



SLOVENSKI STANDARD
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Specification and approval of welding procedures for metallic materials - Part 9: Welding procedure test for pipeline welding on land and offshore site butt welding of transmission pipelines

iTeh STANDARD PREVIEW

Anforderung und Anerkennung von Schweißverfahren für metallische Werkstoffe - Teil 9: Schweißverfahrensprüfung für baustellengeschweißte Stumpfnähte von Versorgungsrohrleitungen an Land und Offshore

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Descriptif et qualification d'un mode opératoire de soudage pour les matériaux métalliques - Partie 9: Epreuve de qualification d'un mode opératoire de soudage pour le soudage bout a bout de canalisations de transport sur site, sur terre et en mer

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EN 288-9

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Specification and approval of welding procedures for metallic materials - Part 9: Welding procedure test for pipeline welding on land and offshore site butt welding of transmission pipelines

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This European Standard was approved by CEN on 3 March 1999.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
 COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 121 "Welding", the secretariat of which is held by DS.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 1999, and conflicting national standards shall be withdrawn at the latest by September 1999.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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Introduction

All new welding procedure approvals are in accordance with this standard from the date of its issue.

However, this standard does not invalidate previous welding procedure approvals made to former national standards or specification, providing the intent of the technical requirements is satisfied and the previous procedure approvals are relevant to the application and production work on which they are employed.

Also, where additional tests are carried out to make the welding procedure approval technically equivalent, the additional tests are made on a test piece which should be made in accordance with this standard.

Consideration of previous procedure approvals to former national standards or specifications should be made at the time of the enquiry or contract stage and agreed between the contracting parties.

1 Scope

This standard specifies how a welding procedure specification is approved by welding procedure tests for on land and offshore site butt welding of transmission pipelines under normal atmospheric conditions.

Tests are carried out in accordance with this standard unless additional tests (e.g. CTOD tests and all weld metal tensile tests) are specified by the relevant application standard or contract when these apply.

This standard defines the conditions for the execution of welding procedure approval tests and the limits of validity of an approved welding procedure for all practical welding operations within the range of variables listed in clause 8.

It applies to the arc welding of steels of groups 1, 2 and 3 according to CR 12187. The principles of this standard can be applied to other fusion welding processes subject to agreement between the contracting parties.

The requirements for welding procedure specification and qualification for hyperbaric and "wet" welding are not covered by this supplementary standard.

Arc welding is covered by the following processes in accordance with EN 24063 :

- 111 - metal-arc welding with covered electrode ;
- 114 - flux-cored wire metal-arc welding without gas shield ;
- 121 - submerged arc welding with wire electrode ;
- 131 - metal-arc inert gas welding, MIG - welding ;
- 135 - metal-arc active gas welding, MAG-welding ;
- 136 - flux-cored wire metal-arc welding with active gas shield ;

141 - tungsten inert gas arc welding, TIG-welding.

Other fusion welding processes by agreement e.g. metal cored wire arc welding.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies .

EN 288-1	Specification and approval of welding procedures for metallic materials - Part 1: General rules for fusion welding
EN 288-2	Specification and approval of welding procedures for metallic materials - Part 2 : Welding procedure specification for arc welding
EN 439	Welding consumables - Shielding gases for arc welding and cutting
EN 760	Welding consumables - Fluxes for submerged arc welding - Classification
EN 875	Destructive tests on welds in metallic materials - Impact tests - Test specimen location, notch orientation and examination
EN 895	Destructive tests on welds in metallic materials - Transverse tensile test
EN 970	Non-destructive examination of welds - Visual examination
EN 1043-1	Destructive test on weld in metallic materials - Hardness testing - Part 1 : Hardness test on arc welded joints
EN 1290	Non-destructive examination of welds - Magnetic particle examination of welds
EN 1321	Destructive test on welds in metallic materials - Macroscopic and microscopic examination of welds
EN 1435	Non-destructive examination of welds - Radiographic examination of welded joints
EN 1714	Non destructive examination of welds - Ultrasonic examination of welded joints
EN ISO 6947	Welds - Working positions - Definitions of angles of slope and rotation (ISO 6947:1993)
EN 10045-1	Metallic materials - Charpy impact test - Part 1 : Test method
EN 24063	Welding, brazing, soldering and braze welding of metals - Nomenclature of processes and reference numbers for symbolic representation on drawings (ISO 4063:1990)

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EN ISO 6520-1:1998 Welding and applied processes - Classification of geometric imperfections in metallic materials - Part 1: Fusion welding (ISO 6520-1:1998)
CR 12187 Welding - Guidelines for a grouping system of materials for welding purposes

3 Definitions

For the purposes of this standard, the definitions listed below and in EN 288-1 apply.

3.1 repair

Any operation which involves welding to rectify the weld, outside the normal welding cycle.

3.2 full penetration repair

A welded repair through the whole thickness of the qualification joint.

