InterDam

NORSOK

Index

Introduction to the NORSOK standards

The Norwegian oil and gas sector contributes around 20% of the government revenue, supporting public spending on schools, health and pensions. The country is just one of 60 to observe the International Organization for Standardization (ISO) activities on materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries (ISO/TC 67).

However, the Norwegian industry has also established its own set of standards, also known as the NORSOK standards, to support the international work with national knowledge and expertise.

"The NORSOK standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness by maximizing longevity for petroleum industry developments and operations. Furthermore, NORSOK standards are, as far as possible, intended to replace oil company specifications and serve as references in the authorities' regulations."

They are developed and published by Standards Norway with the support of the Norwegian Oil Industry Association (OLF) and the Federation of Norwegian Manufacturing Industries (TBL).

The NORSOK standard

NORSOK officially stands for "Norsk Sokkels Konkurranseposisjon" which means the Norwegian shelf's competitive position and became effective in 1994. Back then, there was a need for more rules and regulations that were not met by already existing standards.

Today, NORSOK, ISO, IMO FTP code and SOLAS 74 standards form the basis of the overall regulations for architectural compounds in the on- and offshore oil & gas industry. The standards describe in detail how to achieve the safest and most cost-effective goals in design, engineering, manufacturing and many more other aspects regarding structure compounds in the oil & gas industry.

NORSOK standards in detail

There are a number of NORSOK standards in active use. The standards are divided into categories that relate to on- and offshore operations.

NORSOK Standards	
C - Architect	R - Mechanical
D - Drilling	S - Safety
E - Electrical	T - Telecommunication
G - Geotechnology	U - Subsea
H - HVAC	UB - Underwater operation
I - Instrumentation	WF - Well fluids
I - Metering	Y - Pipelines
I - System Control Diagram	Z - Installation
J - Marine operation	Z - MC and preservation
L - Piping and layout	Z - Reliability engineering and technology
M - Material	Z - Risk analyses
N - Structural	Z - Standard cost coding
O - Operation	Z - Technical information
P - Process	Z - Temporary equipment
R - Lifting equipment	

Each category is divided into a more detailed set of standards. In terms of architectural components the most important categories are C – Architect and S – Safety. These categories focus on the standards C-001 Living quarter areas, C-002 Architectural compounds and equipment and C-004 Helicopter deck on offshore installations. S – Safety is divided into S-001 Technical safety, S-002 Working environment, S-003 Environmental care and S-005 Machinery – working environment analyses and documentation.

Standard C-002 specifically outlines the requirements for all architectural compounds in the oil and gas industry, which includes walls, doors and windows. Therefore, it is regarded as the leading standard for architectural compounds. S-002 is frequently referred to in the C-002 standard because the combination of these standards result in a adequately installed structure which provides safety for personnel and equipment.

NORSOK Standards
for use in the oil and gas industry

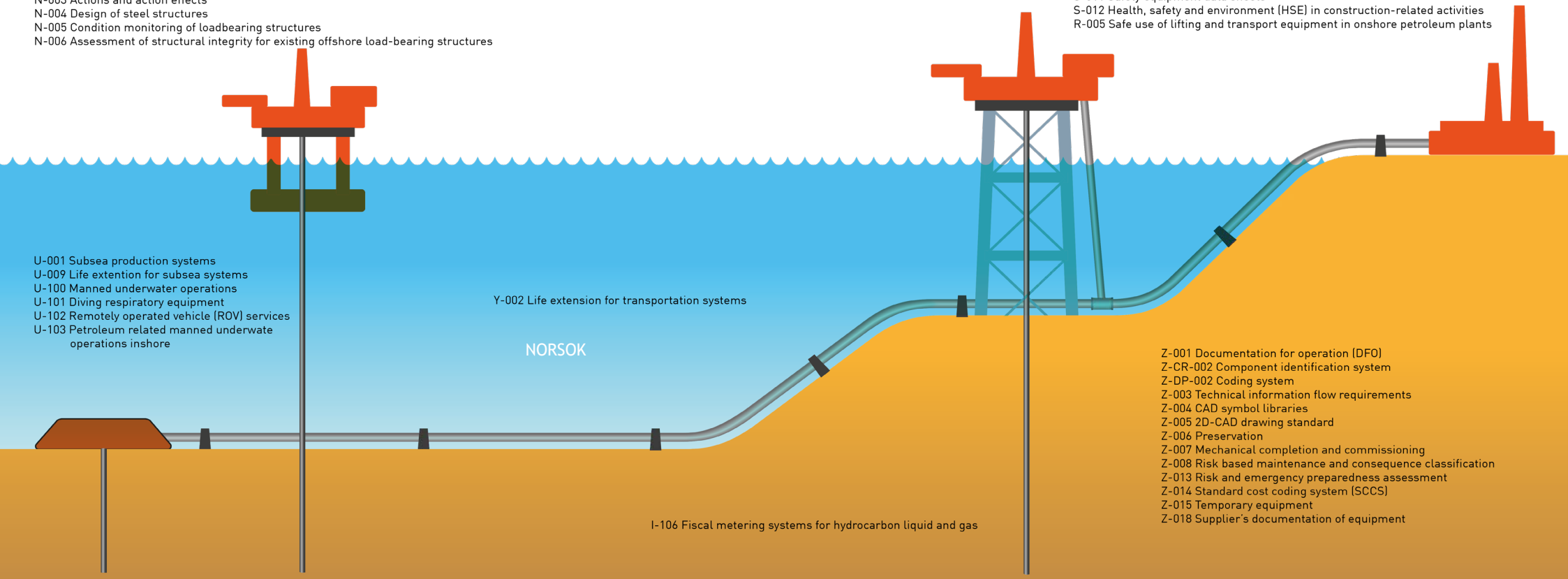
M-001 Materials selection
M-101 Structural steel fabrication
M-102 Structural aluminium fabrication
M-120 Material data sheets for structural steel
M-121 Aluminium structural material
M-122 Cast structural steel
M-123 Forged structural steel
M-501 Surface preparation and protective coating
M-503 Cathodic protection
M-506 CO2 corrosion rate calculation model
M-601 Welding and inspection of piping
M-622 Fabrication and installation of GRP piping systems
M-630 Material data sheets and element data sheets for piping

