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**EN 1993-1-1:2005/AC**

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English version  
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Eurocode 3: Design of steel structures - Part 1-1: General rules and rules  
for buildings

Eurocode 3: Calcul des structures en acier  
- Partie 1-1: Règles générales et règles  
pour les bâtiments

Eurocode 3: Bemessung und Konstruktion  
von Stahlbauten - Teil 1-1: Allgemeine  
Bemessungsregeln und Regeln für den  
Hochbau

This corrigendum becomes effective on 15 April 2009 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 15 avril 2009 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 15. April 2009 zur Einarbeitung in die drei offiziellen Sprachfassungen der EN in Kraft.



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

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Ref. No.: EN 1993-1-1:2005/AC:2009 D/E/F

**Rakennustuoteteollisuus. Käyttö sallittu vain standardien laadintaan. 04.05.2009**

**Modifications due to EN 1993-1-1:2005/AC:2006**

**1) Modifications to Clauses 2, 3, 4, 5 and 6**

*The corrections are to add a "P" after the clause number and change "should" to "shall" where appropriate. The corrections are underlined as shown.*

a) **"2.1.1 Basic requirements"**

"

(1)P The design of steel structures shall be in accordance with the general rules given in EN 1990.

"

b) **"2.1.3.1 General"**

"

(1)P Depending upon the type of action affecting durability and the design working life (see EN 1990) steel structures shall be

"

c) **"2.1.3.2 Design working life for buildings"**

"

(1)P,B The design working life shall be taken as the period for which a building structure is expected to be used for its intended purpose.

"

d) **"2.1.3.3 Durability for buildings"**

"

(1)P,B To ensure durability, buildings and their components shall either be designed for environmental actions and fatigue if relevant or else protected from them.

"

"

(2)P,B The effects of deterioration of material, corrosion or fatigue where relevant shall be taken into account by appropriate choice of material, see EN 1993-1-4 and EN 1993-1-10, and details, see EN 1993-1-9, or by structural redundancy and by the choice of an appropriate corrosion protection system.

"

e) **"2.4.1 Design values of material properties"**

"

(1)P For the design of steel structures characteristic values  $X_k$  or nominal values  $X_n$  of material properties shall be used as indicated in this Eurocode.

"

f) **"3.2.3 Fracture toughness"**

"

(1)P The material shall have sufficient fracture toughness to avoid brittle fracture of tension elements at the lowest service temperature expected to occur within the intended design life of the structure.

"

g) **"4 Durability"**

"

(2)P The means of executing the protective treatment undertaken off-site and on-site shall be in accordance with EN 1090.

"

"

(5)P For elements that cannot be inspected an appropriate corrosion allowance shall be included.

"

h) **"5.1.1 Structural modelling and basic assumptions"**

"

(1)P Analysis shall be based upon calculation models of the structure that are appropriate for the limit state under consideration.

"

"

(3)P The method used for the analysis shall be consistent with the design assumptions.

"

i) **"6.2.1 General"**

"

(1)P The design value of an action effect in each cross section shall not exceed the corresponding design resistance and if several action effects act simultaneously the combined effect shall not exceed the resistance for that combination.

"

j) **"6.2.3 Tension"**

"

(1)P The design value of the tension force  $N_{Ed}$  at each cross section shall satisfy:

"

## EN 1993-1-1:2005/AC:2009 (E)

### k) "6.2.4 Compression"

"

(1)P The design value of the compression force  $N_{Ed}$  at each cross-section shall satisfy:

"

### l) "6.2.5 Bending moment"

"

(1)P The design value of the bending moment  $M_{Ed}$  at each cross-section shall satisfy:

"

### m) "6.2.6 Shear"

"

(1)P The design value of the shear force  $V_{Ed}$  at each cross section shall satisfy:

"

### n) "6.2.9.1 Class 1 and 2 cross-sections"

"

(2)P For class 1 and 2 cross sections, the following criterion shall be satisfied:

"

