



eWCAT (ELECTRONIC WELL CONTROL ASSURANCE TOOL) AND PROCESS SAFETY

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AGENDA

HSSE & SP CF, Process & Personal Safety	1 min
Process Safety, Wells Standards – Dem 1 & 2	2 min
Well Delivery Process & Bow-tie methodology (well life cycle)	2 min
PCM – eWCAT	2 min
P&ID's	1 min
Equipment, Personnel & Barrier Verification Plans (BVP)	2 min
COC & COS	3 min
Compliance in eWCAT	2 min
Questions	?

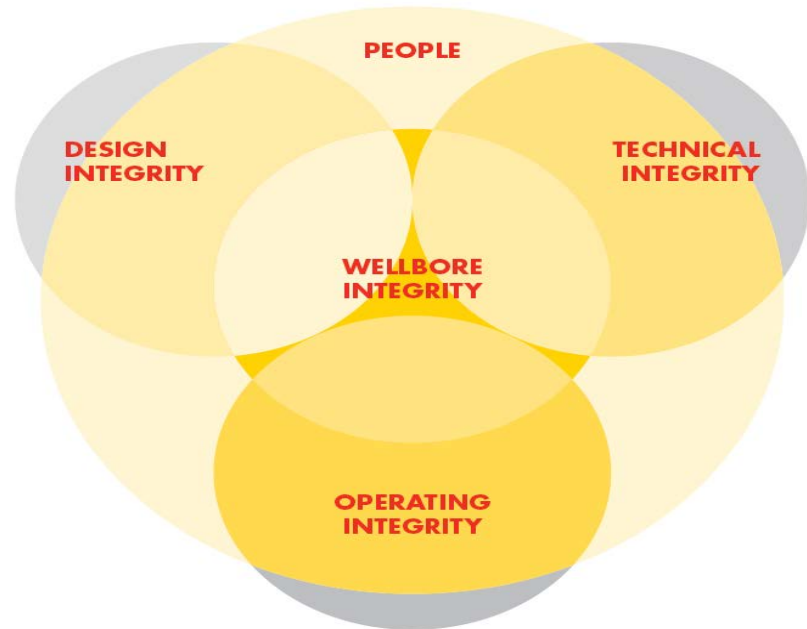
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HSSE & SP CONTROL FRAMEWORK, PROCESS SAFETY & PERSONAL SAFETY



