SLOVENSKI STANDARD
SIST EN 10246-11:2000

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Neporušitveno preskušanje jeklenih cevi - 11. del: Ugotavljanje površinskih nepravilnosti nevarjenih in varjenih jeklenih cevi s tekočimi penetranti

Non-destructive testing of steel tubes - Part 11: Liquid penetrant testing of seamless and welded steel tubes for the detection of surface imperfections

Zerstörungsfreie Prüfung von Stahlrohren - Teil 11: Eindringprüfung nahtloser und geschweißter Stahlrohre zum Nachweis von Oberflächenfehlern

Essais non destructifs sur des tubes en acier - Partie 11: Contrôle par ressuage des tubes en acier sans soudure et soudés pour la détection d'imperfections de surface

Ta slovenski standard je istoveten z: **EN 10246-11:2000**

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This European Standard was approved by CEN on 25 December 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
EUROPÄISCHES KOMITEE FÜR NORMUNG

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FOREWORD

This European Standard has been prepared by Technical Committee ECISS/TC 29, Steel tubes and fittings for steel tubes, the Secretariat of which is held by UNI.

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of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

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.

1 SCOPE

This part of EN 10246 specifies requirements and acceptance levels for liquid penetrant testing of seamless and welded tubes for the detection of surface imperfections.

This part of EN 10246 is applicable to all the tube surface.

European Standard EN 10246, Non-destructive testing of steel tubes, comprises the parts shown in Annex A.

2 NORMATIVE REFERENCES

This part of EN 10246 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 those publications apply to this part of EN 10246 only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 571-1	Non-destructive testing - Penetrant testing - Part 1: General principles
prEN ISO 3059:1999	Non-destructive testing - Penetrant testing and magnetic particle testing – Viewing conditions (ISO/FDIS 3059:1999)
ISO 3453	Non-destructive testing - Liquid penetrant inspection - Means of verification

3 GENERAL REQUIREMENTS

3.1 The liquid penetrant testing covered by this part of EN 10246 is usually carried out on tubes after completion of all the primary production process operations.

3.2 The surface of the tube to be tested shall be sufficiently clean and free from oil, grease, sand or scale or any other foreign matter that would interfere with the correct interpretation of the indications obtained from liquid penetrant testing.

NOTE: The type of indications, as well as the minimum dimension of the surface imperfections to be detected, depend on the specific tube manufacturing process and the surface finish.

4 METHOD OF TEST

4.1 A liquid penetrant is applied to the surface to be examined and allowed to enter the surface imperfections. All excess penetrant is then removed, the surface of the part is dried and a developer is applied. The developer functions both as a blotter to absorb penetrant that has been trapped in imperfections, and as a contrasting background to enhance the visibility of penetrant indications. The dyestuffs in penetrants are either colour-contrast (visible under white light) or fluorescent (visible under ultraviolet light).

For both penetrant techniques, the following three types of penetrant systems can be used:

- water washable;
- postemulsifying;
- solvent removable.

Where the term 'penetrant materials' is used in this part of EN 10246, it is intended to include all penetrants, solvents or cleaning agents and developers used in the testing process.

The liquid penetrant method is an effective means for detecting imperfections which are open to the surface (called surface imperfections in this part of EN 10246). Typical surface imperfections detectable by this method are cracks, seams, laps, cold shuts, laminations and porosity.

The liquid penetrant method does not make it possible to determine the nature, shape and, more particularly, the dimensions of the surface imperfections revealed. The dimensions of the penetrant indication do not directly represent the actual dimensions of the surface imperfection causing this indication.

4.2 The classification of liquid penetrant indications shall be as follows:

a) linear indications in which the length is equal to or more than three times the width;

b) rounded indications which are circular or elliptical and in which the length is less than three times the width;

c) accumulated indications which are linear or non-linear and aligned or clustered, arranged with a distance between them of not more than their own size, and consisting of at least three indications;

d) non-relevant indications which are similar to indications that may occur from localized surface irregularities due to machining marks, scratches or other surface conditions.

4.3 For each tube or each part of a tube to be tested, either a colour-contrast penetrant technique or a fluorescent penetrant technique, in conjunction with one of the three types of penetrant systems, shall be used.

The general principles and methods of verification of liquid penetrant testing and its application are described in EN 571-1, prEN ISO 3059:1999 and ISO 3453 (see also 4.4).

