



SLOVENSKI STANDARD
SIST EN 1999-1-1:2007/A1:2009
01-november-2009

Evrokod 9: Projektiranje konstrukcij iz aluminijevih zlitin - 1-1. del: Splošna pravila za konstrukcije

Eurocode 9: Design of aluminium structures - Part 1-1: General structural rules

Eurocode 9: Bemessung und Konstruktion von Aluminiumtragwerken - Teil 1-1: Allgemeine Bemessungsregeln

Eurocode 9: Calcul des structures en aluminium - Partie 1-1: Règles générales

Ta slovenski standard je istoveten z: EN 1999-1-1:2007/A1:2009

ICS:

91.010.30	V [^] @ã}ããããã	Technical aspects
91.080.10	Kovinske konstrukcije	Metal structures

SIST EN 1999-1-1:2007/A1:2009 en,fr,de

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EUROPEAN STANDARD
NORME EUROPÉENNE
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ICS 91.010.30; 91.080.10

English Version

Eurocode 9: Design of aluminium structures - Part 1-1: General structural rules

Eurocode 9: Calcul des structures en aluminium - Partie 1-1: Règles générales

Eurocode 9: Bemessung und Konstruktion von Aluminiumtragwerken - Teil 1-1: Allgemeine Bemessungsregeln

This amendment A1 modifies the European Standard EN 1999-1-1:2007; it was approved by CEN on 12 March 2009.

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 CEN Management Centre 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 CEN Management Centre has the same status as the official versions.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

EN 1999-1-1:2007/A1:2009 (E)**1) Modifications in the entire document**

Replace 14 times "center" with "centre".

Replace all occurrences of the symbol " M_c " with " M_o ".

Replace all occurrences of the symbol " $M_{c,Rd}$ " with " $M_{o,Rd}$ ".

Replace in the entire document "prEN 1090-2" with "EN 1090-2" and "prEN 1090-3" with "EN 1090-3".

2) Modification to 1.1.1

Paragraph "(3)", delete footnote "5".

3) Modification to 1.1.2

Paragraph "(1)", replace "(see section 3)." with "(see section 3 and Annex C).".

4) Modification to 1.2.1

Delete footnote "6".

5) Modification to 1.2.2

Delete reference to "EN 1993-1-1".

6) Modifications to 1.2.3

Delete the following references:

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EN 573-1	EN 12020-1	EN 439	ISO 18273
EN 573-2	EN 12020-2	EN 970	ISO 1000
EN 573-3	ISO 8062	EN 1011-1	ISO 31-0
EN 573-4	EN 287-2	EN 1418	ISO 3898
EN 515	EN288-4	EN-ISO 10042	

Delete the heading of Subclause "1.2.3.1".

Replace heading numbers "1.2.3.2" to "1.2.3.4" with "1.2.3.1" to "1.2.3.3".

Replace all dated reference numbers with undated reference numbers (e.g. replace "EN 485-1:1993" with "EN 485-1"), except for "EN 755-2:1997" and "EN 1011-4:2000", as well as for "EN 755-2:1997" which is to be replaced with "EN 755-2:2008".

Replace "EN ISO 1302" with "prEN ISO 1302".

Move the following references to the Bibliography (undated): "EN 1592-1", "EN 1592-2", "EN 1592-3" and "EN 1592-4".

Title of "EN 12681", replace "inspection" with "examination".

Replace title of "EN 1011-4" with "Welding – Recommendations for welding of metallic materials – Part 4: Arc welding of aluminium and aluminium alloys."

7) Modifications to 1.6

Section "6.2 Resistance of cross sections", move the symbols " b_o " and " L_e " to Subclause "1.6" – section "Annex K".

Section "8 Design of connections", delete the symbol " γ_{Mc} " and its definition.

8) Modifications to 3.2.2

"Table 3.2b", add two rows to the table with characteristics for "Alloy EN-AW 5454" and "EN-AW 5754", as shown below (some figures shall be **bold** as shown):

"

Alloy EN-AW	Product form	Temper	Thick-ness t mm ¹⁾ 3)	f_o ¹⁾	f_u ¹⁾	A ^{5) 2)}	$f_{o,haz}$ ⁴⁾	$f_{u,haz}$ ⁴⁾	HAZ-factor ⁴⁾		BC ⁶⁾	n_p ⁷⁾
				N/mm ²		%	N/mm ²		$\rho_{o,haz}$	$\rho_{u,haz}$		
5454	ET, EP,ER/B	O/H111 F/H112	$t \leq 25$	85	200	16	85	200	1	1	B	5
5754	ET, EP,ER/B	O/H111 F/H112	$t \leq 25$	80	180	14	80	180	1	1	B	6
	DT	H14/ H24/H34	$t \leq 10$	180	240	4	100	180	0,56	0,75	B	16

"

and delete note 8.