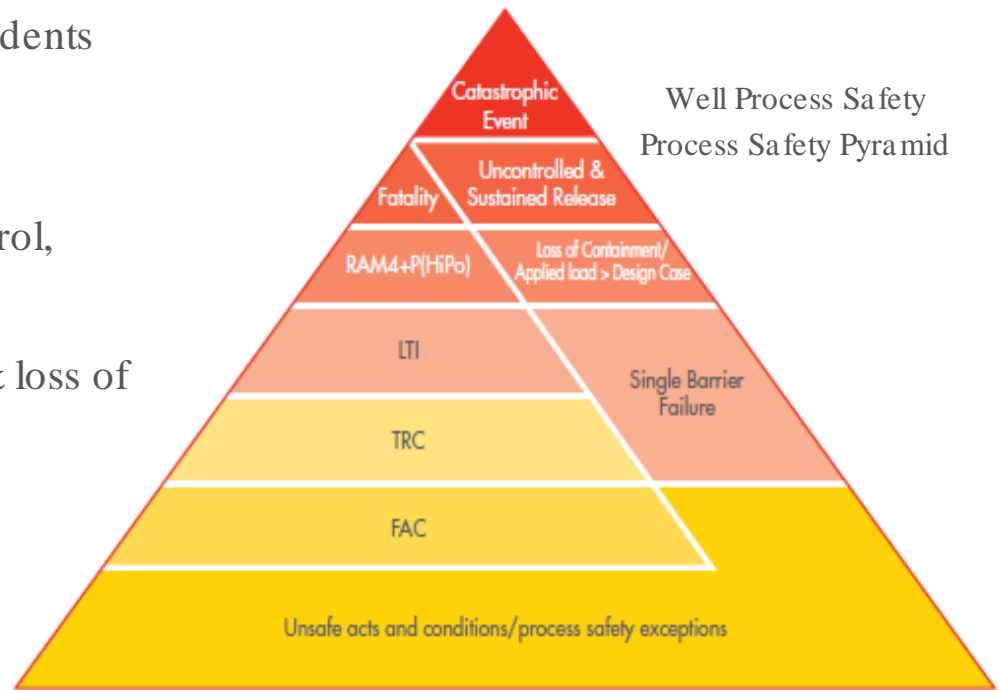
Shell Control Framework

Addressing Wellbore Integrity in Practice



PROCESS SAFETY IN WELLS

- Prevention of potential major industrial incidents caused by unintended release of energy or hazardous substances
- Potential hazards associated with well control, wellbore integrity & containment
- Potential incidents relating to well control & loss of well integrity
 - Loss of primary well control
 - Design load case exceeded
 - Single barrier failures
 - Unintended release of well effluents
 - Other relevant incidents
- Incidents shall be RAM-classified & followed-up accordingly



SEVERITY	CONSEQUENCES				INCREASING LIKELIHOOD				
	People	Assets	Environment	Reputation	A	B	C	D	E
					Never heard of in the Industry	Heard of in the Industry	Has happened in the Organisation or more than once per year in the Industry	Has happened at the Location or more than once per year in the Organisation	Has happened more than once per year at the Location
0	No injury or health effect	No damage	No effect	No impact					
1	Slight injury or health effect	Slight damage	Slight effect	Slight impact					
2	Minor injury or health effect	Minor damage	Minor effect	Minor impact					
3	Major injury or health effect	Moderate damage	Moderate effect	Moderate impact					
4	PTD or up to 3 fatalities	Major damage	Major effect	Major impact					
5	More than 3 fatalities	Massive damage	Massive effect	Massive impact					

PROCESS & PERSONAL SAFETY

DEM 2 : Process safety basic

requirement to prevent re-occurrence of incident.

PSBR's (Process Safety Basic

Requirements), "SHALL" statement [PS]

DEM 1 & WS's: Wells Standards (WS), DEP's (Shell Design and Engineering Practices),

- Example: PCM (Pressure Control Manual) & CTDM (Casing Tubing Design Manual), "shall", mandatory

Process Safety Basic Requirements (PSBR)

Currently 11 PSBR's:

