Norwegian Baseline on HSE Standards for Offshore Exploration, Development and Production

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Scope of Norwegian Baseline Offshore Position Paper

- Review recognised technical standards currently proven for offshore areas such as North Sea,
  - Identify any areas of concern where Barents Sea challenges can affect safety performance

- Recommend a framework of:
  - how existing standards can be applied
  - where additional work is required in order to achieve tolerable safety levels in the Barents Sea
Contents of Position Paper

THREE MAIN PARTS:

- OIL & GAS INDUSTRY STANDARISATION - OVERVIEW

- REVIEW OF STANDARDS FOR SPECIFIC AREAS/DISCIPLINES

- PROPOSED TOPICS FOR RUSSIAN – NORWEGIAN WORKING GROUPS
Oil & Gas Industry Standardisation – Overview

Standardisation Hierarchy

International
Regional
National
Industry & Associations
Philosophy for Standardisation

as expressed by OGP (The International Association of Oil & Gas producers):

- Development and use of ISO and IEC standards should be promoted.
- Duplication of effort should be avoided.
- Standards should be simple and fit for purpose.
- International standards should be used without modification wherever possible.
- Company specifications should be minimised and written, where possible, as functional requirements.

The adoption of this approach is expected to:
  - minimise barriers to trade,
  - enable more efficient worldwide operations,
  - improve the technical integrity of equipment, materials, and offshore structures.
ISO - Facts

- 57 member countries and 245 Technical Committees (TC)
- The oil and gas industry’s work on standards undertaken through ISO TC 67;
  - “Materials, Equipment and Offshore Structures for the Petroleum and Natural Gas Industries”.
- TC67 was formed in 1947 and re-established in 1989
- Currently 6 Subcommittees and 42 Work Groups.
- As of 2008 TC 67 has published some 150 standards and has a further 70 underway
ISO/IETC Standards for use in the oil & gas industry

ISO 10418 Basic surface safety systems
ISO 10423 Wellhead & christmas tree equipment
ISO 15333 Drill-through equipment
ISO 15334 Holing equipment - core/maiain RF
ISO 15335 Holing equipment - specification
ISO 15626 Drilling and well-servicing structures
ISO 15752 Control & mitigation of fire & explosion
ISO 15763 Offshore piping systems
ISO 14224 Reliability/maintenance data
ISO 14652 GRP piping, Parts 1-4
ISO 14693 Drilling and well-servicing equipment
ISO 15166-1 Selection of cracking resistant materials for use in H2S Environments
ISO 15166-2 Cracking-resistant steels and cast irons for use in H2S environments
ISO 15166-3 Cracking-resistant alloys for use in H2S environments
ISO 15158 HVAC offshore
ISO 15344 Emergency Response
ISO 15600 Life Cycle costing, Parts 1-3
ISO 17776 Assessment of hazardous situations
ISO/TS 29001 Sector-specific quality management system
ISO 13637 Mooring MODUs

IEC 61932 Mobile and fixed offshore units. Electrical installations:
IEC 61932-1 General requirements and conditions
IEC 61932-3 Equipment
IEC 61932-5 Mobile units
IEC 61932-6 Installation
IEC 61932-7 Hazardous area

ISO 15819-2 Offshore Structures Fixed Steel
ISO 19000 Offshore Structures
ISO 19901-4 Offshore structures - Part 4: Geotechnical and foundation design
ISO 19901-5 Offshore structures - Part 5: Weight control

ISO 15185 Linings
ISO 15423 Pipelines
ISO 15464 Pipeline welding
ISO 15473 Pipeline valves
ISO 15473 Subsea pipeline valves
ISO 15589-1 Cathodic protection for onshore pipeline systems
ISO 15590-1 Pipeline induction bends
ISO 15590-2 Pipeline fittings

ISO 15672 Connection testing
ISO 15680 CRA casing and tubing
ISO 15610 Packers and bridge plugs
ISO 15156 Progressing cavity pump systems
ISO 15463 Field inspection of new casing, tubing and plate and drill pipe
ISO 15516 Aluminium drillpipe
ISO 15546 Lock mandrels and landing nipples

ISO 16690-1 Borehole casing
ISO 16690-2 Drilling muds - laboratory testing
ISO 16690-3 Drilling fluids - field testing
ISO 16690-4 Drilling fluids - selection
ISO 16690-5 Drilling fluids - transportation
ISO 16690-6 Drilling fluids - storage
ISO 16690-7 Drilling fluids - usage

