

WELL INTEGRITY BEST PRACTICES ALIGNED

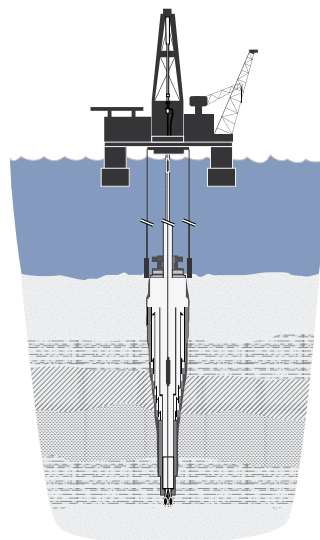
Following the Montara and Macondo incidents, API, NORSOK, ISO, UK Oil & Gas and others have worked hard to develop and update standards and guidelines for deep well drilling and well integrity. These activities have now resulted in the revision of a number of the existing standards and the making of some new standards and guidelines. Ref. OGP Report N° 485, *Standards and guidelines for drilling, well construction & well operations*. Amongst this work, a new project was launched in ISO on Well Integrity for the operational phase.

Petrobras raised the initiative at the ISO level. Several oil and gas operators had already their own so-called good or best practices. The desire for alignment of these practices at an international standard level was an aspiration that lived among many of the OGP members. An ISO 'new work item proposal' was drafted with seventeen operating companies and two service companies participating. The ISO Technical Specification 16530-2 *Well integrity for the operational phase* was published in August.

The benefit the work group had was that members were or had been part of the development of NORSOK D-010, API RP 90, API RP 96, Norwegian Oil & Gas 117 and the UK Oil & Gas *Well Integrity*

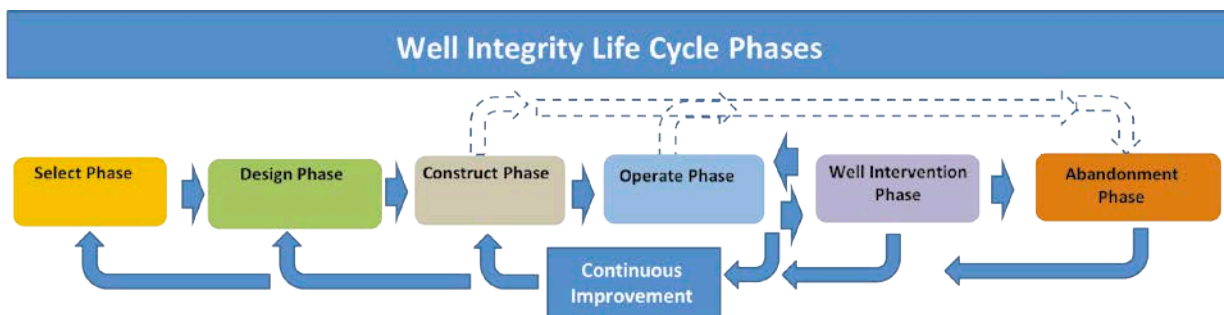
Guidelines, with strong support from their leadership. Following the completion of ISO TS 16530-2 the work group will continue to develop an overall well integrity lifecycle standard that includes the previously issued 'Operate Phase'. The life cycle process includes all phases, providing guidance on assurance in compliance with safety and environmental standards.

- The 'Select Phase' describes the process of identifying the hazard, surface and subsurface, with a risk register that carries through each phase of the lifecycle.
- The 'Design Phase' defines the mitigating controls in the design that safeguard the well design against the identified hazards.
- The 'Construct Phase' builds and verifies the as built well against the design and addresses any changes to the operating envelope.
- The 'Operate Phase' addresses the handover and the requirements for assuring the well operating envelope is maintained and that the well is operated within this envelope.
- The 'Well Intervention Phase' restores well integrity of failed barriers (elements) or changes to the operating envelope, and verifies the barriers before it is returned to operation.



- The 'Abandonment Phase' addresses the abandonment requirements to re-establish the zonal isolation of the geological earth model by providing barriers at competent formations to prevent loss of containment.