P-002 Process system design
R-001 Mechanical equipment
R-002 Lifting equipment
R-003 Safe use of lifting equipment
R-004 Piping and equipment insulation
I-001 Field instrumentation
I-002 Safety and automation system (SAS)
I-005 System control diagram
L-001 Piping and valves
L-002 Piping system layout, design and structural analysis
L-003 Piping details
L-004 Piping fabrication, installation, flushing and testing
L-005 Compact flanged connections
H-003 Heating, ventilation and air conditioning (HVAC) and sanitary systems

S-001 Technical safety
S-002 Working environment
S-003 Environmental care
S-005 Machinery - working environment analyses and documentation
T-001 Telecom systems
T-003 Telecommunication and IT systems for drilling units
T-100 Telecom subsystems
E-001 Electrical systems
C-001 Living quarters area
C-002 Arcitectural components and equipment
C-004 Helicopter deck on offshore installations

M-650 Qualification of manufacturers of special materials
M-710 Qualification of non-metallic sealing materials and manufacturers
S-006 HSE-evaluation of contractors
S-011 Safety equipment data sheets
S-012 Health, safety and environment (HSE) in construction-related activities
R-005 Safe use of lifting and transport equipment in onshore petroleum plants

N-001 Integrity of offshore structures
N-003 Actions and action effects
N-004 Design of steel structures
N-005 Condition monitoring of loadbearing structures
N-006 Assessment of structural integrity for existing offshore load-bearing structures



D-001 Drilling facilities
D-002 Well intervention equipment
D-007 Well testing systems
D-010 Well integrity in drilling and well operations

www.standard.no/petroleum

Updated by July 2016

NORSOK standard C-002 and S-002

The standards C-002 and S-002 are important for architectural compounds. Standard C-002 Architectural compounds and equipment "defines the minimum functional requirements for design and construction of architectural components and equipment to be installed and used on offshore installations in the petroleum industry." Standard S-002 Working environment "applies to the design of new installations and modification/ upgrading of existing installations for offshore drilling, production, utilization and pipeline transportation of petroleum, including accommodation units for such activities."

NORSOK requirements for walls

The internal partitioning of on- and offshore oil and gas structures is of critical importance, since the right partitioning structure can effectively slow the process of fire development. In the past, there have been fires which have cost the lives of personnel. In order to make sure this never happens again, the international and national community of oil and gas experts and professionals are continuously developing and evolving requirements.

The NORSOK standard for architectural components and equipment is such an example. It is regarded as one of the leading standards in the industry. Within the standard, there are strict requirements defined for the characteristics and features of internal and external walls. some of them are described below.

General requirements for walls

First off, the general requirements are explained. They include requirements based on documentation and drawings, which generally takes place during the development/design phase of the project:

- All fabrication and installation work should be based on approved project documentation;
- A detailed wall schedule should be developed (which includes wall types, dimensions. construction, fire rating, penetrations, etc.);
- Drawings should clearly show major interface with other elements and systems, and overall structural support details;
- And drawings should also define the split in scope of work between prefabrication by supplier and field modification to fit at location.

