.*

II. CAUSES OF KICKS

TRAINING TOPICS	*JOB SKILLS*
A. Unintentional flow or "kick" from a formation	■ *Identify causes of <u>unintentional</u> flow or "kicks."*
1. Failure to keep hole full	
2. Swabbing effect of pulling pipe	
3. Loss of circulation	
4. Insufficient density of drilling fluid, brines, cement, etc.	
5. Abnormally pressured formation	
6. Lowering pipe too rapidly into hole (surge)	
7. Annular gas flow after cementing	
B. Intentional flow from a formation	■ *Identify causes of <u>intentional</u> flow from formation.*
1. Drill stem test	
2. Completion	
3. Underbalanced Operations (UBO)	

III. KICK DETECTION

TRAINING TOPICS	*JOB SKILLS*
A. Kick indicators 1. Gain in pit volume (rapid increases in fluid volume at the surface) 2. Increase in return fluid-flow rate (with no pump strokes per minute increase) 3. Well flowing with pump shut down 4. Hole not taking proper amount of fluid during trips 5. Well monitoring and alarm devices a. Pit volume totalizers (PVT) b. Relative flow increase	■ *Identify kick indicators.*
B. Warning signs of kicks 1. Changes in fluid weight & viscosity 2. Changes in shape & volume of cuttings	■ *Identify warning signs of kicks.*
C. Importance of responding to kick indicators in a timely manner 1. Minimize a. Kick size b. Surface pressures c. Lost operations time 2. Consequences of not responding a. Kick becomes blowout b. Release of poisonous gases c. Pollution d. Fire	■ *Identify the importance of early detection and the consequences of not responding to a kick in a timely manner.*

IV. PROCEDURES

TRAINING TOPICS	*JOB SKILLS*
A. Flow checks 1. While drilling 2. While tripping	■ *Describe the procedure (such as a pit drill) to perform a flow check in the situations listed at left.*
B. Shut-in & verification of shut-in 1. Procedure a. While drilling b. While tripping 2. Verification a. While drilling b. While tripping	■ *Upon observing positive flow indicators, participate in the well shut-in in a timely and efficient manner to minimize influx. Proceed according to a specific procedure that will address the operations listed at left.* ■ *For any shut-in, verify well closure by demonstrating that flow paths are closed.*
C. Well monitoring during shut-in 1. Recordkeeping a. Time of shut-in b. Drillpipe and casing pressures 1) At initial shut-in 2) At regular intervals c. Estimated pit gain	■ *Read, record, and report well shut-in recordkeeping parameters.*

Procedures continued on next page.

Procedures, continued.

TRAINING TOPICS	*JOB SKILLS*
D. Tripping 1. Measure hole fill-up 2. Procedure and line-up to keep hole filled	■ *Perform the items listed at left with regard to hole fill-up on trips.*
E. Shallow gas hazards 1. Mechanisms and timing of events 2. Kill procedures a. Shut-in b. Use of diverters 1) With drillpipe 2) Running casing c. Riserless drilling	■ *Explain why it is relatively easy to become underbalanced at shallow depths (e.g., hole sweeps, gas cutting, swabbing, lost circulation).* ■ *Explain the limited reaction time for kick detection.*

V. GAS CHARACTERISTICS AND BEHAVIOR

TRAINING TOPICS	*JOB SKILLS*
A. Gas types 1. Hydrocarbon 2. H_2S	■ *Identify types of gases and hazards of each.*
B. Gas Density	■ *Describe the relatively low density of gas and its effect on the hydrostatic column.*
C. Migration 1. If the well is left shut-in while gas is migrating 2. If the well is allowed to remain open with no control	■ *Explain the consequences of gas migration.*

VI. FLUIDS

TRAINING TOPICS	*JOB SKILLS*
A. Types of wellbore fluids	■ *Identify types of drilling fluids.*
1. Water based mud	
2. Oil based mud (OBM), synthetic oil based mud (SOBM)	
3. Cement slurry	
4. Completion fluids	