The life cycle working draft is near completion, some external reviewers were positive. Engagement with regulators steered the work group in being less prescriptive in the standard. The working draft will be issued in Q3 for ISO ballots to an ISO standard estimated for publication by Q1 2016.



ISO Standards for use in the oil & gas industry

ISO 10418 Basic surface safety systems
ISO 10423 Wellhead & christmas tree equipment
ISO/TR 12489 Reliability modeling/safety systems (New)
ISO 13354 Shallow gas diverter equipment (New)
ISO 13533 Drill-through equipment (BOPs)
ISO 13534 Hoisting equipment - care/maint
ISO 13535 Hoisting equipment - specification
ISO 13626 Drilling and well-servicing structures
ISO 13702 Control & mitigation of fires & explosions (Rev)
ISO 13703 Offshore piping systems
ISO 14224 Reliability/maintenance data
ISO 14692 GRP piping, Parts 1-4
ISO 14693 Drilling equipment

ISO 15156-1 Selection of cracking resistant materials for use in H₂S environments
ISO 15156-2 Cracking-resistant steels and cast irons for use in H₂S environments
ISO 15156-3 Cracking-resistant alloys for use in H₂S environments
ISO 15138 HVAC
ISO 15544 Emergency response
ISO 15663 Life cycle costing, Parts 1-3
ISO 17776 Assessment of hazardous situations
ISO/TS 17969 Guidelines on competency for personnel (New)
ISO 20815 Production assurance and reliability management
ISO 21457 Materials selection
ISO 23936-1 Thermoplastics
ISO 23936-2 Elastomers (New)
ISO/TS 27469 Method of test for offshore fire dampers
ISO/TS 29001 Sector-specific quality management systems

ISO 13624-1 Marine drilling riser systems
ISO/TR 13624-2 Marine drilling riser system analysis
ISO 13625 Marine drilling riser couplings
ISO 19901-7 Station-keeping systems for floating offshore structures (New)
ISO 19904-1 Floating offshore structures

ISO 13628-1 Subsea production systems (Amd)
ISO 13628-2 Subsea flexible pipe systems
ISO 13628-3 Subsea TFL pumpdown systems
ISO 13628-4 Subsea wellhead and tree equipment
ISO 13628-5 Subsea control umbilicals
ISO 13628-6 Subsea production controls
ISO 13628-7 Completion/workover riser system
ISO 13628-8 ROT and interfaces

ISO 13628-9 ROT intervention systems
ISO 13628-10 Bonded flexible pipe
ISO 13628-11 Flexible pipe systems for subsea and marine applications
ISO 13628-15 Subsea structures and manifolds

ISO/TR 10400 Calculations for OCTG performance properties
ISO 10405 Care/use of casing/tubing
ISO 10407-1 Drill stem design
ISO 10407-2 Inspection and classification of drill stem elements
ISO 10414-1 Field testing of water-based fluids
ISO 10414-2 Field testing of oil-based drilling fluids
ISO 10416 Drilling fluids - lab testing
ISO 10417 Subsurface safety valve systems
ISO 10424-1 Rotary drill stem elements
ISO 10424-2 Threading and gauging of connections

ISO 10426-1 Well cementing
ISO 10426-2 Testing of well cements
ISO 10426-3 Testing of deepwater well cement
ISO 10426-4 Preparation and testing of atmospheric foamed cement slurries
ISO 10426-5 Shrinkage and expansion of well cement
ISO 10426-6 Static gel strength of cement formulations
ISO 10427-1 Bow spring casing centralizers
ISO 10427-2 Centralizer placement and stop-collar testing
ISO 10427-3 Performance testing of cement float equipment