4.4 The liquid penetrant testing shall be carried out in the following steps:

a) For the choice of the penetrant system, the tube surface condition and the acceptance levels shall be taken into account.

b) The penetrant materials to be applied shall be sufficiently free from halogens (chlorine/fluorine) and sulphur as to be non-harmful to the tube under test.

c) The temperature of application shall be between 10 °C and 50 °C. When it is not practical to carry out the test within the given temperature range, the testing procedure shall be qualified at the proposed temperature using the liquid penetrant reference block (e.g. a quench-cracked aluminium block).

d) The penetrant should be applied by brushing or spraying. Dipping or flooding is less effective but not prohibited.

e) The penetration time shall not be less than that recommended by the manufacturer of the penetrant system; usually it is between 5 min and 30 min.

f) The removal of excess water-washable or post-emulsified penetrant shall be performed with rinsing by water under UV(A) radiation, where appropriate, at a pressure around 200 kPa (2 bar) with a maximum of 350 kPa (3,5 bar). The temperature of the water shall be less than 40 °C. The UV(A) radiation intensity must be at least 8 W/m^2 and the light level of the background less than 150 lx. The removal of excess water washable or post-emulsified penetrant may be performed in so far as possible by using wipes of clean, lint-free material until most traces of the penetrant have been removed. Then the surface shall be lightly wiped with a lint-free material that has been slightly moistened with solvent until all remaining traces of surface excess penetrant have been removed. Flushing the surface with solvent following the application of the penetrant and prior to developing is prohibited.

g) Drying of the surface subsequent to washing with water can be assisted by using wipes of clean and dry lint-free material or by using a hot-air blast at a pressure below 200 kPa (2 bar) and a temperature below 70 °C. Drying after the solvent-removal process is generally by normal evaporation, therefore no other drying techniques are necessary.

NOTE: The temperature of the tubes should not exceed 50 °C unless otherwise agreed between the purchaser and manufacturer

h) The wet developer shall be applied by spraying in such a manner as to assure complete coverage of the area to be tested with a thin, even film of the developer. The dry-powder developer shall be applied either by:

- dipping the tube, or parts of the tube to be tested, into a fluid bed of dry developer;
- dusting the tube, or parts of the tube to be tested, with a dry-powder developer through a manual powder bulb ensuring that the powder is dusted evenly over the entire surface to be tested;
- spraying the tube, or parts of the tube to be tested, with a powder gun (conventional or electrostatic) ensuring that the powder is sprayed evenly over the entire surface to be tested.

i) The development time begins as soon as the wet-developer coating is dry or immediately after the application of the dry-powder developer. Generally, the development time is equal to the penetration time and varies between 5 min and 30 min. If the bleedout does not alter the inspection results, development periods of more than 30 min are permitted.

j) The inspection of the areas to be tested shall be performed after the applicable development time as specified in 4.4.i, to assure proper bleedout of penetrant from the imperfections onto the developer coating. It is good practice to observe the surface while applying the developer as an aid to evaluating indications. For fluorescent penetrant indications, the inspection shall be carried out in a darkened area using a UV(A) radiation source with a background of light level not exceeding 20 lx and a black light intensity of at least 10 W/m^2 on the surface of the area to be inspected. For visible penetrant indications, the illumination of the surface of the area to be inspected shall not be less than 350 lx (see note).

NOTE: As a guide, this level of illumination would be achieved by using either a fluorescent tube of 80 W at a distance of 0,7 m or a tungsten filament lamp of 100 W at a distance of 0,6 m.

5 ACCEPTANCE LEVELS

5.1 Four acceptance levels corresponding to four severity levels with the maximum number and/or the maximum permissible dimensions (diameter or length) have been established in accordance with tables 1 and 2.

Table 1: Testing of tube surface - Permissible number and dimension of indications within a frame aperture of 100 mm x 150 mm

Acceptance level	Specified wall thickness	Type of indications					
		Rounded		Linear		Accumulated	
	T (mm)	Number max.	Diameter max. (mm)	Number max.	Length max. (mm)	Number max.	Cumulative length max. (mm)
P 1	$T \leq 16$	5	3,0	3	1,5	1	4,0
	$16 < T \leq 50$	5	3,0	3	3,0	1	6,0
	$T > 50$	5	3,0	3	5,0	1	10,0
P2	$T \leq 16$	8	4,0	4	3,0	1	6,0
	$16 < T \leq 50$	8	4,0	4	6,0	1	12,0
	$T > 50$	8	4,0	4	10,0	1	20,0
P 3	$T \leq 16$	10	6,0	5	6,0	1	10,0
	$16 < T \leq 50$	10	6,0	5	9,0	1	18
	$T > 50$	10	6,0	5	15,0	1	30,0
P4	$T \leq 16$	12	10,0	6	10,0	1	18,0
	$16 < T \leq 50$	12	10,0	6	18,0	1	27,0
	$T > 50$	12	10,0	6	30,0	1	45