Fire ratings for walls

The fire ratings are generally based on IMO FTP code regulations. The fire ratings for walls have to be applied as required by project design and certified in compliance with governing body regulations.

Blast pressure for walls

As is the case with fire ratings, the blast pressure should have been previously determined by the project parameters. Once this has been done, all walls and its elements should be able to resist the specified fire and blast pressure. The wall should always remain intact after being exposed to an explosion while simultaneously maintain full fire rating and integrity. This is called fire-post-blast resistance.

The best way to verify if the specific wall can meet the project parameters for fire-post-blast resistance, is to have witnessed and verified single-sample tests where the same sample is subjected to a blast test prior to being subjected to a fire test. This to resemble best what can happen in the field in case of an event.

Thermal requirements for walls

Thermal requirements are not always required by the project. If it is required and not specified otherwise, a U-value of 0,5 W/m2K (or better) should be achieved. This type of insulation should be placed on the internal side of the structure.

Acoustic requirements for walls

The sound insulation requirements regarding field measured values are determined in NORSOK S-002. These should be applied on all installed wall assemblies, unless stated otherwise.

During the laboratory test, the sound reduction index should be at least 5 dB better that the field requirement. Additional requirements state that special attention should be paid to avoid noise leaks, flanking transmission, noise transmission via floor and ceiling voids, etc. Some walls are perforated on the noice production side for improved sound absorption. These perforated walls should be designed in such a way that the airborne sound reduction requirements are not affected.

NORSOK requirements for doors

NORSOK proof doors are applied worldwide in varying environmental conditions. The strength of a NORSOK proof door lies in the strict and reliable construction and operation, which has been proven over and over again within the industry. There are certain requirements a NORSOK door has to comply with.

General requirements according to the NORSOK standard

General NORSOK requirements to be met are:

- Doors and hardware should be designed and arranged in such a way that potential injury to persons is eliminated;
- Door assemblies should be easily operable in a hazardous or accidental situation;
- Doors should have a clear opening of at least 750 mm width and 2050 mm height;
- Doors to cabin bathrooms, toilets, and doors that are not escape routes for more than one person may have a width of less than 750 mm;
- Panic bars should be provided on doors in areas where there is a risk of congestion or panic;
- Threshold detailing and door arrangement should stop all ingress of water from decks;
- Automatic opening devices should be installed on doors used frequently for transport and handling of goods;
- If a hangar door is required on the installation, it should be adequately dimensioned regarding strength, fire rating and exposure to use.

Furthermore, during the design phase, a door schedule should be developed and continuously updated throughout the project in order to specify all required information.

Also, all doors should be supplied by the same company, in accordance with operator/company requirements. The only exception to this requirement are the B15 type lightweight doors and special doors.

Door opening force according to the NORSOK standard

The initial force required to open a door should be low in order to ensure fast and easy evacuation during fire events. Opening forces are measured by a dynamometer and is specified in Newton.

In NORSOK, there are two kinds of requirements for opening forces. One specifies the maximum opening forces for doors in frequent use (used at least 10 times a day). The other requirement specifies the maximum opening forces for all other doors.

For doors in frequent use:

- Hinged doors: 65 N
- Sliding doors: 50 N

For all other doors:

- Hinged doors: 130 N
- Sliding doors: 105 N

In accidental situations, the maximum opening force should never exceed 250 N for doors in main escape routes. During the design of such doors, the materials and construction methods used should eventually result in doors as light as possible.

Ergo latch on sliding doors

50N as maximum opening force of sliding doors cannot be achieved without additional support. A mechanical solution to stay within the maximum opening force is the application of a lever that pushes the door leaf over the inertia moment within 50N opening force.

When the doors are still to be operable when the deck is under an angle (e.g. on FPSO's under severe windy conditions) the default support is a pneumatic operating system.

Fire rating and acoustic requirements according to the NORSOK standard

Fire ratings and sound reduction requirements should be the same as the division in which they are installed. A lower sound reduction value may be accepted only if it meets the required sound reduction value (Rw) for the whole division.

Door materials according to the NORSOK standard

Different materials can be used in the construction of a fire and blast rated door. A very important NORSOK requirement is that the used material should ensure that the door is robust and rattle free based on thickness of frames and door leaf plates. These materials should be able to withstand heavy abuse from mechanical and natural forces. The need for repair and maintenance should be minimal.