"Table 3.2b", replace (some figures shall be **bold** as shown):

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"

6061	EP,ET,ER/B,DT	T4	$t < 25$	110	180	50	95	150	0,86	0,83	B	8
	EP,ET,ER/B,DT	T6	$t \leq 20$	240	260	8	115	175	0,48	0,67	A	55

"

with:

"

6061	EP,ET,ER/B	T4	$t < 25$	110	180	15	95	150	0,86	0,83	B	8
	DT		$t < 20$	110	205	16				0,73	B	8
	EP,ET,ER/B	T6	$t \leq 25$	240	260	8	115	175	0,48	0,67	A	55
	DT		$t < 20$	240	290	10				0,60	A	23

"

"Table 3.2b", for "alloy 6063", column 2, line 5, replace "." with "," to write:

"EP,ET,ER/B".

"Table 3.2b", footnote "3", replace "EN 755-2" with "EN 755-2:2008".

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"Table 3.2b", in footnote "4", second row, replace:

"(3xxx, 5xxx and 8011A)"

with:

"(3xxx and 5xxx)".

"Table 3.2b", for "alloy 6082", replace twice "EP/O,EP/H" with "EP".

9) Modification to 3.2.3.2

Paragraph "(1)", in text and note, replace three times "EN 1706" with "EN 1706:1998"; and replace "see 6.3.3(2) EN ...)" with "see 6.3.3.2 of EN ...)"; and replace "see 6.3.3(3) EN ...)" with "see 6.3.3.2 of EN ...)".

10) Modifications to 3.3.2.1

"Table 3.4", footnote "1" of the table, delete "and (5)".

"Table 3.4", footnote "2" of the table, delete "and (4)".

11) Modifications to 5.3.1

Paragraph "(1)P", note, replace "equal or less than the fundamental geometrical tolerances" with "in accordance with the essential tolerances".

Paragraph "(1)P", note, replace "-valued" with "-values".

12) Modifications to 5.3.2

Paragraph "(7)", "Figure 5.3", replace 4 times " $e_{0,d}$ " with " e_0 ".

Paragraph "(11)", equation "(5.6)", replace:

$$\eta_{\text{init}}(x) = e_{0,d} \frac{N_{\text{cr},m}}{EI_m |\eta_{\text{cr}}''|_{\text{max}}} \eta_{\text{cr}}(x)$$

with:

$$\eta_{\text{init}}(x) = e_0 \frac{N_{\text{cr},m}}{EI_m |\eta_{\text{cr},m}''|} \eta_{\text{cr}}(x)$$

Paragraph "(11)", formula "(5.7)", replace " $e_{0,d}$ " with " e_0 ".

Paragraph "(11)", replace:

"and m denotes the cross-section where $|\eta_{\text{cr}}''|$ reaches its maximum."

with:

"and m denotes the cross-section where $|\eta_{\text{cr}}''|$ reaches its maximum in the case of uniform normal force and uniform cross-section."

Paragraph "(11)", replace:

" $EI_m |\eta_{cr}''|_{\max}$ is the bending moment"

with:

" $EI_m |\eta_{cr,m}''|$ is the bending moment".

Paragraph "(11)", "Note 2", replace "The ratio $\frac{1}{EI_m |\eta_{cr}''|_{\max}}$ " with "The ratio $\frac{1}{EI_m |\eta_{cr,m}''|}$ ".

Paragraph "(11)", "Note 2", replace "may be replaced by $\frac{|\eta''|_{\max}}{M_{\eta_{cr,m}}'' |\eta_{cr}|_{\max}}$ " with "may be replaced by $\frac{|\eta''|_{\max}}{M_{\eta_{cr,m}}'' |\eta_{cr}|_{\max}}$ ", i.e. replace "I" with "II".

Paragraph "(11)", "Note 2", replace:

" $|\eta_{cr}|_{\max}$ is the maximum amplitude of..."

with:

" $|\eta_{cr}|_{\max}$ is the maximum value of the amplitude of..."

Paragraph "(11)", "Note 2", replace: [SIST EN 1999-1-1:2007/A1:2009](https://standards.iteh.ai/catalog/standards/sist/acc7a534-5fb8-4999-ac18-1d5ad35b5b4/sist-en-1999-1-1-2007-a1-2009)
<https://standards.iteh.ai/catalog/standards/sist/acc7a534-5fb8-4999-ac18-1d5ad35b5b4/sist-en-1999-1-1-2007-a1-2009>

" $|\eta''|_{\max}$ is the maximum deflection of the structure calculated using second order analysis for..."

with:

" $|\eta''|_{\max}$ is the maximum deflection of the structure calculated using second order analysis (symbolised by II) for..."

