

NORSOK S-002 Working Environment

Prevention through design

BOHS 2014

Hans Thore Smedbold



PREPARED.

The presentation



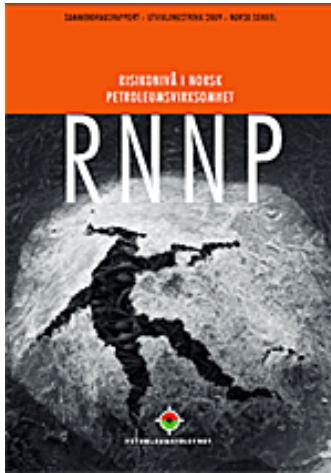
- Field of application
- Background
- Best of two worlds
- Structure
- Some challenges
- Summary





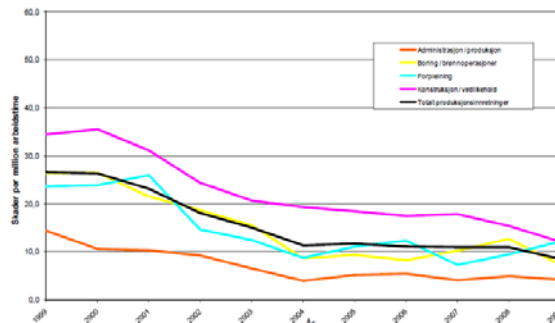
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Risk level in the Norwegian Petroleum Industry

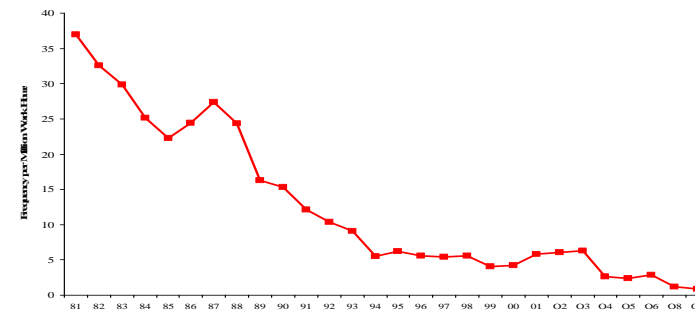


- Yearly monitoring of risk level
- Accidents, questionnaires, work related illnesses, special studies
- «The lowest» risk level in the industry

