

Well Control in Design and Lifecycle Management

George Galloway – Technical Advisor



Agenda

- Safety Moment
- Well Control vs Well Integrity
- Reasons for Well Control in Design and Lifecycle Management
- Training Across the Well Lifecycle
- IWCF Programme Guidance
- Compulsory and Optional Topics
- Target Audience
- Continuous Learning
- Call to Action



Safety Moment

Well Control Incidents – Contributing Factors

- Human Factors > Lack of Situational Awareness
- Barriers > Failure to Maintain a Barrier
- Risk Assessment > Failure to Recognise the Hazard
- Procedures > Inappropriate Procedures

(source: IOGP 637 Review of Well Control Incidents)

- More than 50% of well control incidents happen after the well is drilled i.e. during other phases of the well lifecycle



Safety Moment

(Source: IOGP Well Control Incident Lessons Sharing)

How do you deal with uncertainties?

How do you check competencies?

How do you communicate risks?

**Subsurface uncertainties,
unfamiliar technologies and
shallow water flows in a
subsea exploration well**

How do you ensure new technology is understood?

How do you ensure hazards are recognised?



Well Control vs Well Integrity

Well Control

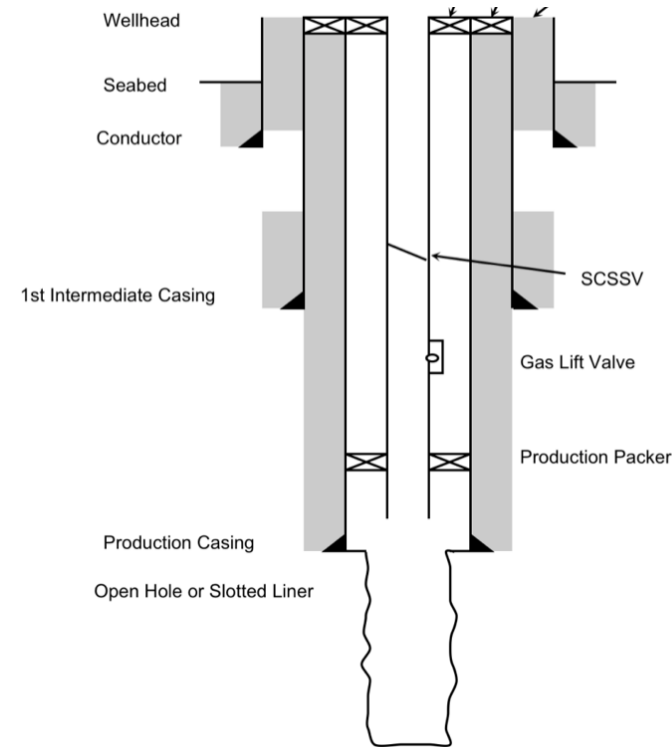
- Containment of well fluids during well operations including drilling, completion & well intervention
- Achieved by having **temporary barriers** (drilling mud, kill weight brine, drilling BOPs, wireline pressure control equipment) to prevent unintentional flow of fluid from the well to the surface environment
- Relates to periods of well operations only



Well Control vs Well Integrity

Well Integrity

- Refers to mechanical “as built” condition of well
- Achieved by having competent ***permanent barriers*** (casing, cement, completion, wellhead & tree) which prevent unintentional fluid flow from a pressure source to the surface or sub-surface environment
- Whole of life cycle condition



Why Well Control in Design

- Human Factors:
 - Learning from situations: understand the role people play
 - Better planning: take action to eliminate error
- Barriers:
 - Redundancy: key concept when planning the operation
 - Barrier inadequate: stems from poor operational planning
- Risk Assessment:
 - Understanding the risks: fundamental in well design
 - Robust processes: contributes significantly to managing risk
- Procedures:
 - Inadequate procedures: too heavy reliance on crew competency
 - Quality procedures: ensure better understanding



Why Well Control in Design

- Typically, well control prevention left to the operations team
- Situations can be avoided through better design and planning
- Well control training and assessment is role specific
- IWCF Level 4 is not aimed at those designing wells
- A robust design will achieve well integrity assurance
- Loss of well integrity can lead to a well control situation

