

N691: Well Integrity Management and Barrier Verification

Format and Duration Classroom - 5 Days

Instructor(s): Kevin Gray

Summary

Ensuring well integrity is a critical component of safe and efficient well operations. A failure in well integrity can result in environmental hazards, operational downtime, and catastrophic blowouts, making a structured approach to well integrity management essential. This course provides a comprehensive understanding of well barriers, their verification, and well integrity management systems. Participants will gain knowledge on barrier principles, industry regulations, verification techniques, and operational challenges throughout the well lifecycle—from drilling to abandonment.

The course begins with the fundamentals of well barriers and integrity, including definitions, industry standards, and how barriers are designed, implemented, and verified. Participants will learn how different well barrier elements—such as casing, cement, wellheads, and fluid columns—interact to maintain well integrity. real-world case studies will help reinforce these concepts. A significant focus will be placed on well barrier verification, testing methodologies, and how to assess well integrity in different operating conditions. Load cases and risk scenarios will be analysed to demonstrate how barriers withstand operational stresses. The course will also cover well intervention and abandonment, examining barrier element selection, quality assurance, and regulatory requirements. Participants will learn how to mitigate common integrity risks such as annular pressure buildup, casing failures, and cement integrity issues. The final section of the course will introduce Well Integrity Management Systems (WIMS) and Safety and Environmental Management Systems (SEMS). These systems are used by operators, regulators, and industry stakeholders to monitor and verify well integrity throughout its lifecycle. Participants will learn how to implement hazard analysis, emergency response planning, management of change, and contractor selection to maintain well integrity. By the end of the course, participants will be equipped with the technical knowledge and practical tools needed to ensure well integrity, perform verification testing, and comply with regulatory standards—improving well safety, reliability, and environmental protection. This course can be tailored to suit various experience levels, from introductory professionals to advanced specialists in well integrity management, well barrier verification, and regulatory compliance.

This course is delivered in partnership with Black Reiver Consulting Ltd.

Learning Outcomes

Participants will learn how to:

- 1. Understand well barriers, their design principles, and acceptance criteria.
- 2. Identify and assess well integrity risks throughout the well lifecycle.
- 3. Apply regulatory and industry standards for well integrity compliance.
- 4. Analyse well barrier elements such as casing, cement, tubing, wellheads, and fluid columns.
- 5. Perform well barrier verification testing and assess load case impacts.
- 6. Develop well integrity management strategies for well intervention and abandonment.
- 7. Implement Well Integrity Management Systems (WIMS) and Safety and Environmental Management Systems (SEMS).
- 8. Evaluate well integrity failures through case studies and real world scenarios.



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Training Method

This is a classroom course comprising a mixture of lectures, discussion, case studies, and practical exercises.

- Instructor led interactive sessions using case studies, simulations, and hands on barrier verification exercises.
- Step by step guidance on well barrier selection, verification, and regulatory compliance.
- Industry best practices shared through real-world examples of well integrity failures and lessons learned.
- Group discussions and scenario based exercises to reinforce learning through practical applications.
- Demonstrations of well integrity monitoring and verification techniques.

Who Should Attend

This course is ideal for professionals involved in well integrity management, well design, and regulatory compliance, including:

- Drilling, Completion, and Well Engineers responsible for well barrier design and verification.
- Well Integrity Engineers & HSE Personnel overseeing regulatory compliance and risk assessment.
- Operations Supervisors & Rig Managers responsible for maintaining well integrity during well construction, intervention, and abandonment.
- Regulatory & Environmental Compliance Officers involved in well integrity governance.
- Production Engineers & Asset Managers ensuring well integrity throughout the well's operational life.
- Service & Intervention Contractors involved in well integrity assurance and testing.

Course Content

1. Well Barriers and Their Principles

- Definition of Well Barriers Primary vs. Secondary Barriers.
- Overview of Well Integrity Importance in operational safety.
- Industry Standards & Government Regulations API, ISO, NORSOK, and regulatory frameworks.
- Barrier Schematics & Acceptance Criteria Understanding well barrier envelopes.
- Case Study: real-world examples of barrier failures and integrity breaches.
- Managing risk in well integrity assessments

2. Well Integrity Elements and Issues

- Common Well Integrity Issues Causes and consequences.
- Well Barrier Elements Fluid columns, casing, cement, tubing, packers, wellheads, and completions.
- Interrelation of Barrier Elements Ensuring a robust well integrity system.



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- Case Study: Analysis of well integrity failures and barrier assessment.
- Reading the local, industry and global standards documents.

3. Well Barrier Verification

- Principles of Verification The paper trail.
- Barrier Verification Testing Integrity testing
- Load Cases & Stress Analysis How different well operations affect barrier performance.
- Operational Integrity Monitoring Ensuring continuous barrier effectiveness.
- Case Study: Step by step walkthrough of a barrier verification process.

4. Well Barrier Element Selection and Issues in Intervention & Abandonment

- Choosing the Right Well Barrier Elements (WBEs) Material selection, standards, and quality control.
- Manufacturing Quality Control Plans (QCP) & Testing Ensuring reliable WBEs.
- Well Barrier Issues in Well Intervention Casing inspections, cement integrity, and tubing failures.
- Annular Pressure Buildup (APB) Management Causes, monitoring, and mitigation.
- Well Abandonment & Suspension Regulatory requirements and best practices.
- Case Study: real-world abandonment project—barrier selection and risk mitigation.

5. Well Integrity Management Systems (WIMS) & Safety and Environmental Management Systems (SEMS)

- Well Integrity Management Systems (WIMS) Components and implementation.
- Safety & Environmental Management Systems (SEMS) Role in regulatory compliance.
- Operational Phase Well Integrity Monitoring, inspections, and risk management.
- Hazard Analysis & Emergency Response Planning Strategies for integrity assurance.
- Contractor Selection & Documentation Ensuring compliance with regulatory frameworks.
- Practical Exercise: Developing a well integrity management strategy.

This comprehensive course provides participants with the knowledge and practical tools needed to oversee the design, verification, and management of well barriers throughout the life of a well. By integrating technical, operational, and regulatory perspectives, attendees will develop a structured approach to well integrity assurance, ensuring safety, reliability, and compliance in well operations.