

Continual Improvement of International Standards and Guidelines for Managing Well Integrity

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Standards, recommended practices and guidelines are an integral part of a regulator's toolbox when assessing and inspecting an operator or duty holder's capability to effectively carry out their well design, well construction, production/testing, well intervention, suspension and abandonment operations.

Whether the regulator administers a prescriptive or non-prescriptive regulatory regime, the standards and guidelines are tools which help assess if the operator or duty holder is adhering to 'good industry practice',

Following the Montara and Macondo blowouts in 2009 and 2010, API, ISO, NORSOK, Oil and Gas UK and other bodies have developed and updated standards and guidelines specifically for well integrity in an effort to assist industry in avoiding the costly mistakes of the past.

NOPSEMA has adopted the philosophy that the following international well integrity standards and guidelines demonstrate 'good industry practice'.

- ISO 16530 Well Integrity - Part 1: Life Cycle Governance
- ISO 16530 Well Integrity - Part 2: Well Integrity for the Operational Phase
- NORSOK Standard D-010 - Well Integrity in Drilling and Well Operations
- Oil & Gas UK Well Integrity Life Cycle Guidelines
- Oil & Gas UK Guidelines for the Abandonment of Wells
- Oil & Gas UK Guidelines for Qualification of Materials for the Abandonment of Wells

Underpinning these international guidelines and standards are approximately 250 specific guidelines and standards from the following bodies: ISO, API, O&G UK, NORSOK, APPEA, IOGP, IADC, NOGEP, Norwegian Oil and Gas, DNV, IRP, NACE, ASTM and Energy Institute (EI). The standards and guidelines pertaining to well integrity can be split into the following categories:

- General guidance – hazards, risks and personnel competencies and technical guidelines e.g. management of safety critical elements, well control operations etc.
- Equipment standards
- Testing standards for materials and equipment
- HPHT standards and guidelines
- Drilling and completion fluids standards
- Cementing and cementing equipment standards

The challenge to industry is to keep these standards and guidelines updated with current good practices and changes in technology, as well as identifying gaps where new standards and guidance may be required. The international regulator is well placed to identify areas where industry requires additional guidance.

NOPSEMA, in collaboration with other regulators, has identified the following potential gaps in existing standards and guidelines:

a) Drilling

- Guidance on monitoring of wellbore indicators during drilling (e.g real-time pore pressure prediction, finger printing at connections and gas indicators).
- Guidance on how subsurface personnel perform PPFG (pore pressure fracture gradient) predictive work.

b) Cementing

- Standardisation between various international guidance documents for placement and length of cement plugs
- Guidance on cementing operations, e.g. cement placement and acceptance criteria for cement jobs

c) Well Barriers

- Standards for shoe-track as barrier – consider qualifying float equipment as barrier.
- Surface controlled subsurface safety valves (SCSSSVs) – guidance on the different statuses e.g. safety critical, primary barrier, emergency only
- Guidance on when is it appropriate to use storm chokes
- Quality control of connector bolts (refer to BSEE Quality Control-Failure Incident Team findings)
- Guidance on risk assessment of wells with sub-hydrostatic reservoirs (barrier requirements)

d) Suspension/Abandonment

- Standardised definition are required for: Shut-in, suspension, temporary suspension, temporary abandonment and abandonment
- Recommended duration of suspension / temporary abandonment periods e.g. risk of degradation of metallic and elastomeric barriers
- Clearer recommendations on monitoring/inspection of long term suspended/temporarily abandoned wells
- Guidance on using geological formations as abandonment barriers (based on the Norway / UK / GoM model)
- Standards for epoxy resin plugs to be used as suspension or abandonment plugs
- More guidance on abandonment with tubing and completion jewellery in place e.g. adhesion of cement to oil wet tubulars, placement methods of cement barriers utilising small volumes.

In summary, this article has identified the key international well integrity standards and guidelines which NOPSEMA uses as a guide to 'good industry practice' when undertaking assessments and inspections. In addition, there are approximately 250 more detailed standards and guidelines that relate to well integrity. Industry faces an ongoing challenge to keep standards and guidelines relevant and current. To assist this goal, the article has identified a number of topics that are not yet clearly and consistently covered by existing standards and guidance. Addressing these gaps would assist industry with understanding and applying current 'good industry practice'.

As stated in the introductory text, standards and guidelines are only part of the regulators toolkit for supporting assessment and inspection against 'good industry practice'. The perception is that industry influences standards and the regulators often identify deficiencies that require noting, the standards bodies can choose to embrace or ignore the regulator's concerns, by reasoned argument, likewise international regulators can choose to embrace standards in whole or in part or not at all. The intension of the identified potential deficiencies and gaps detailed in this article is to stimulate debate on the subject and are not intended as the regulators requirements.

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