ISO 10432 Subsurface safety valves
ISO 11960 Casing and tubing for wells (Rev)
ISO 11961 Drill pipe
ISO 12835 Qualification of casing connections for thermal wells (New)
ISO 13085 Tubing aluminium alloy pipes (New)
ISO 13500 Drilling fluids (Amd)
ISO 13501 Drilling fluids - processing systems evaluation
ISO 13503-1 Measurement of viscous properties of completion fluids
ISO 13503-2 Measurement of properties of proppants
ISO 13503-3 Testing of heavy brines
ISO 13503-4 Measurement of stimulation & gravelpack fluid leakoff
ISO 13503-5 Measurement of long term conductivity of proppants
ISO 13503-6 Measuring leak-off of completion fluids under dynamic conditions (New)
ISO 13678 Thread compounds
ISO 13679 Casing and tubing connections testing
ISO 13680 CRA seamless tubes for casing & tubing
ISO 14310 Packers and bridge plugs

ISO 19900 General requirements for offshore structures (Rev)
ISO 19901-1 Metocean design and operating considerations (Rev)
ISO 19901-2 Seismic design procedures and criteria (Rev)
ISO 19901-3 Topsides structure
ISO 19901-4 Geotechnical and foundation design (Rev)
ISO 19901-5 Weight control
ISO 19901-6 Marine operations
ISO 19901-8 Marine soil investigations (New)
ISO 19902 Amd 1 Fixed steel offshore structures (Amd)
ISO 19903 Fixed concrete offshore structures
ISO 19905-1 Jack-ups
ISO/TR 19905-2 Jack-ups commentary (New)
ISO 19906 Arctic offshore structures

ISO 14998 Accessory completion equipment (New)
ISO 15136-1 Progressing cavity pump systems
ISO 15136-2 Progressing cavity pump systems - drive heads
ISO 15463 Field inspection of new casing, tubing and plain end drill pipe
ISO 15464 Gauging and inspection of threads
ISO 15546 Aluminium alloy drill pipe
ISO 16070 Lock mandrels and landing nipples
ISO/TS 16530-2 Well integrity operational phase (New)
ISO 17078-1 Side-pocket mandrels (Amd)
ISO 17078-2 Flow control devices for side-pocket mandrels
ISO 17078-3 Latches & seals for side-pocket mandrels & flow control devices
ISO 17078-4 Side-pocket mandrels and related equipment
ISO 17824 Sand control screens
ISO 20312 Design of aluminium drill string
ISO 27627 Aluminium alloy drill pipe thread gauging (New)
ISO 28781 Subsurface tubing mounted formation barriers

ISO 3183 Steel pipe for pipeline transportation systems
ISO 12490 Actuation, mechanical integrity and sizing for pipeline valves
ISO 12736 Wet thermal insulation coatings (New)
ISO/TS 12747 Pipeline life extension
ISO 13623 Pipeline transportation systems
ISO 13847 Welding of pipelines (Rev)
ISO 14313 Pipeline valves
ISO 14723 Subsea pipeline valves
ISO 15589-1 Cathodic protection for on-land pipelines (Rev)
ISO 15589-2 Cathodic protection for offshore pipelines

ISO 15590-1 Pipeline induction bends
ISO 15590-2 Pipeline fittings
ISO 15590-3 Pipeline flanges
ISO 16440 Steel-cased pipelines (New)
ISO 16708 Pipeline reliability-based limit state design
ISO 21329 Test procedures for pipeline mechanical connectors
ISO 21809-1 Polyolefin coatings (3-layer PE and 3-layer PP)
ISO 21809-2 Fusion-bonded epoxy coatings (Rev)
ISO 21809-3 Field joint coatings
ISO 21809-4 Polyethylene coatings (2-layer PE)
ISO 21809-5 External concrete coatings

ISO 3977-5 Gas turbines – procurement
ISO 10428 Sucker rods
ISO 10431 Pumping units
ISO 10434 Bolted bonnet steel gate valves
ISO 10437 Special-purpose steam turbines (Rev)
ISO 10438 Lubrication, shaft-sealing and control-oil systems, Parts 1-4
ISO 10439 Centrifugal compressors
ISO 10440-1 Rotary-type positive-displacement process compressors (oil-free)
ISO 10440-2 Rotary PD packaged air compressors
ISO 10441 Flexible couplings – special
ISO 10442 Integrally geared air compressors
ISO 12211 Spiral plate heat exchangers
ISO 12212 Hairpin heat exchangers
ISO 13631 Reciprocating gas compressors
ISO 13691 High speed enclosed gear units
ISO 13704 Calculation of heater tube thickness
ISO 13705 Fired heaters for general service
ISO 13706 Air-cooled heat exchangers
ISO 13707 Reciprocating compressors
ISO 13709 Centrifugal pumps
ISO 13710 Reciprocating positive displacement pumps