The materials and requirements to be used are:

- Carbon steel: in accordance with NS-EN 10025, S235 JRG2 or equivalent;
- Stainless steel: type AISI 316L, or alternatively AISI 316 with a maximum carbon content of 0,05 %. The stainless steel material shall be of the white pickled and passivated condition;
- Aluminum: seawater resistant type;
- Alternative materials: may be used, as long as such materials comply with all relevant requirements.

The surface finish of the door should be stain resistant and should not be painted or coated. After installation, the (heavy duty) door should be able to withstand weld spatter, angle grinding grit and potential damage from other construction activities.

NORSOK requirements for windows

The NORSOK standard C-002 explains in-depth and with great detail how architectural compounds should comply to general requirements. In the standard, several necessary requirements are outlined for windows in the oil & gas industry.

General requirements for windows

The general requirements look at the overall requirements for windows. For example, window frames should be continuously welded to an external bulkhead or prefabricated walls. A bolted installation is allowed if the project requires this.

To make sure that every window unit can be installed on various external wall thicknesses, they should have an adjustment capability in depth. Furthermore, by means of detailing between internal frame and cut-outs in internal linings, gaps between these items should be closed mechanically in order to stop passage of smoke and airborne noise.

It should also be made sure that maintenance, repair and replacement work on the glass can be carried out from the inside of the structure. Internal bolts of the frame are expected to be hidden behind an easily demountable profile system, which surrounds the complete window unit.

Environmental condition requirements for windows

Protection against environmental conditions depend on the location of the structure. Offshore structures face more stringent rules and regulations than onshore structures. In each location, the complete window unit should be able to withstand climate conditions, such as wind, icing, temperature, humidity, saliferous corrosion, etc. The windows are expected to ensure proper operation throughout the entire lifespan of the installation.

Glazing of windows

windowsThe glass should be hermetically sealed to the glazing compound. Within the layers, a minimum of 50% neutral colored, heat-reflecting layers should be included in the external window. This layer should be positioned on the inside of the outer glass.

The expansion movement of glass should be taken into consideration when sizing the glass units, in order to maintain the right performance requirements. Furthermore, forming of condensation between glass layers is unacceptable. When condensation occurs, these window panes should be replaced!

Gasket and glazing compounds for windows

Since gaskets, sealants, setting blocks, spacers and shims are subjected to high levels of sun rays, they have to be designed of durable quality and have to have a high resistance against ultraviolet light. The grooved holding these gaskets should have good anchoring properties.

In order to guarantee stability and maintain adhesion to glass and metal, glazing compounds have to consist out of the best quality weather-resistant mastic.

About InterDam

InterDam creates the safest area possible for people and equipment working in hazardous environments. We are a market leader in our field due to our innovative character and offer a broad and complete portfolio of fire and blast architectural products. We set new standards and raise our shield for fire-post-blast protection. Your shield in the field.

We innovate and can define new standards. We can offer a wide scope of solutions to our clients and become the best certified partner with the most up-to-date and fit-for-purpose solutions available in the industry. At the same time, we build a true leader in the field worldwide. InterDam presents you the pros in protection. We will not settle for anything less.

Our field

Protecting priceless human lives and saving essential resources and capital property with our fire and blast resistant doors, walls, windows and cladding. We optimize choice of welded, built-up or sandwich panels for people's safety. This expertise has become indispensable for areas where shielding is key.

Our products protect people and assets at offshore wind substations, LNG and petrochemical installations, offshore oil and gas platforms, at defense ships and installations and at infrastructural objects. In our production and delivery process we cover the total scope: from setting new standards, to production, to installing, to maintenance and repair.

Our shields

We join forces and can now offer the broadest and most complete portfolio of fire and blast architectural products in the entire world.

Walls - Generation II, Generation III, Generation IV (G21)
Doors - Medium duty and heavy duty, single hinged, double hinged, sliding and specials, heavy duty, gas and watertight
Windows - Fire-post-blast resistant (G21)
Cladding - Heatshield, windshield, explosion relief
Roofs - Generation IV (G21)
Transportable prefabricated buildings - Road transportable dedicated fire-post-blast resistant units.

Services

As InterDam we offer a wide range of services to our clients. Not only 24/7 maintenance and repair, but also installation support, upgrades, refurbishment, replacement, supervision, quality inspections, surveys, spare parts, EPC and turn-key execution, offshore and voyage repairs. So either onshore, at a yard, quayside or offshore, our clients rely on us to keep their shields up.

Location

The heart of the office is located in Ridderkerk, The Netherlands, where the global production and sales network is being managed and maintained. A genuine project organization where all departments contribute to the successful completion of a quest: to provide protection and shield from harm.

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