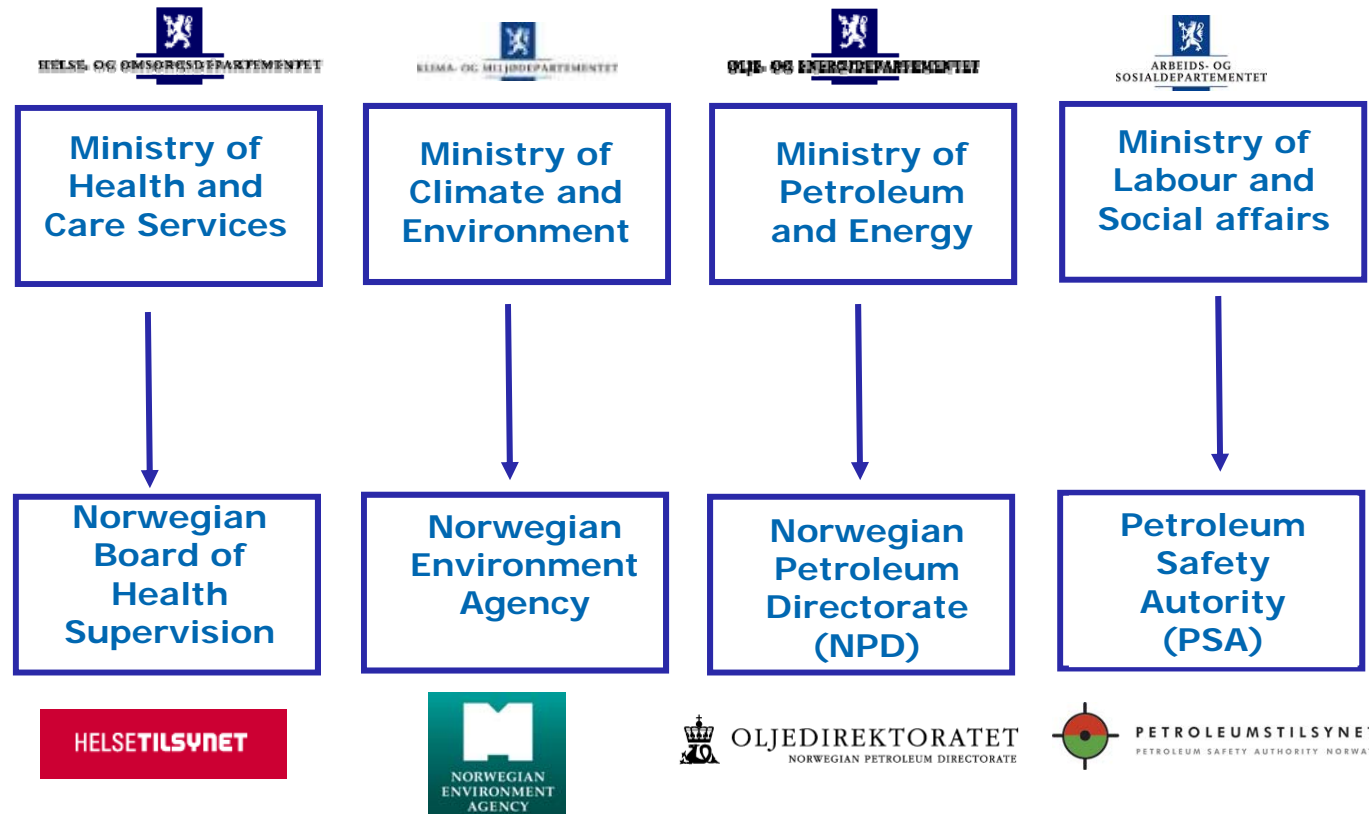
Lost Time Accidents



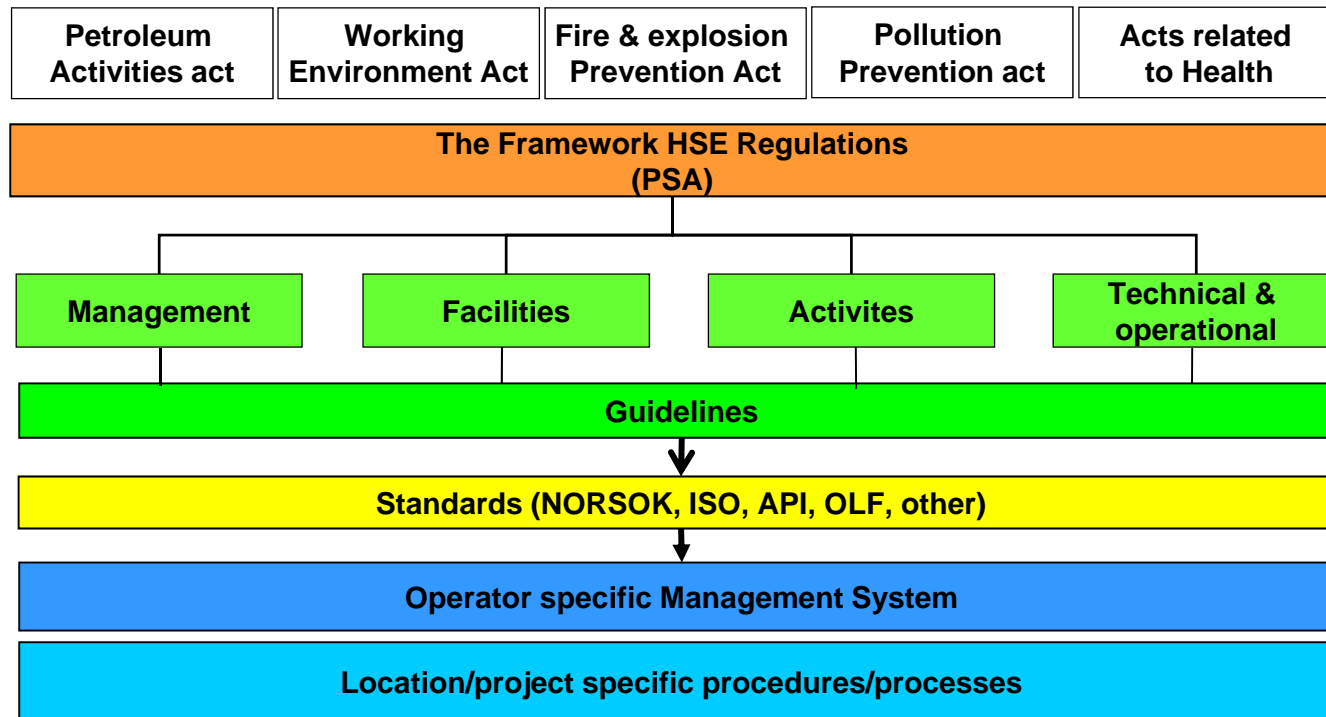
Figur 122 Personskader per million arbeidstimer, produksjonsinretninger



