



**SLOVENSKI STANDARD**  
**SIST EN 13445-2:2009/oprA1:2011**  
**01-marec-2011**

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**Neogrevane tlačne posode - 2. del: Materiali - Dopolnilo A1**

Unfired pressure vessels - Part 2: Materials

Unbefeuerte Druckbehälter - Teil 2: Werkstoffe

Recipients sous pression non soumis à la flamme - Partie 2: Matériaux

**Ta slovenski standard je istoveten z: EN 13445-2:2009/prA1**

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**ICS:**

23.020.30	Tlačne posode, plinske jeklenke	Pressure vessels, gas cylinders
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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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November 2010

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ICS 23.020.30

English Version

## Unfired pressure vessels - Part 2: Materials

Recipients sous pression non soumis à la flamme - Partie  
2: Matériaux

Unbefeuerte Druckbehälter - Teil 2: Werkstoffe

This draft amendment is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 54.

This draft amendment A1, if approved, will modify the European Standard EN 13445-2:2009. If this draft becomes an amendment, 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.

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

**Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## Foreword

This document (EN 13445-2:2009/prA1:2010) has been prepared by Technical Committee CEN/TC 54 “Unfired pressure vessels”, the secretariat of which is held by BSI.

This document is currently submitted to the CEN Enquiry.

This document includes the text of the amendment itself. The corrected pages of EN 13445-2 will be delivered as issue xx of the standard.

## EN 13445-2:2009/prA1:2010 (E)

Replace tables B.2-2 and B.2-3 in chapter B 2.2.2 with the following revised tables:

Table B.2–2 — General requirements for prevention of brittle fracture with reference thickness for plates and strips

Plates and Strips									
No. as per Table D.2-1	European Standard	Grade	Material No.	Max. reference thickness		Design reference temperature $T_R$ (°C)	Material group to CR ISO 15608:2000	Remarks	
				AW	$e_B$ PWHT				
1	EN 10028-2:2003	P235GH	1.0345	35	200	- 20	1.1		
2		P265GH	1.0425	35	200				
3		P295GH	1.0481	35	110		1.2		
4		P355GH	1.0473	35	70				
29	EN 10028-3:2003	P275NH	1.0487	35	200	- 20	1.1		
30		P275NL1	1.0488	35	200	- 40			
31		P275NL2	1.1104	35	200	- 50			
32		P355N	1.0562	35	70	- 20	1.2		
33		P355NH	1.0565	35	70	- 20			
34		P355NL1	1.0566	35	70	- 40			
35		P355NL2	1.1106	35	70	- 50			
39	EN 10028-4:2003	11MnNi5-3	1.6212	35	50	- 60	9.1		
40		13MnNi6-3	1.6217	35	50	- 60			
41		15NiMn6	1.6228	35	50	- 80			
50	EN 10028-5:2003	P355M	1.8821	35	-	- 20	1.2	a)	
51		P355ML1	1.8832	35	-	- 40			a)
52		P355ML2	1.8833	35	-	- 50			a)
53		P420M	1.8824	35	-	- 20	2.1	a)	
54		P420ML1	1.8835	32	-	- 40			a)
55		P420ML2	1.8828	32	-	- 50			a)
59	EN 10028-6:2003	P355Q	1.8866	35	70	- 20	1.2		
60		P355QH	1.8867	35	70	- 20			
61		P355QL1	1.8868	35	70	- 40			
62		P355QL2	1.8869	35	70	- 60	3.1		

a) TMCP steels shall not be Post Weld Heat Treated

**Table B.2–3 — General requirements for prevention of brittle fracture with reference thickness for seamless and welded tubes**

Seamless and welded tubes								
No. as per Table D.2-1	European Standard	Grade	Material No.	Max. reference thickness		Design reference temperature $T_R$ (°C)	Material group to CR ISO 15608:2000	Remarks
				AW	$e_B$ PWHT			
231	EN 10216-3:2002	P275NL1	1.0488	35	40	– 40	1.1	a)
232		P275NL2	1.1104	35	40	– 50		a)
233		P355N	1.0562	35	40	– 20	1.2	a)
234		P355NH	1.0565	35	40	– 20		a)
235		P355NL1	1.0566	35	40	– 40		a)
236		P355NL2	1.1106	35	65	– 50		a)
248	EN 10216-4:2002	P215NL	1.0451	10	10	– 40	1.1	a)
249		P255QL	1.0452	35	40	– 40		a)
250		P265NL	1.0453	25	25	– 40		a)
251		26CrMo4-2	1.7219	15	40	– 60	5.1	a)
252		11MnNi5-3	1.6212	35	40	– 60	9.1	a)
253		13MnNi6-3	1.6217	35	40	– 60	9.1	a)
306	EN 10217-3:2002	P275NL1	1.0488	35	40	– 40	1.1	a)
307		P275NL2	1.1104	35	40	– 50		a)
308		P355N	1.0562	35	40	– 20	1.2	a)
309		P355NH	1.0565	35	40	– 20		a)
310		P355NL1	1.0566	35	40	– 40		a)
311		P355NL2	1.1106	35	40	– 50		a)
316	EN 10217-4:2002	P215NL	1.0451	10	10	– 40	1.1	a)
317		P265NL	1.0453	16	16	– 40	1.1	a)
321	EN 10217-6:2002	P215NL	1.0451	10	10	– 40	1.1	a)
322		P265NL	1.0453	25	25	– 40	1.1	a)

a) Thickness limitation results from wall thickness limitation in the European material standard and in the European component standards respectively.