ISO 14691 Flexible couplings – general
ISO 15547-1 Plate & frame type heat exchangers
ISO 15547-2 Brazed aluminium platefin type heat exchangers
ISO 15649 Piping
ISO 15649 Steel valves DN 100 and smaller
ISO 16812 Shell & tube heat exchangers (Rev)
ISO/TS 16901 Risk assessment of onshore LNG installations
ISO 16961 Coating of above-ground steel storage tanks (New)
ISO 17177 Unconventional LNG transfer systems (New)
ISO 17292 Metal ball valves
ISO 21049 Centrifugal and rotary pumps shaft sealing
ISO 23251 Pressure-relieving and depressuring systems
ISO 24817 Composite repair of pipework (Rev)
ISO 25457 Flares details
ISO 27509 Compact flanged connections
ISO 28300 Venting of storage tanks
ISO 28460 LNG - Ship to shore interface



Standards in brown issued in 2013

Standards in green are a priority for 2014 issue

These ISO standards are only a core collection of several hundreds of International Standards available for the oil & gas industry

OGP NEW STANDARDS SOLUTION

OGP continues to offer ISO/TC67 and other work groups a platform to work and drafting standards in a secured environment. At present 1,500 engineers are registered for work in this area and a number of projects are ongoing. In a very positive meeting between OGP and ISO management in August, ISO proposed a new way to replace the Interim Solution. This new proposal has been found legally compliant and OGP is presently working to design the process to go along with such a solution. This solution looks

very much like the Interim Solution, but is now based on current ISO Directives and the fact that OGP holds a liaison status with ISO/TC67. Once in place, OGP will be able to send draft standards to ISO for ballot and/or publication. In the meantime WGs can continue and are welcome to work under OGP's auspices.

Standards for well integrity
 OGP Report 485 will soon be re-issued. Check this handy report for available standards and guidelines.

VALUE OF STANDARDS

The ISO/TC67 standards are developed using a consensus process that includes more than 3,000 oil & gas industry experts from around the globe and an international review and approval process. The international oil and gas industry, the International Regulators Forum (IRF) and national standardisation organisations support these standards for worldwide applications. The oil and gas industry uses international standards to enhance technical integrity, improve safety, facilitate global operations and reduce the environmental impact

of operations worldwide. A lot has been achieved by the industry over the past two decades. For industry, they will reduce costs and delivery time, and facilitate trade across national borders. For regulators, they offer support for goal-setting and functional regulations, while achieving higher levels of safety through better design. These standards are now being implemented widely in oil and gas provinces around the world, replacing existing industry, regional and national standards and eliminating or reducing the need for company-

specific specifications. For details on standards available from ISO/TC67 see poster above or www.iso.org.

Capture the value added
 Make use of well over 170 new ISO standards for your own benefit!

ADDRESSING THE DRILLING INDUSTRY COMPETENCY CHALLENGE

OGP is working with industry to ensure the competence of our workforce. One group that faced the competency challenge head-on – as it affects the critical area of well control – is the Human Factors Task Force (HFTF) of the Wells Expert Committee (WEC).

The importance of non-technical skills to safety and efficiency has long been recognized in other high risk industries such as aviation, mining, rail and healthcare. The oil and gas exploration and production industry has paid little attention to human factor skills until now. Psychological factors relating to perception and motivation can contribute to safe and efficient operations.

In the area of well operations, the oil and gas exploration and production industry must recognize the importance of both technical and non-technical skills to operational safety, and must embed discipline-relevant skills and attitudes in training and operational practices.

