



IWCF Well Control and Barrier Definitions

Introduction

The Well Control and the Barrier Definitions shall be adopted as common terminology across the IWCF syllabi for drilling well control and well intervention pressure control (WIPC).

The syllabi will include reference to the Norsok D-010 Revision 4 and the Oil & Gas UK Revision 2 standard as being the reference standard IWCF will train and exam to for Well Control during Drilling (Well Construction) Operations.

The syllabi will include reference to ISO/TS 16530-2:2014 as being the standard IWCF will train and test to for Well Control during Well Intervention Operations.

The terminology will be normalised to the Norsok illustrations (*Wellbarrier AS – Will be Appendix 1).

Barrier Philosophy

IWCF shall incorporate the principals of all three standards (ISO, Norsok, and Oil & Gas UK).

- ISO/TS 16530-2 (1st Edition 15-August 2014)
 - Relevant to Well Intervention Well Integrity rather than Drilling (Well Construction) Well Integrity.
- Norsok D-010 Revision 4 (June 2013).
- Oil & Gas UK Revision 2 (March 2011)

IWCF will use terminology from the above standards and will utilize illustrations as contained in the referenced Norsok standard*.

Local legislation, company standards and policy may differ and will take precedence during actual drilling (well construction) and well intervention operations, where applicable.

Terminology

IWCF utilizes the terms of “well barrier envelopes” and “well barrier elements,” as well as “primary” and “secondary barriers.”

IWCF will not create new definitions. While the three reference documents that IWCF will use (for training and certification purposes) have slightly different wording in their definitions, in principle they are similar. As the IWCF definition requires to be singular in detail and commonly used across the syllabi, the definition below is adopted as the IWCF standard:

- A "Well Barrier Envelope" is defined as a combination of one or more Well Barrier Elements that together constitute a method of containment of fluids within a well that prevents uncontrolled flow of fluids into another formation, or, to escape at surface.



- A "Well Barrier Element" is defined as a component part of a well designed to prevent fluids or gases from flowing unintentionally from a formation, into another formation or to escape at surface.
- Well Barrier Primary Element is the first object that prevents flow from a source.
- Well Barrier Secondary Element is the second object that prevents flow from a source.

Awareness of the use of other definitions will also be covered by the *Wellbarrier illustrations in the IWCF Well control courses – e.g. potential and active barriers. These definitions will be examined in the written papers and practical assessment.

Useful Definitions

Unintentional flow: This is any flow of fluid (liquid or gas) in or out of the well through a failed barrier.

Independent: Each type of mechanical closing barrier in/on a well shall be able to be closed and contain the well bore fluids by its own control system irrespective of any power failure.

In a system with two independent tested levels of protection i.e. barriers in place, there shall be always one barrier that acts as a first level of protection and one as a second level of protection.

- The first level of protection is called a **primary barrier**.
- The second level of protection is called a **secondary barrier**.

The primary barrier's function is to prevent unintentional flow to the environment or other formations.

The secondary barrier is to prevent unintentional flow if the primary barrier fails.

To be qualified as a Barrier, it is required to be installed where it is intended and to be tested upon installation.

Pressure testing a barrier is by application of a differential pressure across a "seal" and measuring the capability of this seal to resist this differential pressure. This condition can be achieved by direct application of pressure (pressure testing) and measuring its seal tightness or by decreasing the hydrostatic pressure on the downstream side of the "seal" (Inflow testing) and measuring its effectiveness. Both are pressure testing in the direction of flow.

- A) Mechanical Barrier
 - Pressure tested in the direction of flow from well to achieve required differential across the barrier element by either
 - i) application of positive pressure,
 - Or,
 - ii) by use of inflow testing

If this cannot be realistically achieved the following can be utilized subject to acceptable risk assessment.

- Pressure tested not in the direction of flow from well
- By verification of location (e.g. tagging, cementing etc.)
- B) Hydrostatic Barrier
 - Required to be monitored and maintainable to qualify as a barrier. Some stable



fluids may qualify as a barrier without maintenance (e.g. Water)

Note: Shearing devices that are required to seal should be capable of being pressure tested after a shearing operation in order to qualify as a barrier.

Minimum requirements

- There shall always be two tested barriers identified to prevent flow to the environment. Both will be risk assessed, verified and monitored during any operation on the well.
- In principle, tested and approved barriers shall not have a leak rate greater than 0, before any work is conducted. The owner of the well may accept alternative test criteria to gain assurance that the barrier is secure.
- The owner of the well may accept deviation of the test from this requirement in certain circumstances. The deviation shall as a minimum be specified and documented including:
 - Mitigation actions and responsibilities are identified, in place and fully understood by all staff.
 - Deviation note is approved by a senior person of the well owner management accountable for well integrity
- At all times it shall be clear and understood by personnel working on a well:
 - The consequence of barrier failure and unintentional flows to the environment or to other formations.
 - Which components in a well are the primary and the secondary barriers during the specific work on the well.
 - That the specification of the components are suitable for the intended use.
 - That the verification process for the installation of these components is understood.
 - The acceptance criteria are available for the successful location, and testing for these components.



Appendix 1

Please refer to Wellbarrier AS: <https://www.wellbarrier.com/Publication/Index?active=publication>