

Welding and inspection of piping

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Foreword

The NORSOK standards are developed by the Norwegian petroleum industry to ensure adequate safety, value adding and cost effectiveness 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.

The NORSOK standards are normally based on recognised international standards, adding the provisions deemed necessary to fill the broad needs of the Norwegian petroleum industry. Where relevant, NORSOK standards will be used to provide the Norwegian industry input to the international standardisation process. Subject to development and publication of international standards, the relevant NORSOK standard will be withdrawn.

The NORSOK standards are developed according to the consensus principle generally applicable standards work and according to established procedures defined in NORSOK A-001.

The NORSOK standards are prepared and published supported by The Norwegian Oil Industry Association (OLF) and Federation of Norwegian Manufacturing Industries (TBL).

NORSOK standards are administered and published by Standards Norway.

Annex A is normative.

Introduction

The provision of the NORSOK standards are intended to comply with the requirements of the "Pressure Equipment Directive" (PED) and the Norwegian implementation regulation "Forskrift for trykkpåkjent utstyr" issued 9 June 1999. When this NORSOK standard refers to PED only, it is implicit that it also refers to the Norwegian implementation regulation. In those applications where PED is governing, it is therefore necessary to apply the PED and to involve a notified body to obtain the required approvals dependent of the selected conformity assessment module applicable to each specific project.

The revision 4 replaces revision 3 which was an update to include changes deemed necessary due to

- introduction of PED,
- changes made in the reference standard ASME B31.3, and
- experiences gained with revision 2 of this NORSOK standard.

Revision 4 of this NORSOK standard is an update based upon the hearing processes related to revision 3. Some of the changes made in revision 3 are found necessary to be modified due to reconsiderations.

No additional industrial hearing is carried out related to issue of revision 4, since these reconsiderations are all related to comments given in the industrial hearing related to revision 3.

All changes made after revision 2 are highlighted with revision marks.

1 Scope

This NORSOK standard covers additional and optional technical requirements to ASME B31.3 for welding and weld inspection of piping systems, selected according to NORSOK L-001, and applies to all piping fabrication including prefabrication, module assembly, package or skid mounted units, site and field installation.

NOTE An option to use EN ISO 15614 (all parts) for welding procedure qualifications, EN 287-1, and EN ISO 9606-3 to EN ISO 9606-5 for welder qualifications, and EN 473 for NDT inspectors, is given as an alternative to ASME Section V.

2 Normative and informative references

The following standards include provisions and guidelines, which through reference in this text, constitute provisions and guidelines of this NORSOK standard. Latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet or exceed the requirements and guidelines of the standards referenced below.

2.1 Normative references

ASME Section II,	Materials Part C – Specifications for Welding Rods, Electrodes and Filler Metals.
ASME Section V,	Nondestructive Examination.
ASME Section VIII,	Rules for Construction of Pressure Vessels Division 1.
ASME Section IX,	Welding and Brazing Qualifications.
ASME B31.3,	Process Piping.
ASTM E562,	Practice for Determining Volume Fraction by Systematic Manual Point Count.
ASTM G48,	Standard Test Method for Pitting and Crevice Corrosion Resistance of Stainless Steel and Related Alloys by the use of Ferric Chloride Solution.
EN 287-1,	Qualification test of welders – Fusion welding – Part 1: Steels.
EN 288-2,	Specification and approval of welding procedures for metallic materials – Part 2: Welding procedure specification for arc welding.
EN 473,	Qualification and certification of personnel for non destructive examination.
EN 729-2,	Quality requirements for welding - Fusion welding of metallic materials – Part 2: Comprehensive quality requirements.
EN 970,	Non-destructive examination of fusion welds – Visual examination.
EN 1043-1,	Destructive tests on welds in metallic materials – Hardness testing – Part 1: Hardness test on arc welded joints.
EN 1418,	Welding personnel - Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanised and automatic welding of metallic materials.
EN 10204,	Metallic products - Types of inspection documents.
EN ISO 15156-2,	Petroleum, petrochemical and natural gas industries – Materials for use in H ₂ S-containing environments in oil and gas production – Part 2: Cracking-resistant carbon and low alloy steels, and the use of cast irons.
EN ISO 15156-3,	Petroleum, petrochemical and natural gas industries – Materials for use in H ₂ S-containing environments in oil and gas production – Part 3: Cracking-resistant CRAs (corrosion-resistant alloys) and other alloys.
EN ISO 15614-1,	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 1: Arc and gas welding of steels and arc welding of nickel and nickel alloys.
EN ISO 15614-5,	Specification and qualification of welding procedures for metallic materials – Welding procedure test – Part 5: Arc welding of titanium, zirconium and their alloys.
EN ISO 3690,	Welding and allied processes - Determination of hydrogen content in ferritic arc weld metal.
EN ISO 9606-3,	Approval testing of welders – Fusion welding – Part 3: Copper and copper alloys.
EN ISO 9606-4,	Approval testing of welders – Fusion welding – Part 4: Nickel and nickel alloys.
EN ISO 9606-5,	Approval testing of welders – Fusion welding – Part 5: Titanium and titanium alloys, zirconium and zirconium alloys.
NORSOK M-001,	Materials selection.
NS 477,	Rules for approval of welding inspectors.
PED,	EC Pressure Equipment Directive, 97/23/EC,

2.2 Informative references

EN 288 (all parts),	Specification and approval of welding procedures for metallic materials
EN ISO 15607,	Specification and qualification of welding procedures for metallic materials – General rules.
ISO/TR 15608,	Welding – Guidelines for a metallic materials grouping system.
EN ISO 15609 (all parts),	Specification and qualification of welding procedures for metallic materials – (all parts).
EN ISO 15610,	Specification and qualification of welding procedures for metallic materials – Qualification based on tested welding consumables.
EN ISO 15611,	Specification and qualification of welding procedures for metallic materials – Qualification based on previous welding experience.
EN ISO 15612,	Specification and qualification of welding procedures for metallic materials – Qualification by adoption of a standard welding procedure.
EN ISO 15613,	Specification and qualification of welding procedures for metallic materials – Qualification based on pre-production welding test.
EN ISO 15614 (all parts),	Specification and qualification of welding procedures for metallic materials – (all parts).
NORSOK L-001,	Piping and valves.

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this NORSOK standard, the following terms, definitions and abbreviations apply.

3.1.1

shall

verbal form used to indicate requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted, unless accepted by all involved parties

3.1.2

should

verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required

3.1.3

may

verbal form used to indicate a course of action permissible within the limits of the standard

3.1.4

can

verbal form used for statements of possibility and capability, whether material, physical or casual.

3.1.5

carbon steel type 235

carbon steel with SMYS $\geq$ 220 MPa and not impact tested

3.1.6

carbon steel type 235LT

carbon steel with SMYS $\geq$ 220 MPa and impact tested at - 46 °C

3.1.7

carbon steel type 360LT

carbon steel with SMYS $\geq$ 350 MPa and impact tested at - 46 °C

3.1.8

3.5 Ni steel

low alloyed steel containing 3,5 % Ni