Paragraph "(11)", "Note 2", equation "(5.8)", replace:

$$M_{\eta_{\text{nit}}}''(x) = \frac{e_{0,d} N_{cr,m} |\eta''|_{\max}}{M_{\eta_{cr,m}}'' |\eta_{cr}|_{\max}} M_{\eta_{cr}}''(x)$$

with:

$$M_{\eta_{\text{nit}}}''(x) = \frac{e_{0,d} N_{cr,m} |\eta''|_{\max}}{M_{\eta_{cr,m}}'' |\eta_{cr}|_{\max}} M_{\eta_{cr}}''(x)$$

13) Modifications to 5.3.4

Paragraph "(2)", replace " $e_{0,d}$ " with " e_0 ".

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Paragraph "(3)", replace twice " $e_{0,d}$ " with " e_0 ".

14) Modification to 6.1.4.3

Paragraph "(3)", entry "e)", replace "6.1.4.3(1)a)" with "6.1.4.3(1)".

15) Modification to 6.1.6.2

Paragraph "(2)", replace " $f_{a, haz}$ " with " $f_{u, haz}$ ".

16) Modifications to 6.1.6.3

Paragraph "(5)", replace:

"6xxx or 7xxx series alloys, or 5xxx series..."

with:

"6xxx and 7xxx series alloys, and in 3xxx and 5xxx series..."

Paragraph "(6)", replace:

"or work-hardened 5xxx series..."

with:

"and work-hardened 3xxx and 5xxx series..."

Paragraph "(8)", replace:

"or work-hardened 5xxx series..."

with:

"and work-hardened 3xxx and 5xxx series...";

and replace:

"and work-hardened 5xxx series..."

with:

"and work-hardened 3xxx and 5xxx series..."

Paragraph "(8)", entry "a)", replace:

"If the interpass temperature T_1 (°C), which should be somewhere between 60 °C and 120 °C, it is conservative to assume that for 6xxx, 7xxx or workhardened 5xxx series alloys b_{haz} will be multiplied by a factor α_2 , as follows:"

with:

"If the interpass temperature T_1 (°C) is between 60 °C and 120 °C, it is conservative for 6xxx, 7xxx and work-hardened 3xxx and 5xxx alloys to multiply b_{haz} by a factor α_2 as follows:"

17) Modifications to 6.2.2.2

Replace the last subclause number "(0)" with "(5)".

Paragraph "(2)", delete "gross".

18) Modifications to 6.2.3

Move the last sentence of subclause "6.2.3" to the left (for alignment) and give it the number "(4)".

Paragraph "(3)", replace "see 6.3.1.5" with "see 8.5.2.3".

Paragraph "(1)", add the following "Note":

"Note Eccentricity due to the shift of centroidal axis of asymmetric welded sections may be neglected."

19) Modification to 6.2.4

Paragraph "(1)", add the following "Note":

"Note Eccentricity due to the shift of centroidal axis of asymmetric welded sections may be neglected."

20) Modification to 6.2.5

Paragraph "(1)", add the following "Note":

"Note Eccentricity due to the shift of centroidal axis of asymmetric welded sections may be neglected."

21) Modification to 6.2.5.1

Paragraph "(2)", last line replace " β_1/β_2 " with " β_1/β ".

22) Modifications to 6.2.8

In clauses between "(5)" and "(8)", replace "(2)" with "(6)"; then replace "(3)" with "(7)"; finally move clause "(6)" to the left (for alignment).

Paragraph "(6)", replace "see 6.7.6." with "see 6.2.5."

Paragraph "(8)", replace "see 6.7.8." with "see 6.7.6."

23) Modification to 6.2.9.3

Paragraph "(2)", replace "extend" with "extends".

24) Modification to 6.3.1.1

Paragraph "(2)", in the explanation for " κ ", replace "according to 6.3.3.3." with "according to 6.3.3.3. $\kappa = 1$ if there are no welds."

25) Modification to 6.3.1.2

Paragraph "(1)", in "(6.50)", replace " $\chi < 1,0$ " with " $\chi \leq 1,0$ ".

EN 1999-1-1:2007/A1:2009 (E)**26) Modification to 6.3.1.3**

Replace paragraphs "(1)" and "(2)" with:

"(1) The relative slenderness $\bar{\lambda}$ is given by:

$$\bar{\lambda} = \sqrt{\frac{A_{\text{eff}} f_o}{N_{\text{cr}}}} = \frac{L_{\text{cr}}}{i} \frac{1}{\pi} \sqrt{\frac{A_{\text{eff}} f_o}{A E}} \quad (6.52)$$

where:

L_{cr} is the buckling length in the buckling plane considered

i is the radius of gyration about the relevant axis, determined using the properties of gross cross-section.