**Add to chapter B2.2.2 Ferritic steels below Table B.2-2 the following sentence:**

If planned component thickness is higher than given in table B.2-2 alternative Charpy toughness requirements are provided in chapter B.2.3.1.

**Replace text in chapter B2.3.1 with the following text and tables:**

This method 2 applies to C, CMn, fine grain steels, Ni-alloyed steels with not more than 1,5 % of Ni-alloyed steels with not more than 1.5 % Ni with a specified minimum yield strength  $\leq 500$  MPa and austenitic-ferritic steels with a specified minimum yield strength  $\leq 550$  MPa. This method 2, based on fracture mechanics [16,32] can be used to determine the requirements to avoid brittle fracture in these steels, and may be used at a design reference temperature  $T_R$  which is lower than the value derived by method 1. In this procedure the design reference temperature  $T_R$  is not equal to the impact test temperature  $T_{KV}$ . The diagrams show the relationship between  $T_R$  and  $T_{KV}$  depending on reference thickness and strength level. Distinction is made for as-welded (AW) and post weld heat treated (PWHT) condition. This method does not apply to

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thermomechanically-rolled steels thicker than 35 mm. Two alternatives are provided in Tables B.2-13 and B.2-14 (Nomograms for reference thickness up to 35 mm in AW-condition and up to 110 mm in PWHT condition) and table B.2-15 (for reference thickness up to 200 mm).

For constructional details reference thickness  $e_B$  is defined in Table B.4-1.

Table B.2-13 and B.2-14 show which figure shall be used to determine the impact test temperature  $T_{KV}$  or the design reference temperature  $T_R$  up to the given thickness in the nomograms. The condition "non-welded" shall be treated as the condition PWHT. Parent material, welds and HAZ shall meet the impact energy  $KV$  at impact test temperature  $T_{KV}$ .

Table B.2-15 provides toughness requirements for products with thickness up to 200 mm in PWHT condition. The weld metal, the heat affected zone and other parts affected by manufacturing processes shall satisfy the same impact energy requirements as the guaranteed minimum properties for the base material at  $T_R$  given in the table.

NOTE Table B.2-15 complies with method 2 basic principles and allows the use of pressure components with reference thickness  $e_B$  up to 200 mm thickness, when Nomograms of Method 2 do not apply anymore. However the application of table B.2-14 for lower thicknesses than 110 mm is not restricted, but will result in higher toughness requirements as can be derived from Figures B.2-1 to B.2-7 or method 1.

Linear interpolation between strength and thickness levels given in the Figures B.2-1 to B.2-11 is allowed. Alternatively the next higher strength class or wall thickness can be used. Lower test temperatures than  $T_{KV}$  are admissible for the same requirements.

The temperature adjustment given in Table B.2-12 applies also to method 2. Extrapolations for temperature ranges beyond the temperature ranges as given in the nomograms are not permissible.



**Table B.2-13 — Impact energy requirements for C, CMn, fine grain steels, Ni-alloyed steels with less than 3,0 % Ni**

Specified minimum yield strength of base material	Required impact energy $KV$ (on 10 mm × 10 mm test pieces)	Figure defining required $T_{KV}$	
		Non welded or post-weld heat treated	As welded
MPa	J		
$R_e \leq 265$	27	B.2-1	B.2-2
$R_e \leq 355$	27	B.2-3	B.2-4
$R_e \leq 460$	40	B.2-5	B.2-6
$R_e \leq 500$	40	B.2-7	B.2-8

**Table B.2-14 — Impact energy requirements for austenitic-ferritic stainless steels**

Specified minimum yield strength of base material	Required impact energy $KV$ (on 10 mm x 10 mm test pieces)	Figure defining required $T_{KV}$ for all applications
N/mm <sup>2</sup>	J	
$R_e \leq 385$	40	B.2-9
$R_e \leq 465$	40	B.2-10
$R_e \leq 550$	40	B.2-11

**Table B.2-15 — Impact requirements for higher thickness**

Specified minimum yield strength of base material	Required Impact energy $KV$ (on 10x10 mm specimen) at $T_R$	max. thickness
MPa	J	mm
$R_e \leq 275$ MPa	27	200
$R_e \leq 355$ MPa	40	70 - 200
$R_e \leq 460$ MPa	60	65 - 200
$R_e \leq 500$ MPa	60	60 - 200