PSBR 1 Safe siting of occupied portable buildings

PSBR 2 ESD valves on platform risers

PSBR 3 Temporary refuges

PSBR 4 Permit To Work

PSBR 5 Management Of Change

PSBR 6 Avoid liquid release relief to atmosphere

PSBR 7 Avoid tank overfill followed by vapour cloud release

PSBR 8 Avoid brittle fracture of metallic materials

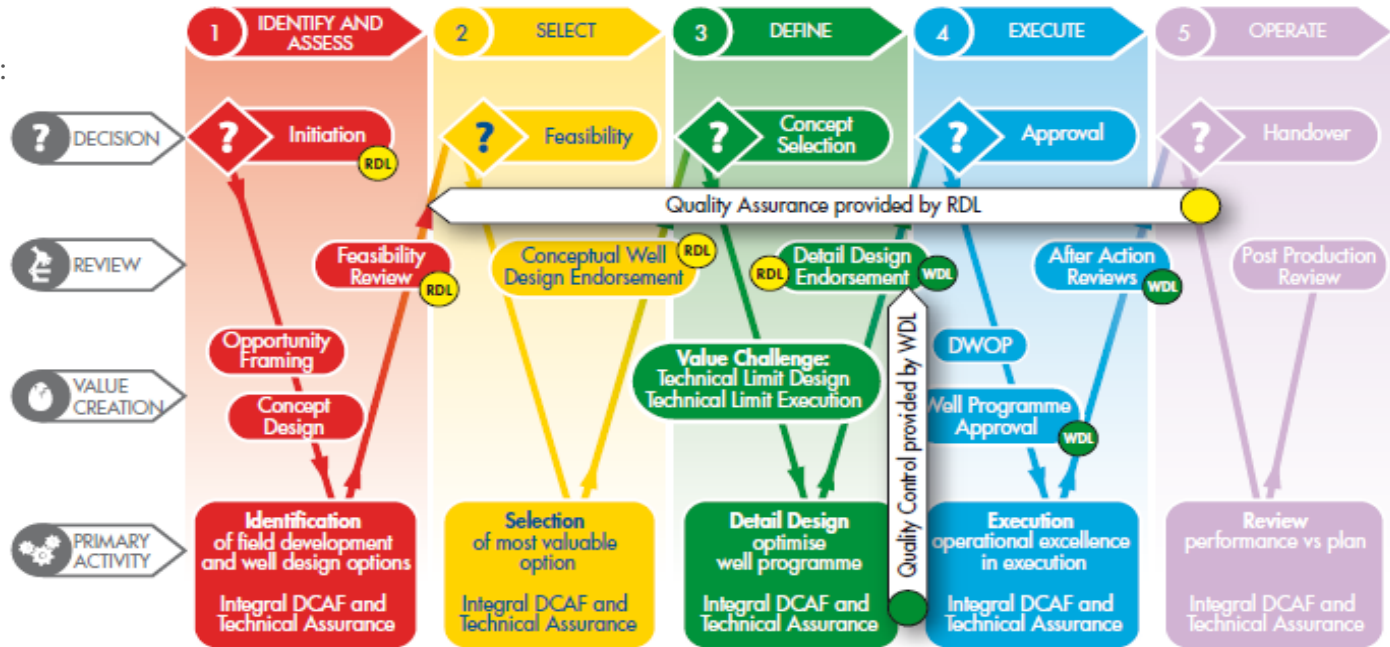
PSBR 9 Alarm management

PSBR 10 Sour Gas (H₂S)

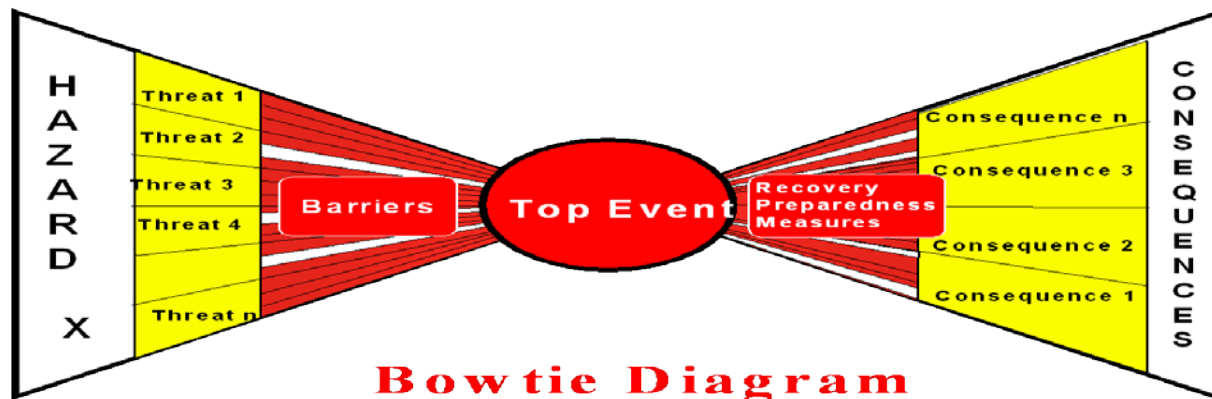
PSBR 11 Deepwater Well Design and Construction

WELL DELIVERY PROCESS & BOW-TIE METHODOLOGY (WELL LIFE CYCLE)

Well Delivery Process:



Bowties:



Bowtie Diagram

eWCAT (PROCESS SAFETY)

CTDM (Casing Tubing Design Manual):

Process Safety requirements:

- Barrier Policy
- Design Process
 - Material, pipe body, connection (selection)
 - Design load scenario's; conditions for casing & tubing.
 - Design Check equations (Casing / tubular limitations vs. conditions)
 - Design Factors (addressing uncertainty load vs. capacity) for:
 - Running-Tension
 - Running – Compression
 - Collapse
 - Tri-axial Burst
 - Supplementary & Specific well design requirements

eWCAT (PROCESS SAFETY)

PCM (Pressure Control Manual):

Process safety requirements:

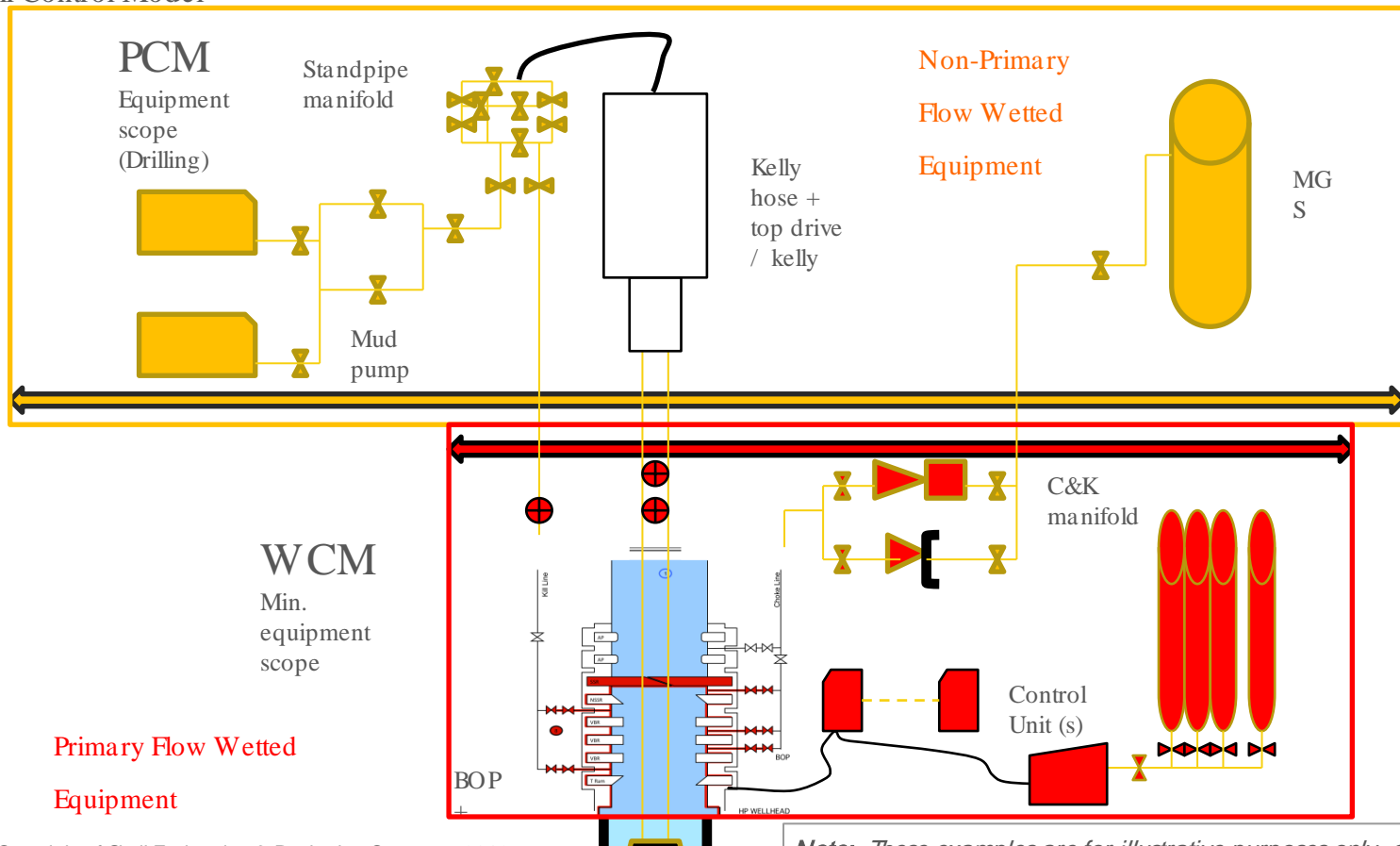
- Policy, Procedures & Practices for well control (well construction phase)
- eWCAT Implementation:
 - Upload template (s)
 - Equipment (“walk the line”)
 - Personnel (contractor & Shell personnel WC certification)
 - Barrier diagram(s) / Verification plan, (primary & secondary barriers)
 - Well Control Model (Min. equipment, tests frequency & scope)

eWCAT APPLIES TO ALL RESERVOIR HYDROCARBON WETTED PRESSURE CONTAINING SYSTEMS

PCM (Pressure Control Manual):