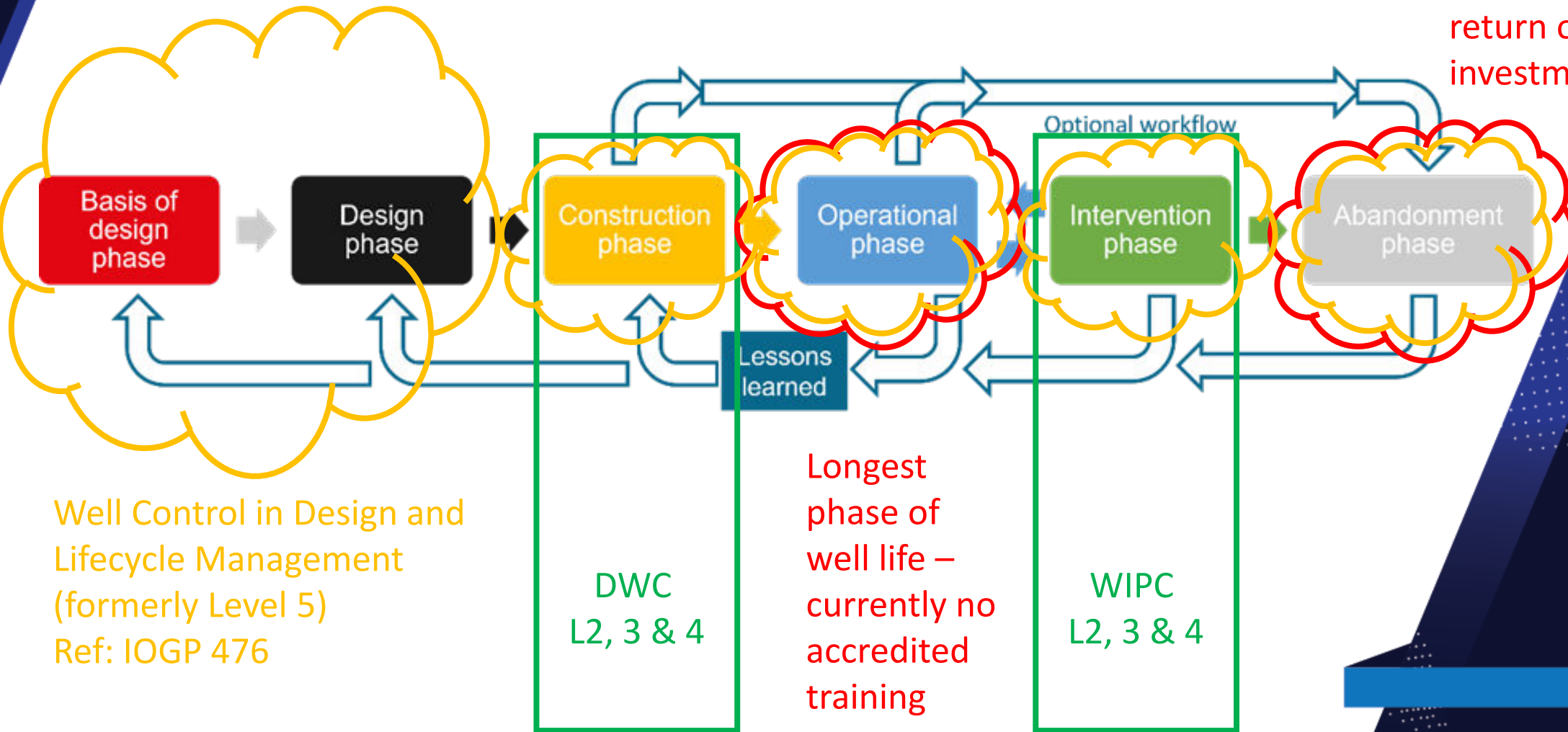
Well Control in Design applies to all phases of the well lifecycle:
Design / Construction / Intervention / Operate / Decommission

Ensures well control competence for support functions.