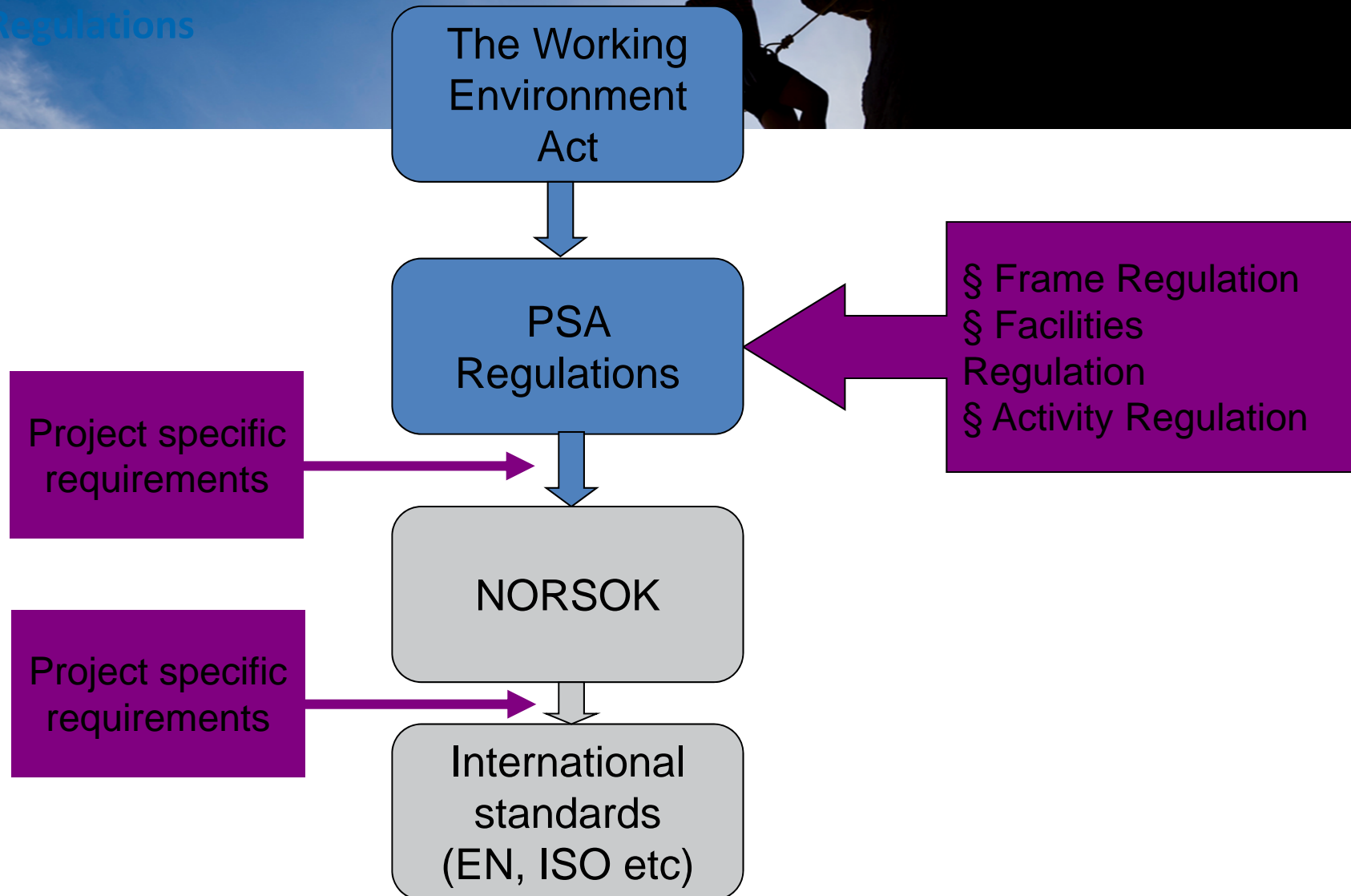
Key HSE Regulators



HSE Regulations

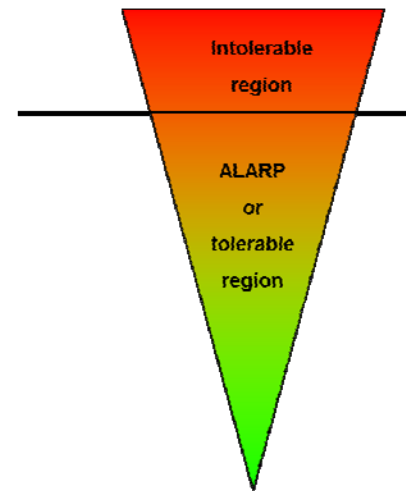


§ Regulations



Risk reduction principles

- As Low As Reasonably Practicable (ALARP)
- Best available technology (BAT)
- Prevention on work group level
- Precautionary
- Substitution
- (Cost – Benefit)



NORSOK

Norsk konkurransefortrinn på norsk sokkel (Norwegian)

(trans. Competitive and cost effective new building and modifications on the Norwegian Continental Shelf)

- S-002 rev. 1 1993 (Terje Salbo (Statoil), Urban Kjellen (Hydro))
- Last revision 2004 (rev. 4)
- Based on international standards and industry best practice

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S-002 Working environment (Rev. 4, August 2004)



This NORSOK standard applies to the design of new installations and modification or upgrading of existing installations for offshore drilling, production, and utilisation and pipeline transportation of petroleum, including accommodation units for such activities.

This NORSOK standard stipulates design requirements related to the working environment of petroleum installations as well as requirements regarding systematic management of working environment issues in project development and the design process.