WCM:

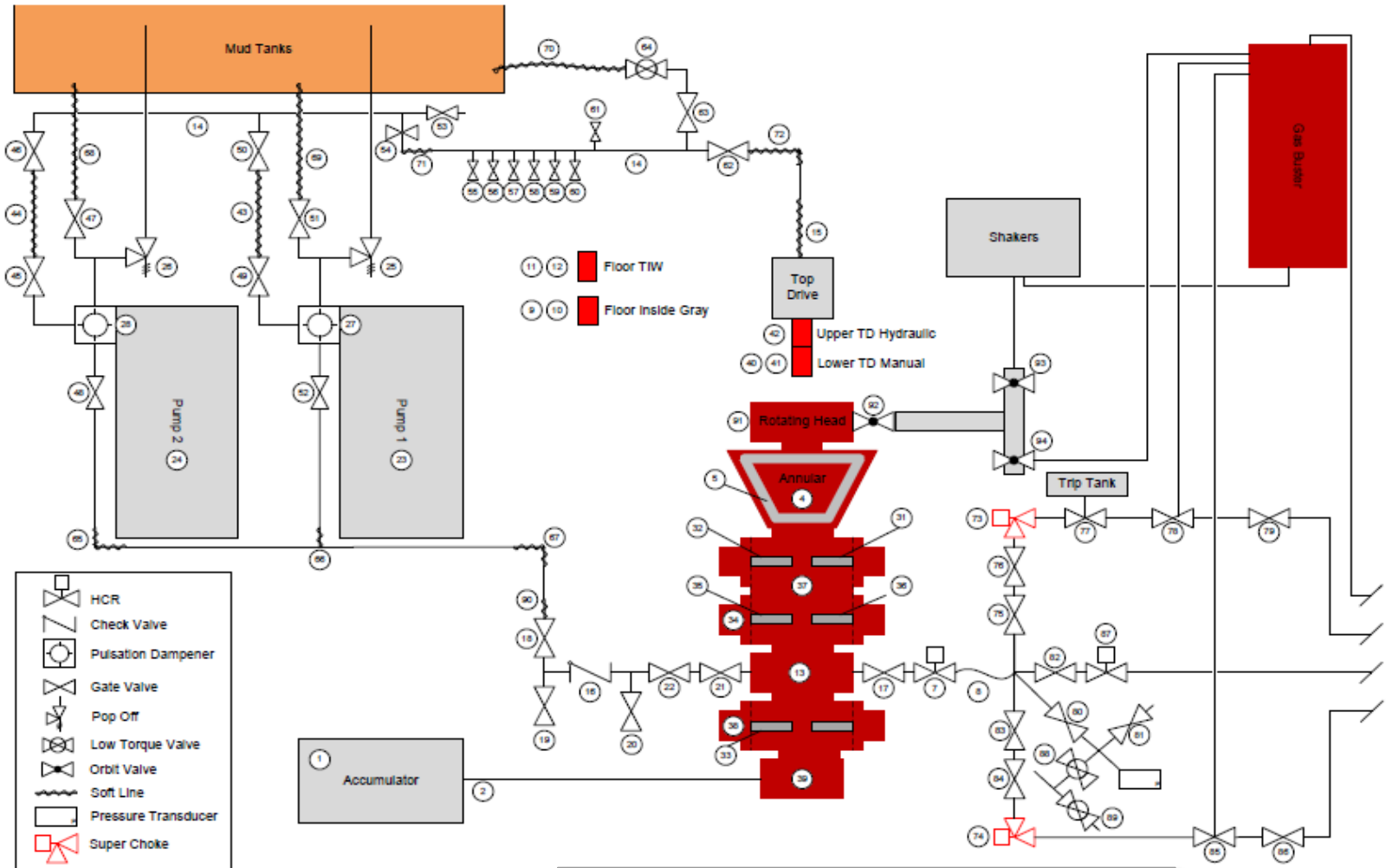
- Barrier Diagrams / Verification Plans
- Well Control Model



eWCAT/ P&IDs

Implementation:

P&ID Dia grams



Note: This example is for illustrative purposes only, and is not intended to cover all equipment, sites or situations

eWCAT / BARRIER VERIFICATION PLANS

Implementation:

Barrier diagram / verification plan(s), (primary & secondary barriers for operational scopes, Norsok D-010-rev.3)

Barrier verification test(s)

Activity Stage Details

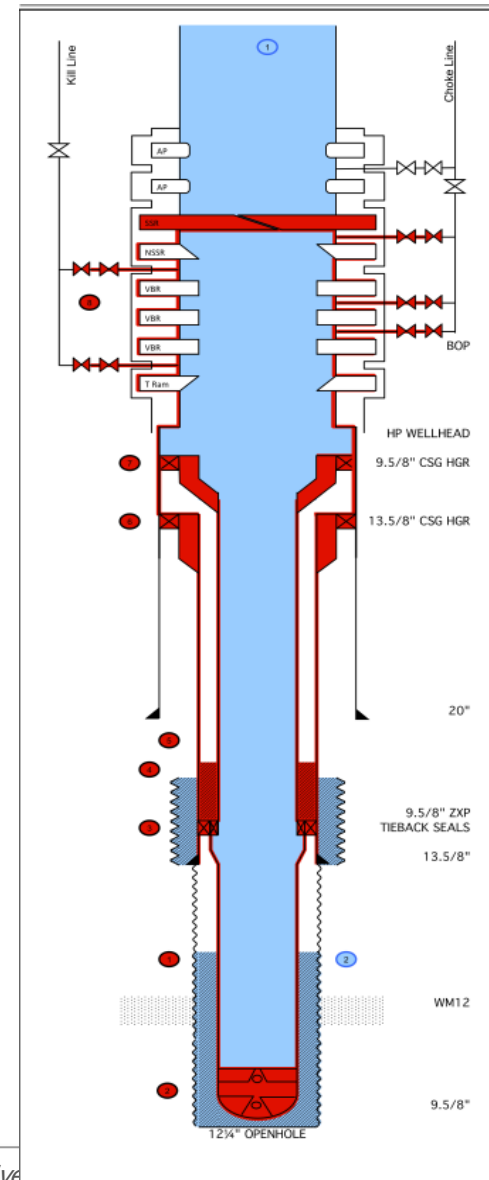
Name

Barrier Scenario

Well Risk Parameters	
Max anticipated wellhead pressure	<input type="text" value="2060.0"/> psi
Max anticipated H ₂ S level	<input type="text" value="0"/> ppm
Risk of shallow gas	<input type="checkbox"/>
Maximum anticipated wellhead temperature	<input type="text" value="65"/> F
Well Is HPHT	<input type="checkbox"/>

Barrier Elements	
Name	Verifying Tests
Wellhead	Pressure Test Casing
Casing Hanger	Pressure Test Casing
Production Casing	Production Casing Shoe Depth
	Pressure Test Casing
	Check Backflow Volume
	Inflow test
Production Casing Cement	Pressure Test Casing
	Inflow test
	Cement
	Formation Test