(2) The buckling length L_{cr} should be taken as kL , where L is the length between points of lateral support; for a cantilever, L is its length. The value of k , the buckling length factor for members, should be assessed from knowledge of the end conditions. Unless more accurate analysis is carried out, Table 6.8 should be used.

NOTE The buckling length factors k are increased compared to the theoretical value for fixed ends to allow for various deformations in the connection between different structural parts.

Table 6.8 - Buckling length factor k for members

End conditions	k
1. Held in position and restrained in direction at both ends	0,7
2. Held in position at both ends and restrained in direction at one end	0,85
3. Held in position at both ends, but not restrained in direction	1,0
4. Held in position at one end, and restrained in direction at both ends	1,25
5. Held in position and restrained in direction at one end, and partially restrained in direction but not held in position at the other end	1,5
6. Held in position and restrained in direction at one end, but not held in position or restrained at the other end	2,1

".

27) Modification to 6.3.1.2

Paragraph "(1)", add note at the end of "(1)":

"NOTE In a member with a local weld the slenderness parameter $\bar{\lambda}_{\text{haz}}$ according to 6.3.3.3 (3) should be used for the section with the weld".

28) Modification to 6.3.1.5

Paragraph "(1)", entry "d)", replace "ingle" with "single".

29) Modification to 6.3.2.1

Paragraph "(1)", replace "mayor" with "major".

30) Modification to 6.3.3.1

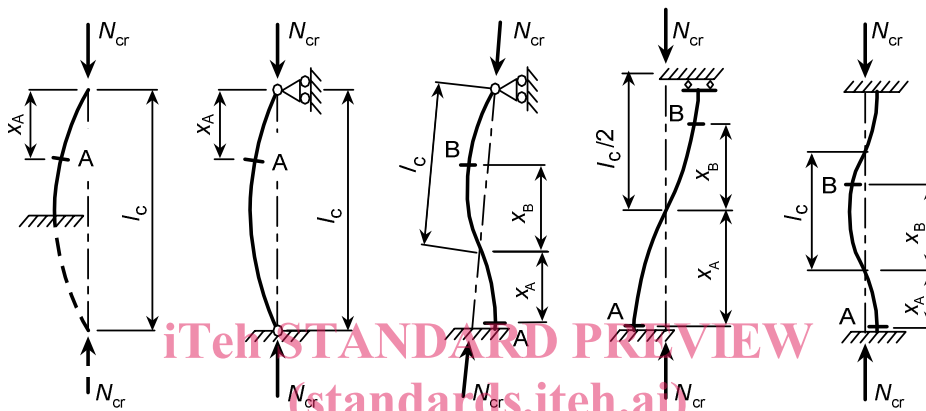
Paragraph "(1)", replace "otherwise 6.3.3 and 6.3.3.4" with "otherwise 6.3.3, 6.3.3.4 and 6.3.3.5".

31) Modification to 6.3.3.5

Paragraph "(2)", replace clause "(2)" with:

"(2) For end moments $M_{Ed,1} > M_{Ed,2}$ only, the distance x_s can be calculated from

$$\cos\left(\frac{x_s \pi}{l_c}\right) = \frac{(M_{Ed,1} - M_{Ed,2})}{M_{Rd}} \cdot \frac{N_{Rd}}{N_{Ed}} \cdot \frac{1}{\pi(1/\chi - 1)} \quad \text{but } x_s \geq 0 \quad (6.71)$$



A and B are examples of studied sections marked with transverse lines. See Table 6.8 for value of buckling length $l_c = KL$.

Figure 6.14 - Buckling length l_c and definition of x_s ($= x_A$ or x_B).

32) Modification to 6.5.2 and 6.5.3

Move "Figure 6.22" into Subclause "6.5.1".

33) Modification to 6.5.2

Paragraph "(4)", entry "b)", replace twice " λ " with " $\bar{\lambda}$ ".

34) Modifications to 6.5.3

Paragraph "(2)", last line, replace " $M_{a,Rd}$ " with " $M_{u,Rd}$ ".

Paragraph "(3)", replace "Class 1 and 2 cross-section" with "Class 1 and 2 cross-sections".

Paragraph "(3)", last line of the clause, delete:

" f_o is the characteristic value of strength for overall yielding".

35) Modifications to 6.5.4

Paragraph "(1)", replace text of the clause with: