



SLOVENSKI STANDARD
SIST EN 13445-5:2002/A3:2006
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Unfired pressure vessels - Part 5: Inspection and testing

Unbefeuerte Druckbehälter - Teil 5: Inspektion und Prüfung

Réipients sous pression non soumis a la flamme - Partie 5: Inspection et contrôles

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Ta slovenski standard je istoveten z: **EN 13445-5:2002/A3:2006**

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English Version

Unfired pressure vessels - Part 5: Inspection and testing

Réipients sous pression non soumis à la flamme - Partie
5: Inspection et contrôles

Unbefeuerte Druckbehälter - Teil 5: Inspektion und Prüfung

This amendment A3 modifies the European Standard EN 13445-5:2002; it was approved by CEN on 28 November 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This amendment 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.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This European Standard (EN 13445-5:2002/A3:2006) has been prepared by Technical Committee CEN/TC 54 “Unfired pressure vessels”, the secretariat of which is held by BSI.

This Amendment to the European Standard EN 13445-5:2002 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2006, and conflicting national standards shall be withdrawn at the latest by November 2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

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

This amendment is based on EN 13445-5:2002 up to Issue 16 (October 2005).

The document includes the text of the amendment itself. The corrected pages of EN 13445-5 will be delivered as issue 20 of the standard.

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2 Normative references

Insert:

EN ISO 4063:2000, *Welding and allied processes – Nomenclature of processes and reference numbers (ISO 4063:1998)*

Replace 6.6.2 by the following text:

6.6.2 Determination of extent of non-destructive testing

6.6.2.1 General

As a general rule, the extent of non-destructive testing, given as a percentage value, shall be in accordance with Table 6.6.2-1 which only covers the processes listed in EN 13445-4. This percentage value reflects the extent of non-destructive testing of the total length of the welded joint and takes into consideration the testing group and type of weld.

6.6.2.2 Welded joints covered by Table 6.6.2-1

Table 6.6.2-1 is designed for steel for:

- multilayer welds welded as single or double side welds;
- single run one side circumferential welds;
- performed with consumables;
- produced by the following typical processes: Manual Metal Arc (MMA) 111, Submerged Arc (SAW) 121, Metal Active Gas (MAG) 135, Metal Inert Gas (MIG) 131, Tungsten Inert Gas (TIG) 141, Plasma MIG welding 151.

6.6.2.3 Other welded joints

6.6.2.3.1 General

Special problems arising from elements such as those described below are not covered in Table 6.6.2-1 and shall be considered for all butt-welded joints especially for longitudinal/governing joints:

- single run one side governing welds;
- joints between dissimilar materials or dissimilar consumables.

6.6.2.3.2 Single run one side governing welds

For single run governing welds made from one side, the thickness shall be limited to 10 mm. It is also noted that these vessels are limited to non cyclic duty i.e. 500 full pressure cycles. For volumetric NDT of single runs, one of the two options below shall be used:

- a) NDT extent shall be as prescribed in Table 6.6.2-1 conditional upon a hydrotest at a higher test pressure performed as specified in paragraph 10.2.3.3.1, Table 10.2.3.3-1 with control of peaking and excess weld.

- b) NDT extent prescribed in Table 6.6.2-1 shall be multiplied by 2 without exceeding 100 % but not less than 25 % for longitudinal and 10 % for circumferential. When there is a change which could influence the performance of the welding process (e.g. before changing the copper bar or the gas, after changing the wire or the powder and production test specimens, before changing the copper bar or gas and after changing wire) additional NDT shall be performed at the start of those seams.

For both a) and b), welding shall require qualification with welding procedure test, as requested in EN 13445-4, on the actual nominal thickness of the weld joint that is welded by the single run from one side. The range of qualification shall be restricted to $0,8 \cdot t$ to t , where t is the actual nominal thickness of the test coupon.

For all thicknesses, X-Ray in the direction of the weld preparation shall be used.

6.6.2.3.3 Non destructive testing of joints between dissimilar materials or dissimilar consumables

NDT on these joints must be performed to a specific written procedure with additional attention to interpretation of the results.

6.6.2.4 Testing group 2

For testing group 2, the reduction in percentage of NDT given in Table 6.6.2-1 is given by the two figures (e.g. 100 % - 10 %). The first value refers to the initial extent of NDT required until sufficient satisfactory experience (See 6.6.1.1.4) is established when the second lower value applies.

6.6.2.5 When less than 100 % NDT is required by the selected testing group in Table 6.6.1-1

In case of less than 100 % required testing, the extent and location of non-destructive testing shall be determined by the following criteria. The joints selected shall be representative of all welding on the pressure vessel.