3.3 internal repair

A welded repair carried out from the inside surface or the root side of a weld, after excavation and reparation, using either a single or a multi-pass weld deposition sequence.

3.4 make

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Make is the specific trade or brand name of the consumable, but not its designation.

4 Preliminary welding procedure specification (pWPS)

The preliminary welding procedure specification shall be prepared in accordance with EN 288-2. It shall specify the range for all relevant parameters including the following additional items :

- steel grade and supply conditions (N, TM, QT steels) ;
- number and location of welders ;
- time laps between start of root pass and start of hot pass ;
- partially completed joint : number of runs before the joint is permitted to cool to ambient temperature ;
- type of line up clamp ;
- time of clamp removal ;
- number of runs completed before lowering off or barge move up ;

- preheating method ;
- method to control cooling.

5 Welding procedure test

The making and testing of test pieces representing the type of welding used in production shall be carried out in accordance with clause 6 and 7 of this standard.

When a welding procedure is to be qualified and approved for pipe-reeling, the proposed welding procedures shall include relevant previously documented strain ageing data and/or any additional tests specified.

NOTE : These tests can include representative strain cycles and accelerated ageing typically for 1 h at 100° C.

Where data regarding pipe material performance/weldability exist, these data shall be considered when selecting suitable welding parameters and conditions for incorporating into the pWPS. Where such data do not exist it can be necessary to carry out preliminary welding trials to establish these data.

The welder who undertakes the welding procedure test satisfactorily in accordance with this standard can be approved, by agreement between the contracting parties, for welding on site within the ranges covered by the approved welding procedure specification.

6 Test piece

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6.1 General

The welded assembly to which the welding procedure will relate in production shall be represented by making a standardized test piece or pieces, as specified in 6.2.

6.2 Shape and dimensions of test pieces

Test welds shall be made between whole pipe lengths (if agreed between the contracting parties the length could be reduced to a minimum of one diameter) under simulated site conditions (this may include the application of installation strains). Welding shall follow the pWPS, with removal of line-up clamps, lowering off, partial completion and recommencement where applicable.

6.3 Welding of test pieces

Preparation and welding of test pieces shall be carried out in accordance with the pWPS, and under the general conditions of production welding which they shall represent. Welding positions and limitations for the angle of slope and rotation of test piece shall be in accordance with EN ISO 6947 (see also 8.4.2.).

If tack welds are to be fused into the final joint they shall be included in the test piece.

Welding and testing of the test pieces shall be witnessed by an examiner or examining body.

7 Examination and testing

7.1 Extent of testing

The testing includes both non-destructive examination (NDE) and destructive testing which shall be carried out in accordance with the requirements of table 1.

When Charpy impact tests are specified for welds exceeding 20 mm thick, they are required at two different thickness locations (see 7.4.3).

Repairs outside essential variables need full approval in accordance with annex A.

Table 1 : Examination and testing of the test pieces

Test piece	Type of test	Extent of testing	Note
Butt-weld	Visual examination (EN 970)	100 %	-
	Radiographic examination (EN 1435) or Ultrasonic examination (EN 1714)	100 %	-
	Surface crack detection	100 %	1
	Transverse tensile test (EN 895)	2 test specimens	-
	Impact test (EN 875)	2 or 4 sets	2
	Hardness test (EN 1043-1)	required	3
	Macro-examination (EN 1321)	1 test specimen	-
<p>NOTE 1 : Magnetic particle examination according to EN 1290.</p> <p>NOTE 2 : 1 set in the weld metal and 1 set in the HAZ at each location. See also 7.4.3.</p> <p>NOTE 3 : Not required for parent metals in ferritic steels with $R_m \leq 430 \text{ N/mm}^2$ ($R_e \leq 275 \text{ N/mm}^2$).</p>			

7.2 Location and cutting of test specimens

The location of test specimens shall be in accordance with figures 1 and 2.

Test specimens shall be taken after non-destructive examination (NDE) has shown satisfactory results. It is permitted to take the test specimens from locations avoiding areas showing acceptable imperfections.