### o) "6.2.9.2 Class 3 cross-sections"

"

(1)P In the absence of shear force, for Class 3 cross-sections the maximum longitudinal stress shall satisfy the criterion:

"

### p) "6.2.9.3 Class 4 cross-sections"

"

(1)P In the absence of shear force, for Class 4 cross-sections the maximum longitudinal stress  $\sigma_{x,Ed}$  calculated using the effective cross sections (see 5.2.2(2)) shall satisfy the criterion

"

## Modifications due to EN 1993-1-1:2005/AC:2009

### 2) Modification to "National Annex for EN 1993-1-1"

*1<sup>st</sup> paragraph, 3<sup>rd</sup> line, change "of steel structures to be constructed" into: "of steel structures and civil engineering works to be constructed".*

**3) Modification to 1.1.1**

Paragraph "(6)", change title of part EN 1993-1-3 "Cold-formed thin gauge members and sheeting" into: "Cold-formed members and sheeting".

**4) Modification to 1.1.2**

Paragraph "(1)", "NOTE", change "For cold formed thin gauge members and plate thicknesses  $t < 3\text{mm}$  see EN 1993-1-3" into: "For cold formed members and sheeting, see EN 1993-1-3".

**5) Modification to 1.2.1**

Change "EN 1461" into: "EN ISO 1461".

**6) Modification to 1.5.6**

Change "buckling resistance" into: "critical buckling load".

**7) Modifications to 1.6**

a) Paragraph "(2)", "Section 2", page 13, change " $X_K$ " into: " $X_k$ ".

b) Paragraph "(2)", "Section 3", page 13, change " $R_{eh}$ " into: " $R_{eH}$ ".

c) Paragraph "(2)", "Section 5", page 13, change:

"

$H_{Ed}$  design value of the horizontal reaction at the bottom of the storey to the horizontal loads and fictitious horizontal loads

"

into:

"

$H_{Ed}$  total design horizontal load, including equivalent forces transferred by the storey (storey shear)

".

d) Paragraph "(2)", "Section 5", page 13, change:

"

$V_{Ed}$  total design vertical load on the structure on the bottom of the storey

"

into:

"

$V_{Ed}$  total design vertical load on the frame transferred by the storey (storey thrust)

".

## EN 1993-1-1:2005/AC:2009 (E)

e) *Paragraph "(2)", "Section 5", page 14, change:*

"

$\alpha_{ult,k}$  minimum force amplifier to reach the characteristic resistance without taking buckling into account

"

*into:*

"

$\alpha_{ult,k}$  minimum load amplifier of the design loads to reach the characteristic resistance of the most critical cross section of the structural component considering its in plane behaviour without taking lateral or lateral torsional buckling into account however accounting for all effects due to in plane geometrical deformation and imperfections, global and local, where relevant

"

f) *Paragraph "(2)", "Section 5", page 14, definition for " $\alpha_{cr}$ ", change "elastic critical buckling" into: "elastic critical buckling load".*

g) *Paragraph "(2)", "Section 5", page 14, change:*

"

$\varepsilon$  coefficient depending...

"

*into:*

"

$\varepsilon$  factor depending...

"

h) *Paragraph "(2)", "Section 5", page 14, change:*

"

$k_{\sigma}$  plate buckling coefficient

"

*into:*

"

$k_{\sigma}$  plate buckling factor

"

i) *Paragraph "(2)", "Section 6", page 15, change:*

"

$V_{pl,Rd}$  plastic design shear resistance

"

*into:*

"

$V_{pl,Rd}$  design plastic shear resistance

"

j) *Paragraph "(2)", "Section 6", page 15, add between "I" and "A<sub>w</sub>":*

"

$A$  cross-sectional area

"

k) *Paragraph "(2)", "Section 6", page 15, change:*

"

$T_{t,Ed}$  design value of internal St. Venant torsion

"

*into:*

"

$T_{t,Ed}$  design value of internal St. Venant torsional moment

"

l) *Paragraph "(2)", "Section 6", page 15, change:*

"

$T_{w,Ed}$  design value of internal warping torsion

"

*into:*

"

$T_{w,Ed}$  design value of internal warping torsional moment

"

m) *Paragraph "(2)", "Section 6", page 15, change:*

"

$B_{Ed}$  bimoment

"

into:

"

$B_{Ed}$  design value of the bimoment

".