- a) For shells, formed heads, communicating chambers and jackets
- 1) non-destructive testing shall be performed at all intersections of longitudinal and circumferential butt joints. The minimum tested length shall be 200 mm. Where the inclusion of all intersections exceeds the percentage in Table 6.6.2-1 then this higher value will apply;
 - 2) if necessary to attain the percentage required in Table 6.6.2-1, additional randomly selected locations on the butt welded joint shall be subject to non-destructive testing;
 - 3) if an opening intersects or is within a distance less than 12 mm of a main weld (longitudinal or circumferential), then the main weld shall be examined for a length of not less than the diameter of the opening on each side of the opening. These shall be included as an addition to the percentage in Table 6.6.2-1, if applicable.
- b) Nozzles and branches attached to the vessel (butt welds).

To determine the extent of non-destructive testing, the total number of nozzles and branches which have full penetration butt welds shall be grouped as follows:

- 1) for 100 % non-destructive testing: the size of the group is 1 (i.e. every individual nozzle and branch) ;
- 2) for 25 % non-destructive testing: the size group size is 4 (i.e. at least one complete nozzle or branch for each group of 4) ;
- 3) for 10 % non-destructive testing: the size of the group is 10 (i.e. at least one complete nozzle or branch for each group of 10).

Thereafter, the complete circumferential and longitudinal butt joints of at least one nozzle or branch in each group or partial group shall be tested. When the inclusion of the number of complete circumferential and longitudinal butt welds or nozzles exceeds the percentage in Table 6.6.2-1, then the higher value will apply.

10 Final assessment

In clause 10.2.3.3.1 add after the first sentence:

Special provisions are given in d) for single run governing welds, e) for vessels designed in part or totality by experimental methods B and C, f) for vessels working in part or totality in the creep range.

Replace d) by:

d) For vessels with single run governing welds inspected according to 6.6.2.3.2 a), the proof test pressure shall be as follows:

$$P_t = f_k \cdot P_s \cdot \frac{f_a}{f_t} \quad (10.2.3.3.1-5)$$

where

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P_t is the test pressure

P_s is the maximum allowable pressure [SIST EN 13445-5:2002/A3:2006](https://standards.iteh.ai/catalog/standards/sist/6b44158f-9483-4db5-a6b9-311764db2c9e/sist-en-13445-5-2002-a3-2006)

f_a is the nominal design stress for normal operating load cases at test temperature

f_t is the nominal design stress for normal operating load cases at the maximum allowable temperature

The values of f_k are given by Table 10.2.3.3.1-1.

Table 10.2.3.3.1-1 — Value of f_k

Actual thickness of the shell e	f_k	Corrosion allowance C	maximum shape deviations h : peaking (measured after test) e_w : excess weld
$e \leq 4$ mm	2,1	$c \geq 1$ mm	$h + 0,5 \cdot e_w \leq 0,75 \cdot e_{\min}$
		$c < 1$ mm	$h \leq 0,5 \cdot e_{\min}$ $e_w \leq 0,75 \cdot e_{\min}$
$e \leq 4$ mm	2,0	$c \geq 1$ mm	$h + 0,5 \cdot e_w \leq 0,5 \cdot e_{\min}$
	2,1	$c < 1$ mm	$h \leq 0,5 \cdot e_{\min}$ $e_w \leq 0,5 \cdot e_{\min}$
$4 < e \leq 5$ mm	1,9	$c \geq 1$ mm	$h + 0,5 \cdot e_w \leq 0,5 \cdot e_{\min}$
	2,1	$c < 1$ mm	$h \leq \frac{1}{3} \cdot e_{\min}$ $e_w \leq 0,25 \cdot e_{\min}$
$5 < e \leq 7$ mm	1,8	$c \geq 1$ mm	$h < \frac{1}{4} \cdot e_{\min}$
	2,0	$c < 1$ mm	$e_w < 50\%$ of allowed value given in Table 6.6.3-1
$7 < e \leq 10$ mm	1,7	$c \geq 1$ mm	$h < \frac{1}{6} \cdot e_{\min}$
	1,9	$c < 1$ mm	$e_w < 50\%$ of allowed value given in Table 6.6.3-1

In Table 10.2.3.3.1-1:

e_{\min} is the minimum possible fabrication thickness, as defined in EN 13445-3

h is the peaking after test, measured as defined in EN 13445-4

e_w is the excess weld, as illustrated by h in number 1.9 of EN ISO 5817:2003