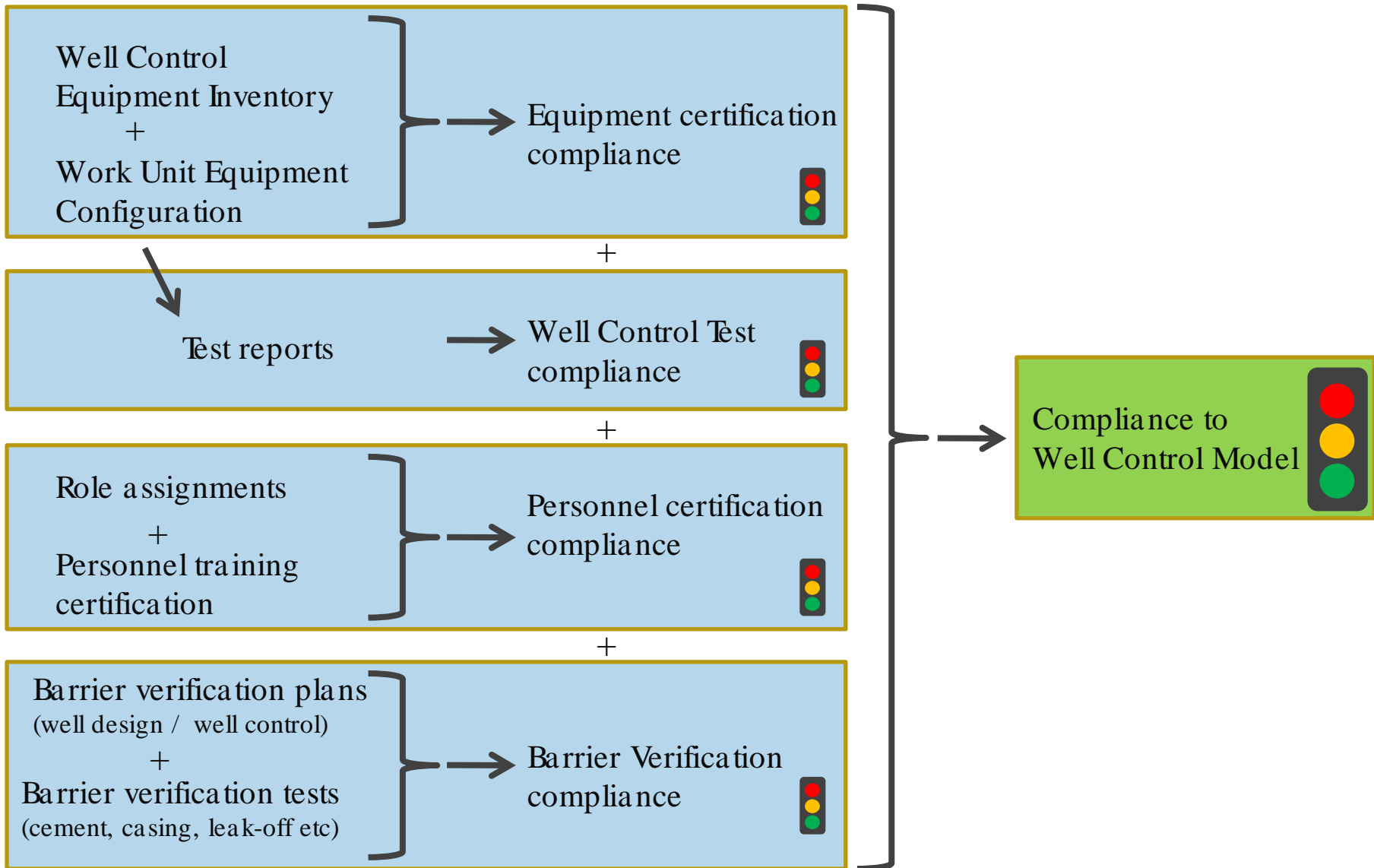
Barrier Diagram



EWCAT / COC & COS

- Certificate of Compatibility
- Certificate of Compliance
- Certificate of Conformance (COC)
- Certificate of Service (COS)

COMPLIANCE IN EWCAT



Q & A

KEY MESSAGES

- Process Safety
- Well life cycle
- Well bore integrity, barriers & verification
- eWCAT (electronic Well Control Assurance Tool)



Back up slides

eWCAT / COC & COS

Certificate of Compatibility: Document in which a Manufacturer, Repairer, Remanufacturer, or recognized technical authority certifies that the part or system is compatible with the Original Product Definition, including design changes resulting from a malfunction or failure history of drill-through equipment manufactured, remanufactured and/ or repaired to the appropriate International Standard/ Specification and is fully *compatible* and/ or can be integrated into other systems guaranteeing the operations envelope as defined by the OEM.

Certificate of Compliance: Document in which the OEM or recognized technical authority certifies that the equipment and/ or system *meets* the required standards or rules as depicted in the relevant area of operations regulatory requirement.

Certificate of Conformance (COC): Document in which the OEM or OEM-licensed facility certifies that the assembly or part has been manufactured/ remanufactured in conformance to the mentioned standard(s), specifications and guidelines in *accordance* with the Original Product Definition, including design changes resulting from a malfunction or failure history of drill-through equipment manufactured, remanufactured and/ or repaired to the appropriate International Standard/ Specification.

Certificate of Service (COS): Document in which the equipment OEM, OEM-licensed facility, recognized technical authority/ Owner or Operator certifies that the equipment has been inspected, properly maintained and tested in *accordance* with Original Equipment Manufacturer (OEM) specifications.