- n) Paragraph "(2)", "Section 6", page 16, definitions of " $\bar{\lambda}_{LT,0}$ " and of " $\beta$ ", change "for rolled sections" into: "for rolled and welded sections".
- o) Paragraph "(2)", "Section 6", page 16, definition of " $i_{fz}$ ", change " $i_{fz}$ " into: " $i_{f,z}$ ".
- p) Paragraph "(2)", "Section 6", page 17, definition of " $\Delta M_y$ ", change " $\Delta M_y$ " into: " $\Delta M_{y,Ed}$ ".
- q) Paragraph "(2)", "Section 6", page 17, definition of " $\Delta M_z$ ", change " $\Delta M_z$ " into: " $\Delta M_{z,Ed}$ ".
- r) Paragraph "(2)", "Section 6", page 17, definition of " $\alpha_{cr,op}$ ", change "critical resistance" into: "critical buckling load".
- s) Paragraph "(2)", "Section 6", page 17, definition of " $M_{Ed}^1$ ", change "maximum moment" into: "maximum first order moment".
- t) Paragraph "(2)", "Section 6", page 17, change:

"

n number of planes of lacings

"

into:

"

n number of planes of lacings or battens

".

- u) Paragraph "(2)", "Annex A", page 18, add the following definition between the definitions of " $I_y$ " and " $M_{i,Ed}(x)$ ":

"

C1 ratio between the critical bending moment (largest value along the member) and the critical constant bending moment for a member with hinged supports

".

- v) Paragraph "(2)", "Annex B", page 18, definition of " $\alpha_s$ ", add to the definition: "; s = sagging".

- w) Paragraph "(2)", "Annex B", page 18, definition of " $\alpha_h$ ", add to the definition: "h = hogging".



x) Paragraph "(2)", "Annex BB", page 19, change:

"

$\eta$  ratio of critical values of axial forces

"

into:

"

$\eta$  ratio of elastic critical values of axial forces

".

### 8) Modification to 2.2

Paragraph "(1)", change "in EN 1990, 3.3 are" into: "in the clause 3.3 of EN 1990 are".

### 9) Modification to 2.3.1

Paragraph "(4)", change " $G_k$  from a single action" into: " $G_k$  to form a single action".

### 10) Modification to 2.4.1

Paragraph "(1)", change " $X_K$ " into: " $X_k$ ".

### 11) Modification to 2.4.3

Paragraph "(1)", Equation "(2.1)", add: ", " between the indices "k" and "l" and between "k" and "i".

### 12) Modification to 3.2.1

Paragraph "(1)", list entry "a)", change " $f_y=R_{eh}$ " into: " $f_y=R_{eH}$ ".

### 13) Modifications to 3.2.3

a) Paragraph "(4)", change "EN 1461" into: "EN ISO 1461".

b) "Table 3.1", 2<sup>nd</sup> row "EN 10025-2", 4<sup>th</sup> line "S 355", 3<sup>rd</sup> column " $f_u$  [N/mm<sup>2</sup>]", change "510" into: "490".

c) "Table 3.1", 5<sup>th</sup> row "EN 10025-5", 3<sup>rd</sup> line "S 355 W", 3<sup>rd</sup> column " $f_u$  [N/mm<sup>2</sup>]", change "510" into: "490".

d) "Table 3.1 (continued)", 1<sup>st</sup> column, 2<sup>nd</sup> row "EN 10210-1", change "S 420 NH/NHL" into: "S 420 NH/NLH".