Training Across Well Lifecycle

Ageing well stock with no return on investment



Well Control in Design and Lifecycle Management (formerly Level 5)
Ref: IOGP 476



Well Control in Design and Lifecycle Management

- Stand alone programme / not part of progression
- Aimed as those designing and planning well operations
- Well integrity assurance throughout the well lifecycle
- Core 28hr classroom based training with practical elements
- Flexible curriculum (core plus optional topics)
- Pre-course work and case study project
- Well control competency for engineering & support personnel
- 5 year validity
 - recommendation to undertake continuous learning refreshers to allow for changing technologies, practices, designs and standards.
- Commenced in 2019 initially as level 5

Country	No of Candidates
Global	90
Netherlands	53



IWCF Guidance Changes

IWCF Well Control in Design and Lifecycle Management

- A more flexible approach for course delivery
- Updated course structure and content
- Clarifications on simulator requirements
- Case study project as a requirement
- Instructor accreditation requirements
- Pre-requisites for candidates

All designed to increase uptake without compromise on quality.



Practical Elements

The course must include practical activities using table –top exercises and/or simulators.

This is a key element of the course and must be used as a means of assessing candidates' understanding of the subject matter.

- Use of simulator – high fidelity / portable / online
- Use of well barrier schematics
- Explore potential leak paths
- Exercise to calculate kick tolerance
- Perform risk assessment
- Group breakout and discussion



Well Control in Design and Lifecycle Management

Nine compulsory topics

- Subsurface impact
- Holistic design
- Design uncertainties
- Barrier management
- Cement integrity
- Verification methods
- Dealing with pressure influx
- Lifecycle well integrity
- Risk management