VII. CONSTANT BOTTOMHOLE PRESSURE WELL CONTROL METHODS

TRAINING TOPICS	*JOB SKILLS*
A. Objectives of constant bottomhole pressure methods 1. Re-establish primary well control by restoring hydrostatic balance 2. Avoid additional kicks 3. Avoid excessive surface and downhole pressures to prevent inducing an underground blowout	■ *Identify objectives of constant bottomhole pressure methods.*
B. Principles of constant bottomhole pressure methods 1. Shutting-in well will stop influx when bottomhole pressure equals formation pressure 2. Circulate kick out of well while maintaining constant bottom hole pressure.	■ *Read, record and report drillpipe and annulus pressures.* ■ *List the phases of at least one constant bottomhole pressure well control method.*
C. Well control procedures 1. Drillers method 2. Weight and wait method 3. Diverter	■ *Describe the difference between diverting and well kills that use constant bottomhole pressure methods.*

VIII. EQUIPMENT

TRAINING TOPICS	*JOB SKILLS*
A. Well control related instrumentation 1. Fluid pit level indicator 2. Fluid return indicator 3. Pressure measuring equipment and locations a. Locations 1) Standpipe pressure gauge 2) Drillpipe pressure gauge 3) Pump pressure gauge 4) Casing pressure gauge (also referred to as choke manifold or annular pressure gauge) b. Range and accuracy 4. Mud pump/Stroke counter 5. Mud balance and pressurized mud balance 6. Gas detection equipment a. H_2S b. Flammable/Explosive gases 7. Drilling recorder a. Pit volume (number of barrels of fluid in the pit) b. Flow rate c. Rate of penetration (ROP) d. Pressure e. Strokes per minute (SPM) f. Mud weight g. Depth recorder	■ *Describe the purpose and use of the mud pump/stroke counter (e.g., stroke rate, flow rate, and displaced volume).* ■ *Describe the importance of the mud balance.*

Equipment continued on next page.

Equipment, continued.

TRAINING TOPICS	*JOB SKILLS*
B. BOP configuration 1. Components a. Annular preventer b. Ram preventers/elements 1) Blind 2) Blind/Shear 3) Pipe 4) Variable bore pipe 5) Ram elements c. Drilling spool or integral body 2. Valves 3. Functions of BOP Components 4. Arrangements and flow paths	■ *Demonstrate basic understanding of the use of ram and annular preventers.* ■ *Identify flow path for normal drilling operations.* ■ *Identify flow path for well control operations.* ■ *Identify and assist as directed to line-up for equipment pressure testing, shut-in, and pumping operations.*
C. Manifolds and piping 1. Standpipe 2. Choke 3. Mud pressure relief	■ *Distinguish the function of the choke from that of other valve types.*

Equipment continued on next page.

Equipment, continued.

TRAINING TOPICS	*JOB SKILLS*
D. Auxiliary well control equipment 1. Mud/Gas separator a. Gas blow-through b. Vessel rupture 2. Mud pits a. Suction pit b. Return pit c. Mixing equipment 3. Degasser 4. Trip tank a. Gravity feed b. Recirculating type 5. Safety valves, lower and upper 6. Inside BOP (IBOP)	■ *Define function, operating principles, flow paths, and components of mud-gas separators.* ■ *Assist as directed in pit alignment during well control operations (e.g., vacuum degasser, flaring).* ■ *Describe the procedures for handling of gas in return fluids (e.g., vacuum degasser, flaring).*
E. BOP closing unit – function and performance 1. Consequences of losing nitrogen pre-charge pressure	■ *Demonstrate understanding of the function of the accumulator system, including an explanation of the consequences of losing nitrogen pre-charge pressure.*
F. Workover/Completion equipment 1. Packers 2. Lubricators 3. Christmas trees 4. Test trees	■ *Perform, explain, or demonstrate the items listed at left.*

IX. GOVERNMENT, INDUSTRY AND COMPANY RULES, ORDERS AND POLICIES

TRAINING TOPICS	*JOB SKILLS*
A. Incorporate by reference regional and/or local regulations where required, and/or company-specific policies.	■ *Identify how to obtain information on relevant regulations and/or company-specific policies.*