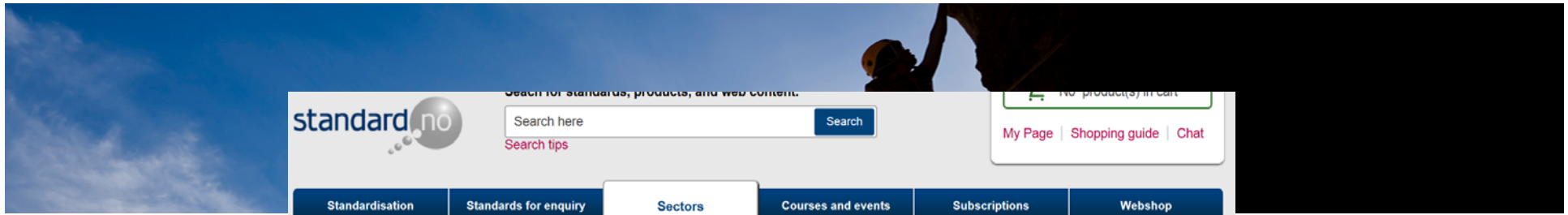
The purpose of this NORSOK standard is to ensure that the design of the installation promotes the quality of the working environment during the operational phase.

Revision 4 includes the following changes:

- **Implementation of unique ID reference tag number for both existing and new requirements information.** All new requirements / supplementary information is identified with revision mark.
- Clause 4 is changed considerably in order to highlight the importance of early-qualified execution of studies/analyses for validation and verification in line with industry and authorities expectations. In addition, there are, through the clauses/annexes, several changes both in textual descriptions as well as to tabular information.
- The following annexes in the previous revision have been voided:
 - Annex D "Typical hazardous substances"
 - Annex G "List of applicable acts, regulations, standards and guidelines for the Norwegian continental shelf"
- Updating according to regular revision cycle and in view of International Standards (ISO) and European Standards (EN).
- Capture the good practices and project user experience reported by the oil and gas industry since issue of revision 3.

STANDARDS

- [A-Administration](#)
- [C-Civil/Architect](#)
- [D-Drilling](#)
- [E-Electrical](#)
- [G-Geotechnology](#)
- [H-HVAC](#)
- [I-Instrumentation](#)
- [I-Metering](#)
- [I-SCD-Syst Control Diagram](#)
- [J-Marine Operation](#)
- [L-Piping / Layout](#)
- [M-Material](#)
- [N-Structural](#)
- [O-Operation](#)
- [P-Process](#)
- [R-Lifting Equipment](#)
- [R-Mechanical](#)
- [S-Safety \(SHE\)](#)
- [T-Telecommunication](#)
- [U-Subsea](#)
- [U-Underwater Operation](#)
- [WF-Well fluids](#)
- [Y-Pipelines](#)
- [Z-E&I Installation](#)
- [Z-MC & Preservation](#)
- [Z-Regularity & Criticality](#)
- [Z-Risk analyses](#)
- [Z-Stand. Cost Coding](#)
- [Z-Technical Info](#)
- [Z-Temporary Equipment](#)



◀ Start ▶ Sectors ▶ Energi og petroleum ▶ Petroleum



Photo: iStockPhoto

- NORSOK standards
- Organisation
- Expert groups
- PSA Regulations
- Norwegian Oil and Gas Association Guidelines
- ISO and CEN committees
- NORSOK – enquiry and review
- Communication guideline

Petroleum

International (ISO/IEC) and European standards (CEN/CENELEC), form the basis of all activities in the petroleum industry. Experts from a wide range of Norwegian companies participate heavily in the development of international and european standards, in order to define safe and economical design and processes. However, Norwegian safety framework and climate conditions may require own standards, or additions and supplements to International Standards and European Standards. The NORSOK standards have been developed to fulfil these needs.

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Contact information

General enquiries
petroleum@standard.no

See also [key personnel](#)

Sales information

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NORSOK S-002 Working Environment

1 Scope

This NORSOK standard applies to the design of new installations and modification or upgrading of existing installations for offshore drilling, production, and utilisation and pipeline transportation of petroleum, including accommodation units for such activities.