The HFTF is working on a ground-breaking new area for teaching non-technical skills such as situational awareness and team decision making. In just two years, the HFTF published recommendations on enhancing (and expanding) traditional well control technical training. Many of the HFTF's concepts have been applied to what will become the first ISO standard devoted to competency in the oil and gas industry.

In Phase 1 of their work, the HFTF focused on improving existing industry systems for providing well control training and certification. This became OGP Report No. 476, *Recommendations for enhancements to well control training, examination and certification*. This report recommends enhancing existing training at the

introductory, driller and supervisor levels, an awareness-level course for non-technical staff, and a higher drilling engineering course for those actively engaged in well design and other crucial aspects of well construction.

Phase 2 of the HFTF's work focused on improving operational safety and efficiency of entire well operations teams through effective development and application of non-technical skills, called Crew Resource Management (CRM).

OGP initiated a research project with the University of Aberdeen to develop a syllabus for CRM training in well control. The syllabus was recently published as OGP Report No. 501, *Crew Resource Management for Well Operations team*. The syllabus focuses on improving the skills of the individual worker in a team setting and addresses behaviour in routine operations.

Work to generate recommended practice for Crew Resource Management for well operations teams will soon be published as OGP Report No. 502. It is for training providers developing CRM courses, and provides guidance for instructor qualifications, class size, course duration and training methods to ensure consistency and quality of instruction.

After a period of stand-alone training, CRM concepts should be integrated into existing technical training courses. Integration will

help develop and sustain the awareness, knowledge and instinctive application of non-technical skills alongside technical skills.

The HFTF will join forces with the OGP Safety Committee to work on OGP Report No. 503. This report will define behavioural markers for measuring the effectiveness of CRM in the workplace.

Finally, an ISO team including HFTF members is working under the OGP umbrella, utilizing WLCPF and IADC work, to develop ISO/TS 17969, Petroleum, petrochemical and natural gas industries – Guidelines on competency management for well operations personnel. This technical specification will outline the importance of having a Competency Management System (CMS) A CMS will assure competency of operations personnel through an auditable competency record and validation appropriate to risk. The ISO document will assist companies without a CMS to develop one.



ABOUT OGP

The International Association of Oil & Gas producers (OGP) encompasses most of the world's leading publicly traded, private and state-owned oil & gas companies, oil & gas associations and major upstream service companies. OGP members operate in more than 80 different countries and produce more than half the world's oil and about one third of its gas.

The association was formed in 1974 to develop effective communications between the upstream industry and an increasingly complex network of international regulators.

An essential part of OGP's mission is to represent the interests of the upstream industry to international regulators and legislators.

OGP also helps members achieve continuous improvement in safety, health and environmental performance, and in the engineering and operation of upstream ventures. OGP's extensive international membership brings with it a wealth of know-how, data and experience. OGP committees and task forces manage the exchange and dissemination of this knowledge. OGP additionally promotes awareness of Corporate

Responsibility issues such as transparency of revenues and combatting corruption.

The OGP Standards Committee monitors, co-ordinates and influences the development of international standards to meet the needs of OGP members. There is close communication with key standards bodies, particularly API, CEN, GSO and ISO. The Committee also influences and monitors adoption of international standards in Asia, America, Europe and other regions.

OGP POSITION ON STANDARDS

OGP has been a catalyst in the industry's approach to standards and strongly supports the internationalisation of key standards used by the petroleum and natural gas industries.

OGP's position on standards is to:

- promote development and use of ISO and IEC International Standards;
- ensure standards are simple and fit for purpose;
- use International Standards without modification wherever possible;

- ensure visibility of the international standard's identification number, whatever the method of publication;
- base development of standards on a consensus of need;
- avoid duplication of effort;
- minimise company specifications which should be written, where possible, as functional requirements; and
- promote "users" on standards work groups.

The adoption of this approach is expected to minimise technical barriers to trade, enable more efficient worldwide operations, and improve the technical integrity of equipment, materials, and offshore structures used by the petroleum and natural gas industries.



<http://info.ogp.org.uk/standards/>