### 14) Modifications to 5.2.1

a) Paragraph "(4)B", 3<sup>rd</sup> line, change "may" into: "should".

b) Paragraph "(4)B", under Equation "(5.2)", change:

"

$H_{Ed}$  is the design value of the horizontal reaction at the bottom of the storey to the horizontal loads and fictitious horizontal loads, see 5.3.2(7)

"

into:

"

$H_{Ed}$  is the total design horizontal load, including equivalent forces according to 5.3.2(7), transferred by the storey (storey shear)

".

c) Paragraph "(4)B", under Equation "(5.2)", change:

"

$V_{Ed}$  is the total design vertical load on the structure on the bottom of the storey

"

into:

"

$V_{Ed}$  is the total design vertical load on the frame transferred by the storey (storey thrust)

".

d) Paragraph "(4)B", "Figure 5.1", Title, change "Notations for 5.2.1(2)" into "Notations for 5.2.1(4)".

e) Paragraph "(4)B", "NOTE 2B", 2<sup>nd</sup> line, change "may" into: "should".

### **15) Modification to 5.3.1**

Paragraph "(1)", change "and any minor eccentricities" into: "eccentricities greater than the essential tolerances given in EN 1090-2".

### **16) Modifications to 5.3.2**

a) Paragraph "(3)", list entry "b)", "NOTE", Title of "Table 5.1", change into: "Design value of initial local bow imperfection  $e_0/L$  for members".

b) Paragraph "(3)", list entry "b)", "NOTE", "Table 5.1", 1<sup>st</sup> column, 1<sup>st</sup> row, change the text in the cell into: "Buckling curve according to Table 6.2".

c) Paragraph "(7)", on "Figure 5.4", change " $e_{0,d}$ " into: " $e_0$ ".

d) Paragraph "(11)", Equation "(5.9)", change two times " $\eta_{cr,max}''$ " into: " $|\eta_{cr}|_{max}$ ".

e) Paragraph "(11)", under Equation "(5.11)", definition of " $\alpha_{cr}$ ", change "the elastic critical buckling" into: "the elastic critical buckling load".

f) Paragraph "(11)", "NOTE 1", add:

"

In case of elastic global calculation and plastic cross-section check the linear formula  $\frac{N_{Ed}}{N_{pl,Rd}} + \frac{M_{Ed}}{M_{pl,Rd}} \leq 1$  should be used.

"

### **17) Modification to 5.3.4**

Paragraph "(3)", 2<sup>nd</sup> line, change "where  $e_{0,d}$  is" into: "where  $e_0$  is".

### **18) Modification to 5.4.2**

Paragraph "(1)", "NOTE", change the reference "see 5.1.2(2) to (4)" into: "see 5.1.2".

### **19) Modification to 5.5.2**

Paragraph "(2)", change "EN 1993-1-5, 5.2.2" into: "EN 1993-1-5, 4.4".

### **20) Modifications to 5.6**

- a) Paragraph "(2)", list entry "b)", change "where h is the height of the cross section at this location" into: "where h is the height of the cross section".
- b) Paragraph "(3)", change "vary along their length" into: "vary along its length".
- c) Paragraph "(6)", "Table 5.2 (sheet 3 of 3)", 4<sup>th</sup> row, replace " : " with: "and".

### **21) Modifications to 6.2.1**

- a) Paragraph "(5)", delete the word "local" from the definitions of the stress components used in Equation "(6.1)".
- b) Paragraph "(8)", change "at least Class 2" into: "Class 1 or Class 2".

### **22) Modification to 6.2.2.3**

Paragraph "(2)", "NOTE", change "For cold formed thin gauge members see" into: "For cold formed members see".

### **23) Modification to 6.2.2.5**

Paragraph "(2)", change "cold formed thin walled sections" into: "cold formed sections".

### **24) Modifications to 6.2.3**

- a) Paragraph "(4)", change "(see EN 1993-1-8, 3.4.2(1))" into: "(see EN 1993-1-8, 3.4.1(1))".
- b) Paragraph "(5)", change "see also EN 1993-1-8, 3.6.3" into: "see also EN 1993-1-8, 3.10.3".