ISO 15930-1 Performance testing of cement float equipment
ISO 15930-2 SSWF Casing and tubing
ISO 15930-3 DrilPipe Drilling fluids
ISO 15930-4 Measurement of viscous properties of completion fluids
ISO 19906 – Arctic Structures

- Currently under development, expected issue 2010
- Purpose: Coherent and consistent definition of methodologies to design, analyse and *assess arctic and cold regions* offshore structures
- Specifies requirements and provides guidance for the design, construction, transportation, installation, and decommissioning of offshore structures in arctic and cold regions environments.
- Not covered:
  - operation, maintenance, service life inspection or repair of arctic offshore structures.
  - mobile offshore drilling units (but ice actions and ice management may be applicable)
  - mechanical, process and electrical equipment
The NORSOK standards are developed by the Norwegian petroleum industry.

Some 80 NORSOK Standards have been developed.

NORSOK standards are intended to:
- ensure adequate safety and cost effectiveness for petroleum industry developments and operations
- to replace oil company specifications
- serve as references in the authorities regulations
NORSOK Philosophy and Principles

- Availability of international standards is the main goal, but for some areas NORSOK standards are necessary.

- NORSOK has been proven as a useful tool to document and disseminate Norwegian solutions.
  - This helps to speed up the process of getting international standards where Norwegian needs are included.

- NORSOK standards are consequently in some areas necessary to cover a need, temporarily or permanently, pending availability of relevant international standards.
Review of Standards for Specific Areas/Disciplines

■ 13 areas covered:
  - Loads and Load Effects
  - Foundations
  - Materials
  - Submarine Pipelines
  - Subsea Facilities
  - Fixed Steel Structures
  - Concrete Structures
  - Floating Structures
  - Mooring
  - Risers
  - Topside Facilities on Offshore Structures
  - LNG terminals
  - Operational Safety & Human Factors
Review of Standards for Specific Areas/Disciplines

Methodology:

1. Identification of Norwegian sector standards as recommended by the PSA
2. Identification of other relevant recognised standards and guidelines
3. Discussion of specific considerations for arctic conditions
4. Recommendations of Barents Sea harmonised standardisation basis
5. Identification of gaps / aspects for further study
Conclusions

- Recommendations for Barents Sea applicable standards identified for all areas
- Gaps / aspects for further study identified for all areas
- "Short list" suggested for suitable topics for Russian – Norwegian workshops
Conclusions: Recommended standards and studies

**Loads and load effects**

- **Codes recommended as basis for Barents Sea application:**
  - ISO 19901-1: Metocean design and operating considerations
  - ISO 19901-2: Seismic design procedures and criteria
  - ISO 19902: Fixed steel offshore structures
  - ISO 19903: Fixed concrete offshore structures
  - ISO 19904-1: Floating offshore structures
  - ISO 19906, Arctic Offshore Structures, sec8: “Actions and action effects”
  - NORSOK N-002, Collection of metocean data

- **Cold climate aspects needing further study:**
  - Sea ice, icebergs, icing and wind chill.
  - Data on ice and iceberg are insufficient.
  - Reliability of weather forecasts
Conclusions: Recommended standards

**Materials:**

- **Codes**
  - ISO 19906 - Arctic offshore structures
  - ISO CD21457 - based on NORSOK M-001 Material selection,
  - NORSOK M-101 Structural steel fabrication (also incorporated in ISO 19902),
  - NORSOK M-102 Structural aluminium fabrication
  - ISO 13623 Petroleum and natural gas industries – Pipeline transportation systems, Chapter 8
  - DNV OS-F101 Submarine Pipeline System, Section 6 for pipeline systems,
  - DNV OS-F201 Dynamic Risers, Section 7 f (work ongoing on ISO 13678-12 based on the DNV document)
  - Class rules for mobile offshore units

- **Cold climate aspects not covered:**
  - Material qualification for arctic service
  - Painting and coating
Conclusions: Recommended standards and studies

**Foundations:**

- **Codes:**
  - ISO 19901-4 – Geotechnical and Foundation Design Considerations.
  - ISO 19906 - Arctic offshore structures

- **Cold climate aspects needing further study:**
  - melting permafrost
  - hydrates

**Fixed Steel Structures:**

- **Codes:**
  - ISO 19901 — Specific requirements for offshore structures
  - ISO 19902 — Fixed steel offshore structures
  - ISO/CD 19906 -- Arctic offshore structures

- **Cold climate aspects needing further study:**
  - Same as for loads and materials
Conclusions: Recommended standards and studies

**Submarine pipelines:**

- **Codes**
  - DNV OS-F101, Submarine Pipeline System,
  - ISO 13623 – Pipeline transportation systems