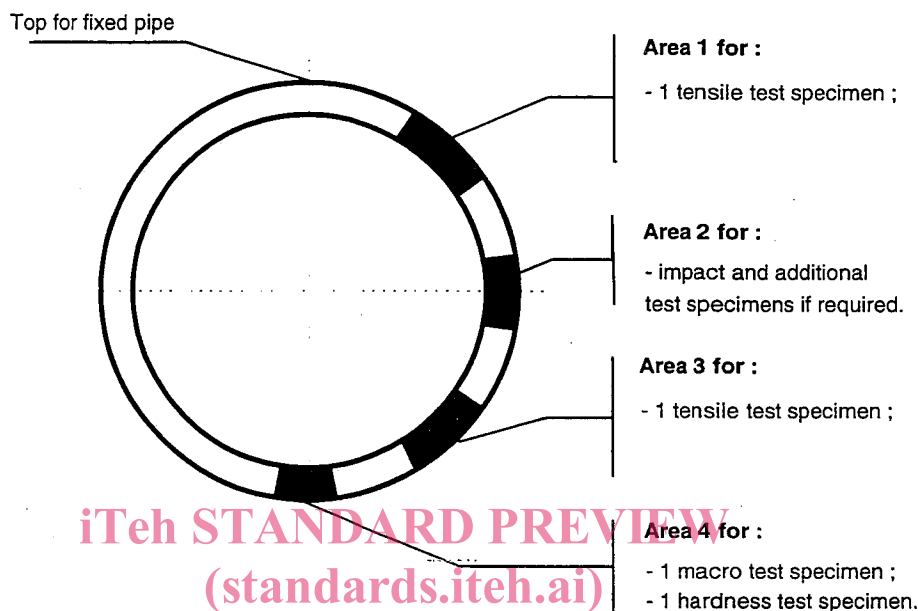


Figure 1 : Location of test specimens for a butt weld in pipe - Upwards welding

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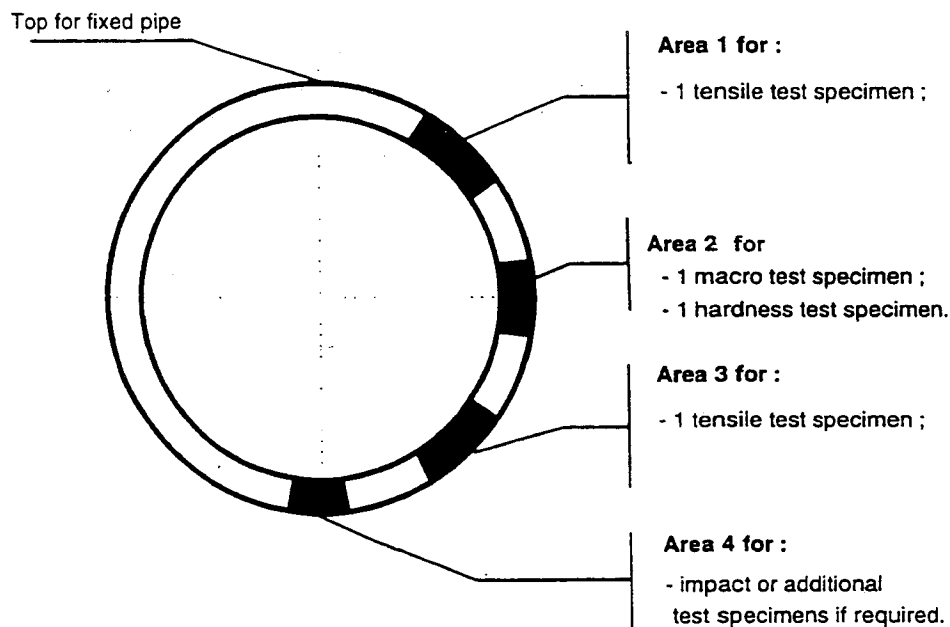


Figure 2 : Location of test specimens for a butt weld in pipe - Downwards welding

7.3 Non-destructive examination

7.3.1 Method

After any required post-weld heat treatment and prior to the cutting of test specimens, all test pieces shall be examined visually and non-destructively in accordance with 7.1.

For non-post-weld heat treated test pieces, account should be taken of the materials susceptibility to hydrogen induced cracking and consequently the NDE should be delayed. The NDE delay shall be 24 h, unless agreed by the contracting parties or by the relevant application standard.

7.3.2 Acceptance levels

A welding procedure is approved if the imperfections in the test piece are within the specified limits given in table 2 :

Table 2 : Limits for imperfections

Imperfection designation	EN ISO 6520-1:1998 reference	Limits for imperfections
Cracks	100	Not permitted
Gas pore Uniformly distributed porosity Linear porosity Elongated cavity Surface pore	2011 2012 2014 2016 2017	Individual gas pores or uniformly distributed porosity shall be unacceptable when any of the following conditions exists : a) the size of an individual pore exceeds 3 mm ; b) the size of an individual pore exceeds 25 % of the thinner of the nominal wall thickness joined ; c) the total area, when projected radially through the weld shall not exceed 2 % of the projected weld area in the radiograph, consisting of the length of the weld affected by the porosity, with a minimum length of 150 mm multiplied by the maximum width of the weld.
Localized (clustered) porosity	2013	- Clustered porosity that occurs in any pass except the finish pass shall comply with the criteria of gas pores. - Clustered porosity that occurs in the finish pass shall be unacceptable when any of the following conditions exists : a) the diameter of the clustered porosity exceeds 13 mm; b) the aggregate length of clustered porosity in any continuous 300 mm length of weld exceeds 13 mm ; c) an individual pore within a clustered porosity exceeds 2 mm in size.