### **25) Modification to 6.2.5**

Paragraph "(4)", "NOTE", delete: "in the region of plastic hinges".

### **26) Modification to 6.2.6**

Paragraph "(3)", list entry "c)", delete " $0,9 (A - bt_f)$ " and add:

"

– for rolled T-sections:  $A_v = A - bt_f + (t_w + 2r) \frac{t_f}{2}$

– for welded T-sections:  $A_v = t_w (h - \frac{t_f}{2})$

".

### 27) Modifications to 6.2.7

a) Paragraph "(2)", under Equation "(6.24)", change "the internal St. Venant torsion" into: "the design value of the internal St. Venant torsional moment".

b) Paragraph "(2)", under Equation "(6.24)", change "the internal warping torsion" into: "the design value of the internal warping torsional moment".

### 28) Modification to 6.2.9.1

Paragraph "(6)", "circular hollow sections", after line:

"

$$\alpha = 2 ; \beta = 2$$

",

add the following line:

"

$$M_{N,y,Rd} = M_{N,z,Rd} = M_{pl,Rd} (1 - n^{1,7})$$

".

### 29) Modifications to 6.2.9.3

a) Paragraph "(1)", change "the local longitudinal stress" into: "the longitudinal stress".

b) Paragraph "(2)", change "The following criterion should be met:" into: "As an alternative to the criterion in (1) the following simplified criterion may be used:".

### 30) Modification to 6.3.2.3

Paragraph "(2)", Equation "(6.58)", replace "but  $\chi_{LT,mod} \leq 1$ " with: "but  $\left\{ \begin{array}{l} \chi_{LT,mod} \leq 1 \\ \chi_{LT,mod} \leq \frac{1}{\lambda_{LT}^2} \end{array} \right.$ ".

### 31) Modification to 6.3.2.4

Paragraph "(1)B)", "NOTE 1B", description of " $A_{eff,w,c}$ ", change "areas" into: "area".

**32) Modifications to 6.3.4**

- a) Paragraph "(1)", change "single members, built-up or not" into: "single members with mono symmetric cross sections, built-up or not".
- b) Paragraph "(3)", change "elastic critical resistance" into: "elastic critical load".

**33) Modifications to 6.4.1**

- a) Paragraph "(1)", Sub-paragraph "2.", change "battenings" into: "battens".
- b) Paragraph "(2)", Sub-paragraph "1.", change "battenings" into: "battens".
- c) Paragraph "(4)", "Figure 6.7", Title, change "battenings" into: "battens".

**34) Modification to 6.4.3.1**

Paragraph "(3)", under Equation "(6.74)", change "n = number of planes of lacings" into: "n = number of planes of battens".

**35) Modifications to Annex A**

- a) "Table A.1", 1<sup>st</sup> column, 7<sup>th</sup> row, equation for "n<sub>pl</sub>", change " $\gamma_{M1}$ " into: " $\gamma_{M0}$ ".
- b) "Table A.1", 7<sup>th</sup> row, 2<sup>nd</sup> column, change the formula for the term "C<sub>zz</sub>" into:

$$C_{zz} = 1 + (w_z - 1) \left[ 2 - \frac{1,6}{w_z} \cdot C_{mz}^2 \bar{\lambda}_{\max} - \frac{1,6}{w_z} \cdot C_{mz}^2 \bar{\lambda}_{\max}^2 - e_{LT} \right] n_{pl} \geq \frac{W_{el,z}}{W_{pl,z}}$$

- c) "Table A.1 (continued)", just before " $\varepsilon_y = \dots$ ", add: "C<sub>mi,0</sub> see Table A.2".
- d) "Table A.1 (continued)", add:

C<sub>1</sub> is a factor depending on the loading and end conditions and may be taken as  $C_1 = k_c^{-2}$  where  $k_c$  is to be taken from Table 6.6.