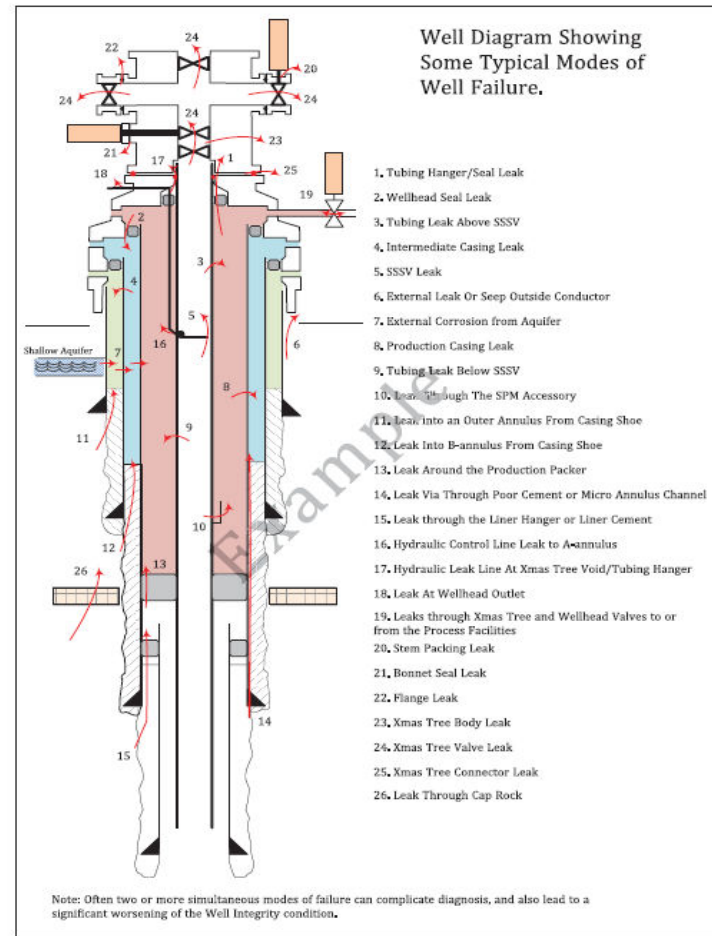


Figure Q.1 — Well diagram showing some typical leakage well failure modes

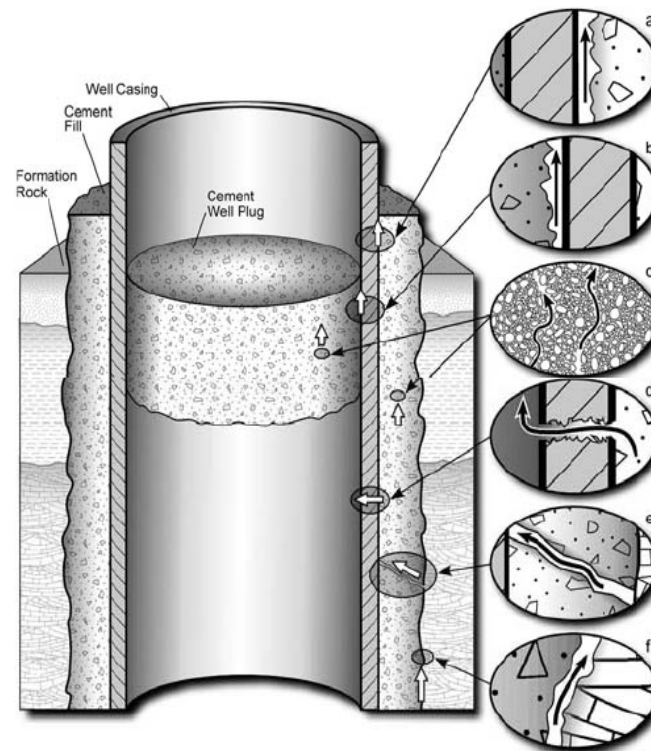
Reference: ISO 16530-1 well integrity lifecycle governance



Well Control in Design and Lifecycle Management

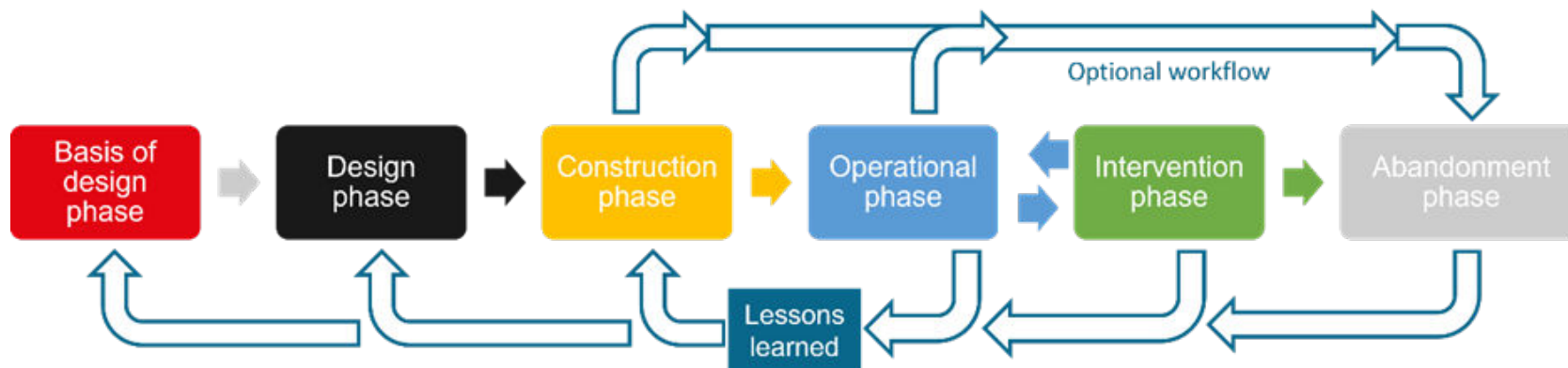
Choose from the following optional topics

- Human and Organisational Performance
- Corrosion Design and Material Selection
- Well Maintenance
- Well Integrity Assurance
- Shallow Gas
- Abandonment
- Tertiary Well Control
- Other Lifecycle Considerations
- Well Planning Considerations
- Barrier Integrity Assurance
- Regulatory Requirements