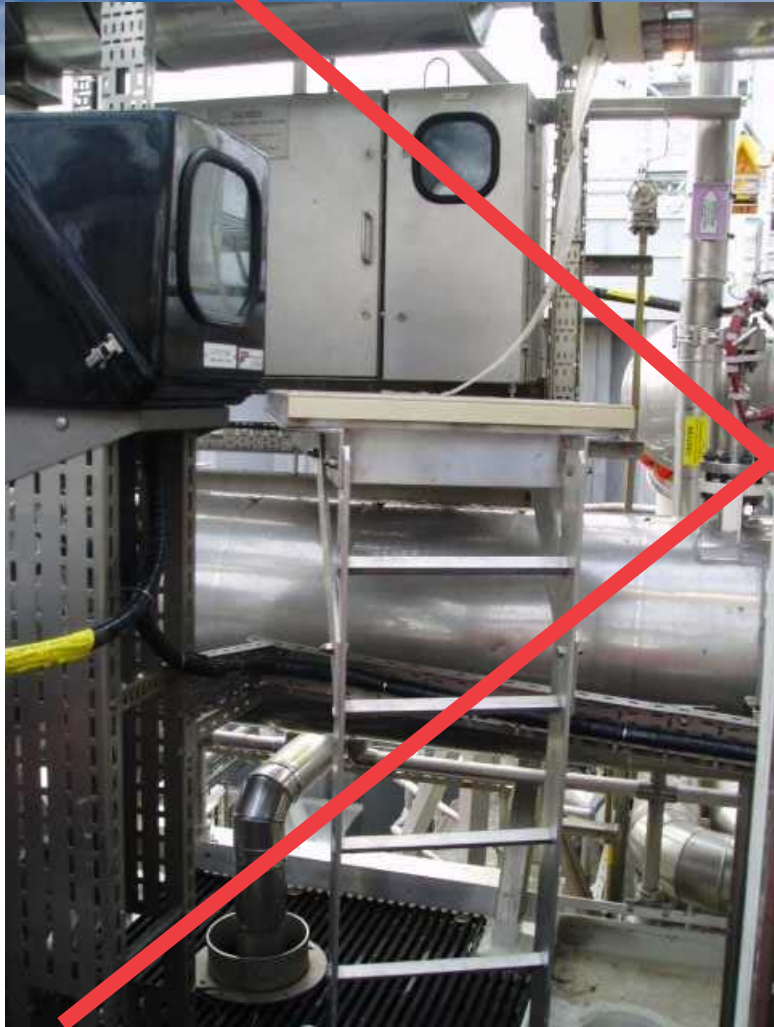
This NORSOK standard stipulates design requirements related to the working environment of petroleum installations as well as requirements regarding systematic management of working environment issues in project development and the design process.

The purpose of this NORSOK standard is to ensure that the design of the installation promotes the quality of the working environment during the operational phase.

NORSOK S-002



- Human centered design process
- Extracts and presents core elements of 50-60 international WE standards
- It's free (www.standard.no), however, it makes these international standards mandatory for use in Norwegian Oil & Gas industry, which is not free





The best of two worlds



Prescriptive requirements

- Area requirements (WEAL)

Functional requirements

- Personal exposure

NORSOK standard S-002

Rev. 4, August 2004

6.10-1

Room description	Level of manning *	Average illuminance level (lux) †	Temperature min/max °C	Vibration limit	Noise total dB(A)	Noise HVAC dB(A)
External walkways and access ways		100	Outdoor		90 ¹	
Stairs, walkways and access ways in enclosed work areas		150			90-90	
Lay down area		200			75 ¹	
Mustle area	U	200	Outdoor	2	75	
Pne pump room	U	200	5-35	3	110 ¹	90
Emergency generator room	U	200	5-35	3	110 ¹	90
Unmanned machinery room	U	200	5-35	3	110 ¹	90
General process and utility area	I	200	Outdoor 5-35	3	95/90 ¹	
HVAC room	U	200	5-35	3	90	
Switchboard and transformer room	I	200	5-35	2	95	70
Central control room	M	600	20-24	1	45 ¹	40
Local control room	I	400	Adjustable			
Local control room	I	400	19-25	2	90	90
Coffee base outside LQ	M	150	19-25	2	90 ¹	90
Battery room	U	200	5-35	3	95	70
Main generator room	U	200	5-35	3	95/90 ¹	70
InsVIL workshop	M	600	19-25	2	95 ¹	90
Mechanical workshop/working	M	600	19-25	2	95 ¹	90
Stores - Large parts		200	19-25	2	95 ¹	90
Stores - Small parts		300	19-25	2	95 ¹	90
Laboratory	I/M	600	19-25	2	90	90
Paint shop	I	600	19-25	2	95 ¹	95
Sandblasting room	I	300	19-25	2	95 ¹	95
Workshop office	M	600	19-25	2	95	90

5.5.2 Noise limits

- 5.5.2.0-1 The following noise level limits reflect the requirements for conservation of hearing:
- 5.5.2.0-2 The individual employee's maximum exposure to noise during a 12 h working day is 83 dB(A).
- 5.5.2.0-3 The maximum allowable noise level in any situation is 130 dB(C) ("peak"). This limit also applies to enclosed "normally unmanned areas".
- 5.5.2.0-4 Annex A deals with vibration limits and area noise level limits, total and for HVAC.
- 5.5.2.0-5 The area noise level limits shall apply as the maximum sound pressure level at any location within an area, but not closer than 1 m to equipment and other noisy installations.
- 5.5.2.0-6 All limits refer to broadband noise without any distinct tonal characteristics. In case of tonal characteristics, the noise level limit shall be set 5dB lower.
- 5.5.2.0-7 For areas where the area noise limit is 95 dB(A) or 90 dB(A), the limit of 90 dB(A) shall apply only where a lower limit is unfeasible. If an area limit of 90 dB(A) is incompatible with the individual employee's maximum noise exposure, technical measures to reduce the need to stay in the noise zone shall be implemented.