- **Cold climate aspects needing further study**
  - impact from sea ice in structural design
  - Inspection and maintenance in sub ice conditions

**Subsea Facilities:**

- **Codes**
  - ISO 13628 – Design and operation of subsea production systems (all parts),
  - ISO/CD 19906 - Arctic offshore structures

- **Cold climate aspects needing further study**
  - soil behavior
  - impact loads from icebergs and ice keels
  - reliability of hydraulic systems in long tie backs in arctic regions
  - installation of subsea facilities in arctic conditions
Conclusions: Recommended standards and studies

**Floating Structures:**

- **Codes**
  - ISO 19904-1 — Floating offshore structures
  - ISO/CD 19906 -- Arctic offshore structures
  - Classification Society Rules

- **Cold climate aspects needing further study**
  - impact from sea ice and icebergs in structural design to avoid loss of stability or buoyancy
  - impact from icing in assessment of stability
  - effect of low temperatures on material selection and design
  - winterization of ballast system/stability systems, incl. icing of radars, navigation- and telecommunication equipment
Conclusions: Recommended standards and studies

**Mooring:**

- **Codes**
  - ISO 19901-7 - Specific requirements for offshore structures -- Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units
  - ISO/CD 19906 -- Arctic offshore structures
  - DNV-OS-E301 Position Mooring

- **Cold climate aspects needing further study**
  - effect of ice loads from drifting ice and ice ridges on mooring systems
  - effect of pack ice on Dynamic Positioning

**Risers:**

- **Codes:**
  - DNV OS-F201, Dynamic Risers,
  - ISO 13628-2 (API 17J), Specification for Unbonded Flexible Pipe

- **Cold climate aspects needing further study**
  - current safety factors not documented for artic applications
  - impact from sea ice in structural design to avoid loss of containment
**Conclusions: Recommended standards and studies**

**Topside Facilities:**

**Codes:**

- ISO 13702: Control and mitigation of fires and explosions on offshore production installations -- Requirements and guidelines
- ISO/CD 19906: Petroleum and natural gas industries -- Arctic offshore structures
- IEC 61892, Fixed and mobile offshore units - Electrical Installations
- IEC 60092, Electrical installations in ships (relevant parts)
- IEC 60331, Tests for electric cables under fire conditions
- IEC 60332, Tests on electric cables under fire conditions
- IEC 61508, Functional safety of electrical/electronic/programmable electronic safety-related systems,
- IEC 62511, Power system reliability in a deregulated electricity market environment
- NORSOK C-001 Living quarters area
- NORSOK C-002 Architectural components and equipment,
- NORSOK H-001 HVAC – Heating, Ventilation and Air Conditioning
- NORSOK I-002 Safety and automation systems (SAS),
- NORSOK L-001 Piping and Valves
- NORSOK L-002 Piping Design, Layout and Stress Analysis
- NORSOK R-001 Mechanical Equipment
- NORSOK R-004 Piping and equipment insulation.
- NORSOK R-100 Mechanical Equipment Selection,
- DNV OS-A101, Safety Principles and Arrangement
- DNV OS-D101, Marine & Machinery Systems & Equipment.
- DNV OS-D202, Instrumentation, Control & Safety Systems
- DNV OS-D301, Fire Protection
Conclusions: Recommended standards and studies

*Topside Facilities:*

- **Cold climate aspects needing further study**
  - Design of escape ways, evacuation and rescue systems, taking into consideration sea ice, icing, long period of darkness and remoteness
  - Sheltering/enclosing of (process) areas
  - Winterizing areas, process equipment and safety functions with electrical heat tracing etc. Ensure that cold climate and harsh weather does not reduce functionality
Conclusions: Recommended standards

**Human Factors:**

**Codes:**
- NORSOK S-002 Working Environment
- ISO 6385: Ergonomic principles in the design of work systems
- EN 614, Safety of machinery – Ergonomic design principles
- EN 894, Safety of machinery – Ergonomics requirements to the design of displays and control actuators

**Cold climate aspects needing further study**
- common requirements to rescue and medical treatment for offshore activities in the Barents Sea.
- design of sheltered areas where personnel shall operate, to ensure good working conditions
- philosophy and design for safe refuge space
Conclusions

- "Short-list" of areas for further investigation in Russian – Norwegian workshops within:
  - Offshore structure design loads
  - Floater challenges wrt ice
  - Effect of iceformations on pipeline and subsea installations
  - Winterisation
  - Human factors
  - Rescue
  - LNG plant safety
  - List of recommended recognised standards for Barents Sea

- Detail list will be presented / discussed during DAY 2