- e) "Table A.2", 2<sup>nd</sup> column, 3<sup>rd</sup> row, description of "M<sub>i,Ed(x)</sub>", add: "according to the first order analyses".
- f) "Table A.2", 2<sup>nd</sup> column, 3<sup>rd</sup> row, description of " $|\delta_x|$ ", replace "displacement" with: "deflection".

**36) Modifications to Annex B**

- a) "Table B.3", last column on the right, 9<sup>th</sup> row, change:

$$0,90 - 0,10\alpha_h(1+2\psi)$$

"

into:

"

$$0,90 + 0,10\alpha_h(1+2\psi)$$

".

b) "Table B.3", 1<sup>st</sup> column on the left, 5th row (as counted on the left side of the table), change " $C_{Mz}$ " into: " $C_{mz}$ ".

### **37) Modification to BB.1.3**

Paragraph "(3)B", replace:

"

For latticed girders with parallel chords and braces, for which the brace to chord diameter or width ratio  $\beta$  is less than 0,6 the buckling length  $L_{cr}$  of a hollow section brace member without cropping or flattening, welded around its perimeter to hollow section chords, may generally be taken as 0,75L for both in-plane and out-of-plane buckling, unless smaller values may be justified by tests or by calculations.

"

with:

"

The buckling length  $L_{cr}$  of a hollow section brace member without cropping or flattening, welded around its perimeter to hollow section chords, may be generally taken as 0,75L for both in-plane and out-of-plane buckling. Lower buckling lengths may be used based on testing or calculations. In this case the buckling length of the cord may not be reduced.

"

### **38) Modifications to BB.2.1**

a) Paragraph "(1)B", change "by equation (BB.2)" into: "by formula (BB.2)".

b) Paragraph "(1)B", Equation "(BB.2)" and under the equation, change two times " $I_t$ " into: " $I_T$ ".

c) Paragraph "(1)B", under Equation "(BB.2)", description of "S", change "to be connected to the beam at each rib" into: "to be connected to the beam at the bottom at each rib".

d) Paragraph "(1)B", "NOTE", change "Equation (BB.2)" into: "Formula (BB.2)".

### **39) Modifications to BB.3.1.1**

a) Paragraph "(1)B", Equation "(BB.5)" and under the equation, change two times " $I_t$ " into: " $I_T$ ".

b) Paragraph "(1)B", under Equation "(BB.5)", change:

"

$C_1$  is a factor depending on the loading and end conditions to be taken from literature

"

into:

"

$C_1$  is a factor depending on the loading and end conditions and may be taken as  $C_1 = k_c^{-2}$  where  $k_c$  is to be taken from Table 6.6

".

#### **40) Modification to BB.3.1.2**

Paragraph "(3)B", change "see BB.3.1.1" into: "see BB.3.1.1".

#### **41) Modifications to BB.3.2.1**

a) Paragraph "(1)B", Equations "(BB.9)" and "(BB.10)", change " $I_t$ " into: " $I_T$ ".

b) Paragraph "(1)B", between definitions of "A" and " $W_{pl,y}$ ", add:

"

$C_1$  is a factor depending on the loading and end conditions and may be taken as  $C_1 = k_c^{-2}$ , where  $k_c$  is to be taken from Table 6.6

".

c) Paragraph "(1)B", under Equation "(BB.10)", list of definitions, change three times " $I_t$ " into: " $I_T$ ".

#### **42) Modifications to BB.3.3.1**

a) Paragraph "(1)B", "Figure BB.4", change " $\beta t \geq -1,0$  thus  $\beta t = -1,0$ " into: " $\beta t \leq -1,0$  thus  $\beta t = -1,0$ ".

b) Paragraph "(1)B", formula for " $N_{crT}$ ", change " $I_t$ " into: " $I_T$ ".

#### **43) Modification to BB.3.3.2**

Paragraph "(1)B", "Figure BB.5", change the title of the figure into:

"

Figure BB.5: Moment values

".