The core NORSOK S-002 process

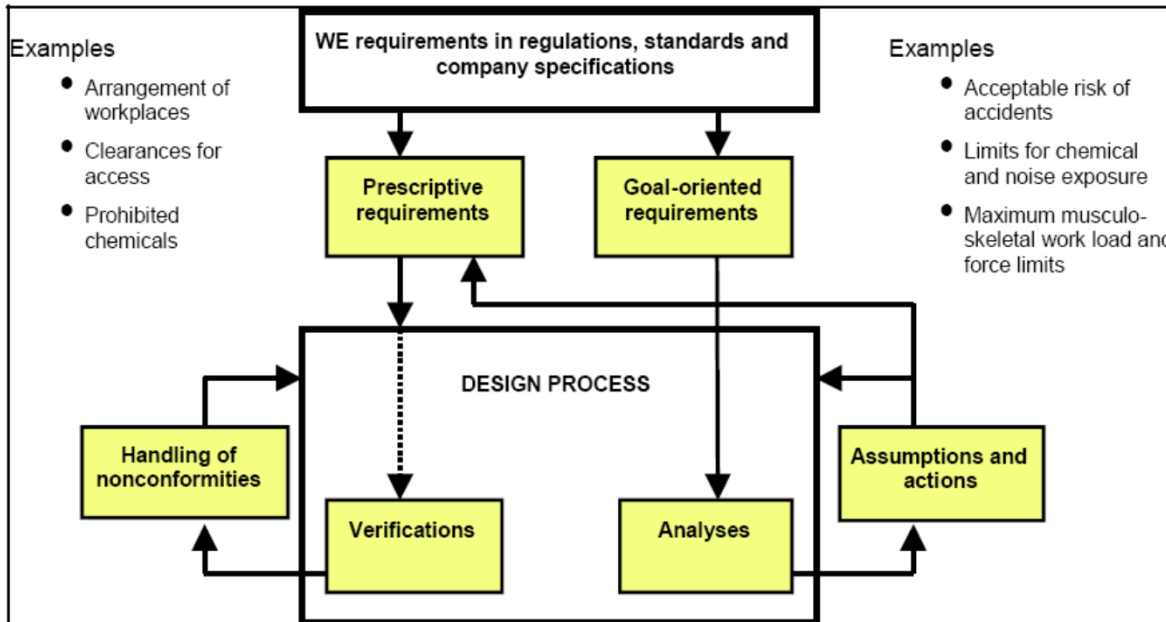


Figure G. 1 - Processes to implement prescriptive and goal-oriented WE requirements

4.4.7 Noise and vibration control

4.4.7.0-1 During project development, the procedure for noise control in Annex H, or a procedure documented to be of equivalent functionality and quality, shall be applied.

4.4.7.0-2 During concept definition and optimisation/FEED, the activity shall ensure that:

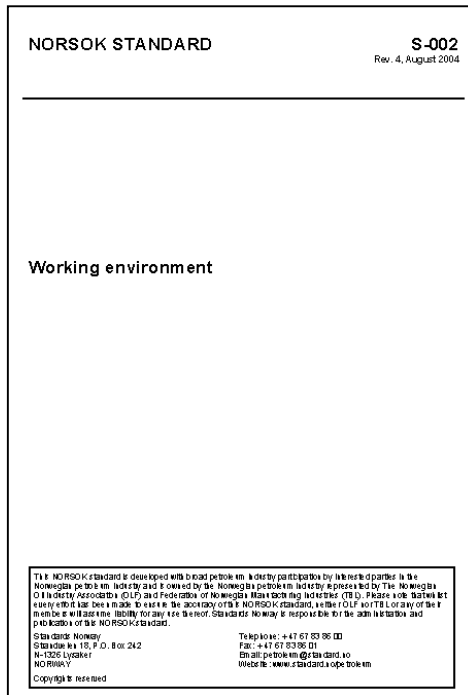
- 4.4.7.0-3 - major noise and vibration sources are identified,
- 4.4.7.0-4 - possible use of low-noise equipment is evaluated,
- 4.4.7.0-5 - a review of the localisation of noisy equipment and noise-exposed areas in relation to quiet areas is performed, and the use of "buffer" zones is evaluated,
- 4.4.7.0-6 - area noise level limits (total and HVAC) are specified,
- 4.4.7.0-7 - preliminary predictions of area noise levels and personnel exposure levels are performed,
- 4.4.7.0-8 - noise data sheets are issued for high-noise equipment to be ordered in the FEED phase. The equipment noise level limits shall be based on the project's area limits, and shall take into account other noise sources that are planned in the area, and area/room characteristics.

NORSOK S-002

Working environment



Industry standard for modifications and new buildings of offshore installations



- WE program
 - Design basis (WEAL)
 - Activity list
 - **Systematically follow-up of modification and new buildings**
 - Worker involvement
- Required analyses
- Functional and descriptive requirements
- Knowledge requirements

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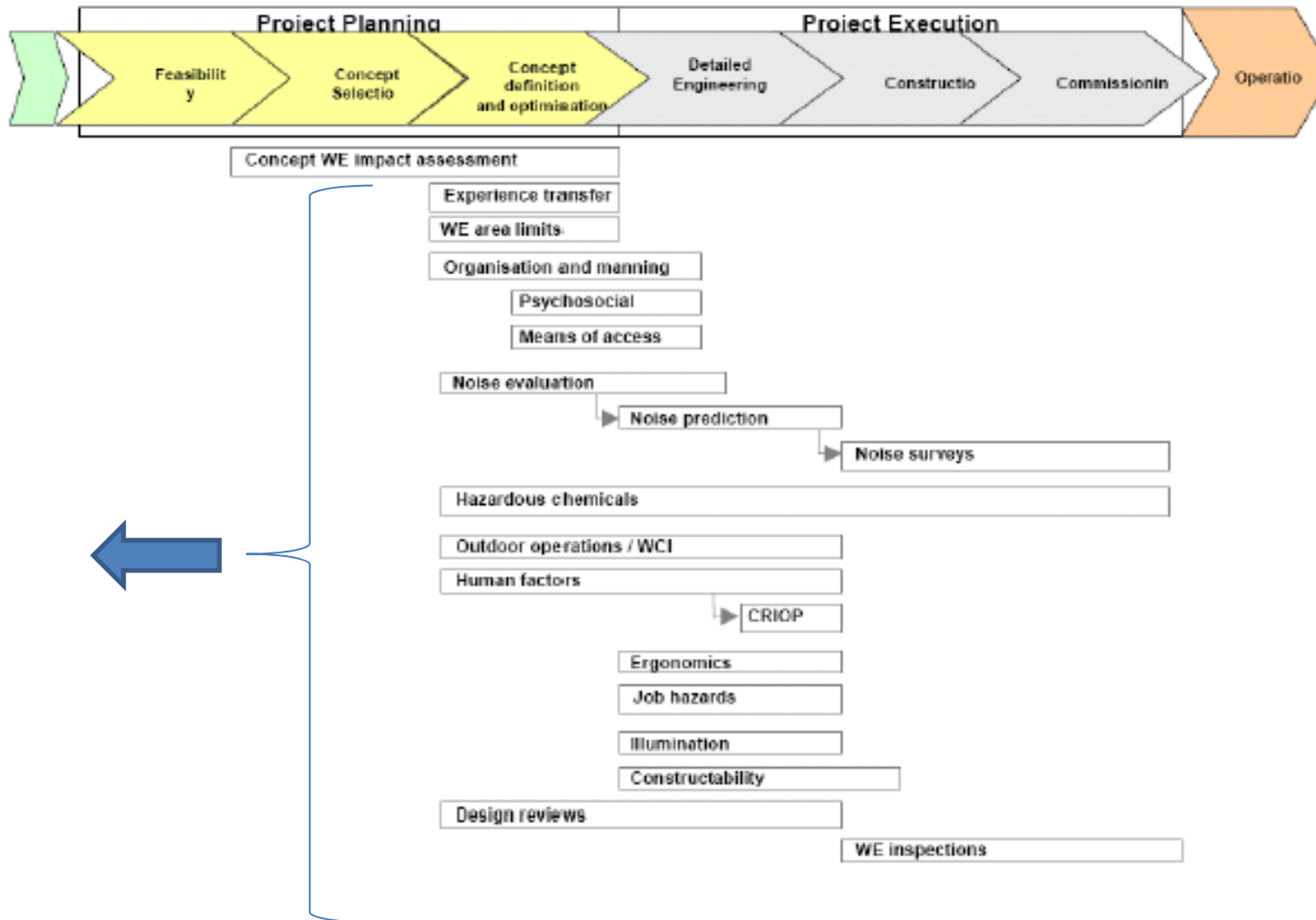


WE requirements in Norsok

- Norsok C-001 Living quarters area
- Norsok C-002 Architectural components and equipment
- Norsok S-002 Working Environment
- Norsok S-005 Machinery Safety

- + Other disciplinary standards

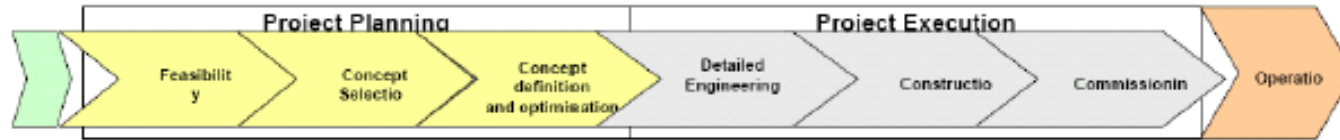
NORSOK S-002 gives an example of Work Analysis preferable should be conducted in a normal project



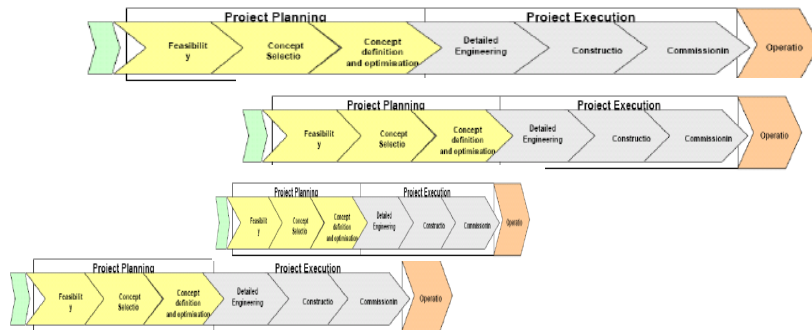
Trends in project executions



Sequential traditional long time planning and execution projects



Fast track multi sequential projects



Planning and execution of projects moves abroad (EU, America, Asia)

Some reflections



- “The Project” - a new first time experience for the project organization – but not for the industry
- The analyses require a mature understanding of the manning, operation and task required to operate the platform / rig
- Area limits are difficult to implement in a design process
- The projects often fails in how they are addressing, implementing, and verifying that they are fulfilling the goal oriented requirements in the projects
- The required analysis is done retrospective to document compliance with both Ch 4 and Ch 5 requirements



The future

NORSOK S-002 is under revision

- Outdated references and terminology
- Difficult to apply internationally
- “New” project models
- Some important requirements missing
- Overlaps with NORSOK S-005

- Hopefully issued for comments Q2-3 2014

Summary



- NORSOK S-002 – proven use full
- A balance between descriptive and functional requirements
- Human / work task centered process
- Involvement of the workers in the design process
- Future ?
 - Performance (emission) criteria's set for equipment
 - Stricter and simplified requirements
 - Analysis to prove compliance with functional requirements when not feasible to comply with the descriptive requirements



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Prepared.



Systematically follow-up - The Working Environment Programme

- A WE programme shall be established for every project phase.
- The WE programme may be a separate document or integrated into the project's HSE programme, and shall be linked to the project execution plan.



Working Environment Programme

- The WE programme shall
 - define the project's WE objectives
 - define risk acceptance criteria for occupational safety, human error and health risks
 - State references to applicable WE requirements and procedures
 - describe means of ensuring the statutory worker participation in the design process



Working Environment Programme

- The WE programme shall include an activity plan stipulating the responsibilities, schedule and deliverables for the various activities to manage WE in the design process.
- In particular, the WE analyses shall be planned with due consideration of the needs for timely input to design and procurement, and needs for verification and documentation.
- The WE activity plan shall be maintained to provide status regarding execution and documentation of the various WE management activities.



Working Environment Programme

- Deviations from WE requirements shall be subject to the project's nonconformity procedures.
- A follow-up system shall be established that enables proper documentation, handling, follow-up and closeout of agreed actions and recommendations from the various WE studies and analysis in the project. The WE follow-up system shall be integrated in the overall HSE management system in the project.



Working Environment Programme

- To document status regarding implementation of WE requirements, Working Environment Area Charts (WEAC's) shall be issued at predefined project milestones
- In principle, a WEAC shall be prepared for each room and area on the installation.



Working Environment Activity Plan (example)

- This Working Environment Activity Plan (WE Activity Plan) provides information on WE activities and documentation to be performed or issued by xxx during execution of xxx EPCH Project.
- This activity plan supports project /1/ Working Environment Program, doc. no. xxx and is established for survey and status reporting between Company and Contractor throughout Project

Working Environment Activity Plan (example)



- The plan contains planning and status information provided in the following tables:
- Table 1: WE documentation and analyses
- Table 2: WE Area design reviews
- Table 3: Specific WE reviews and analyses
- Table 4: Human Factor activities and analysis
- Table 5: WE Packages Follow-Up
- Table 6: Familiarisation of WE Design Basis

Activity Plan (example)

Specific analysis and reviews

- Coarse Chemical Health Risk Assessment (Coarse CHRA) of DECK and HULL
- Detailed Chemical HRA; CHEMICAL SAMPLING ARRANGEMENTS
- Detailed Chemical HRA; MEG & TEG SYSTEMS
- Detailed Chemical HRA; PIGGING OPERATIONS
- Detailed Chemical HRA; CHEMICAL INJECTION SYSTEMS
- WE Design Review; WIND AND WEATHER PROTECTION
- WE Design Review; ACCESS TO EQUIPMENT, VALVES AND INSTRUMENTS
- WE Design Review; ACCESS TO FLOODLIGHTS, LIGHT FIXTURES, F&G, TELECOM
- ERGONOMIC ANALYSIS OF MAJOR MANUAL WORK



WE Package Follow-Up (example)

BE: Bid Evaluation

DR: Design Review

PI/SI: Package/Site Inspection

Noise: Includes noise activity

- ER252 GAS COMPRESSORS(CENTRIFUGAL) – High priority BE DR PI Noise
- ER254 PROCESS & UTILITY PUMP – Medium priority BE Noise
- ER255 EMERGENCY & ESSENTIAL DIESEL GENERATOR – High priority BE DR PI Noise
- ER256 NITROGEN COMPRESSOR, AIR COMPRESSORS – Medium priority BE Noise