Holistic Design

- Well lifecycle phases are interconnected and cannot be looked at individually.
- For a phase to be executed effectively it requires deliverables from the previous phase.
- Changes will happen during the phases requiring the design, the risks and mitigations, the WBEs to be understood.
- Must consider the users, the interfaces and the environment



Design Uncertainties

- Well objectives
 - Target / Use / Change of Use / Life Expectancy
- Subsurface hazards
 - Faults / Fracture Gradient / Pore Pressure / Shallow Gas
- Surface hazards
 - Environment / Nearby Activities / Water Source
- Well construction
 - Offset Wells / Well Path / Abandonment / Known Integrity Issues

Consider aspects that can threaten well integrity at any time over the anticipated life cycle of the well.

Capture all in a risk register as part of the well basis of design.



Audience (as per IOGP 476 chart)

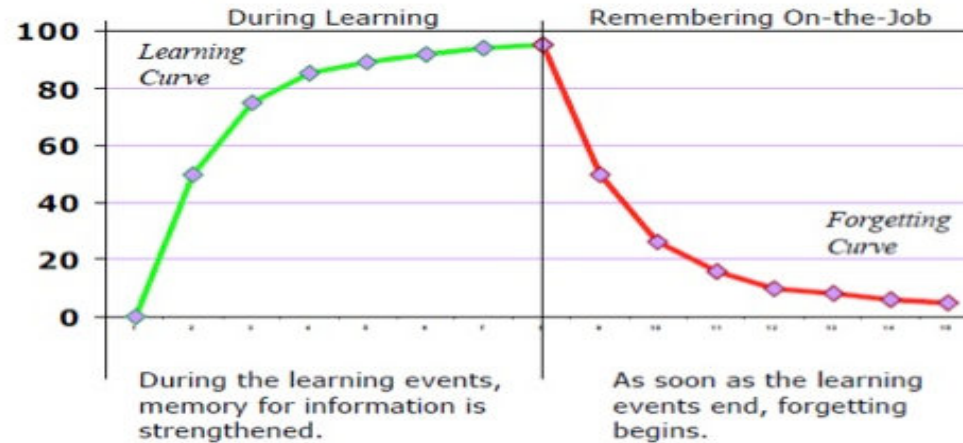
- Drilling engineer / senior drilling engineer
- Completion engineers / senior completion engineer
- Petroleum engineers / senior petroleum engineers
- Well service engineer / senior well service engineer
- Intervention engineer / senior intervention engineer
- Drilling / intervention superintendent (if involved with well design)
- Drilling manager (up to first line drilling management)
- Drilling project managers (up to first line drilling management)
- Well operations managers
- Well services managers
- Office-based design personnel
- Senior wells personnel, e.g., team leader and general manager wells
- **Well integrity professionals**



Continuous Learning / Demonstration of Competence



Typical Learning and Forgetting Curves



- Necessary to maintain proficiency / competency
- 5 year certification cycle supported with
 - modular refresher training
 - capturing lessons learnt
 - changing practices / better designs

McCoy's Law: competence = knowledge x skills x behaviour



Concluding Remark

Well Control Events will continue unless the following is addressed:

- Human Factors > Lack of Situational Awareness
- Barriers > Failure to Maintain a Barrier
- Risk Assessment > Failure to Recognise the Hazard
- Procedures > Inappropriate Procedures

IWCF Well Control in Design and Lifecycle Management will address these factors early in the process (lifecycle of the well) so the hazard can be identified and eliminated / designed out.



Call to Action

- Well Control in Design and Lifecycle Management will attract a different audience:
 - well engineers
 - well integrity professionals
 - subsurface disciplines
 - equipment designers
- Will require engagement with different stakeholders:
 - operator forums e.g. OEUK
 - industry regulators – IRF / NSOAF
 - Society of Petroleum Engineers (SPE)
 - Petroleum engineering trainers
- Help us continue to raise the standard in well control training and assessment





**Time now for
discussion**

Any questions?

