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English version
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Deutsche Fassung

Eurocode 6 - Design of masonry structures - Part 1-1: General rules for reinforced and unreinforced masonry structures

Eurocode 6 : Calcul des ouvrages en maçonnerie - Partie 1-1: Règles générales pour ouvrages en maçonnerie armée et non armée

Eurocode 6 - Bemessung und Konstruktion von Mauerwerksbauten - Teil 1-1: Allgemeine Regeln für bewehrtes und unbewehrtes Mauerwerk

This corrigendum becomes effective on 29 July 2009 for incorporation in the three official language versions of the EN.

Ce corrigendum prendra effet le 29 juillet 2009 pour incorporation dans les trois versions linguistiques officielles de la EN.

Die Berichtigung tritt am 29.Juli 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 1996-1-1:2005/AC:2009 D/E/F

1) Modification to "Links between Eurocodes and harmonised technical specifications (ENs and ETAs) for products"

Page 10, title of "Part 1-1", add "structures" as follows:

"Part 1-1: General Rules for reinforced and unreinforced masonry structures".

2) Modification to "National Annex for EN 1996-1-1"

Page 11, list, replace:

"— 8.5.2.2(2) Cavity walls;"

with:

"— 8.5.2.2(2) Cavity and veneer walls;"

3) Modification to 1.1.3

Page 12, delete the whole Subclause 1.1.3.

4) Modification to 1.2.2

Page 14, replace:

"— EN ISO 1461, Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods."

with:

"— prEN 10348, Steel for the reinforcement of concrete — Galvanized reinforcing steel."

5) Modification to 1.5.3.3

Page 16, replace:

"the strength of masonry subjected to shear forces"

with:

"the strength of masonry in shear subjected to shear forces".

6) Modification to 1.5.5.4

Page 17, replace the definition of "lightweight masonry mortar" with the following one:

"designed masonry mortar with a dry hardened density equal to or below 1300 kg/m³ according to EN 998-2".

7) Modifications to 1.6

Page 21, replace:

" $b_{ef,l}$ effective width of a flanged member;"

with:

" $b_{ef,l}$ effective width of a L-shaped flanged member;"

Page 21, replace:

" $b_{ef,t}$ effective thickness of a flanged member;"

with:

" $b_{ef,t}$ effective width of a T-shaped flanged member;"

Page 22, add between the definitions of " E " and " $E_{longterm}$ ":

" E_d design value of the load applied to a reinforced masonry member;"

Page 23, definitions of " f_{xk1} ", replace "a plane of failure" with "the plane of failure" as follows:

" f_{xk1} characteristic flexural strength of masonry having the plane of failure parallel to the bed joints;"

Page 23, definitions of " f_{xk2} ", replace "a plane of failure" with "the plane of failure" as follows:

" f_{xk2} characteristic flexural strength of masonry having the plane of failure perpendicular to the bed joints;"

Page 24, definition of " M_i ", delete the comma "," in the definition as follows:

" M_i end moment at node i ;"

Page 25, definition of " R_e ", replace "stress" with "strength".

Page 25, delete the line:

" E_d design value of the load applied to a reinforced masonry member;"

Page 25, delete the symbol and definition of " N_{EI} ":

" N_{EI} load applied by a floor;"

8) Modification to 2.3.2

Page 28, paragraph "(1)P", replace "should" with "shall" as follows:

"(1)P Partial factors for actions shall be obtained from EN 1990."

9) Modification to 3.1.1

Page 30, paragraph "(1)P", last line, delete "pr" as follows:

“— dimensioned natural stone units in accordance with EN 771-6.”.

10) Modification to 3.1.2

Page 32, paragraph "(2)", after "coefficient of variation of", add "the compressive strength of" as follows:

“(2) When the manufacturer declares the normalised compressive strength of masonry units as a characteristic strength, this should be converted to the mean equivalent, using a factor based on the coefficient of variation of the compressive strength of the units.”.

11) Modification to 3.2.3.1

Page 33, delete the whole paragraph "(2)".

12) Modification to 3.2.3.2

Page 33, "NOTE 2", delete "pr" (from "EN 1052-5") and ", under preparation," as follows:

“NOTE 2 EN 1052-3 deals with the determination of the initial shear strength of masonry and EN 1052-5 deals with the determination of flexural bond strength.”.

13) Modification to 3.3.2

Page 33, paragraph "(4)", 2nd sentence, replace "slump classes S5 or S6" with "slump class S5 or flow class F6", as follows: “In holes, where the smallest dimension is less than 85 mm, slump class S5 or flow class F6 should be used.”.

14) Modifications to 3.4.1

Page 34, paragraph "1(P)", reference to "prEN 10080" in the first sentence, delete "pr".

Page 34, "NOTE", replace "stress" with "strength" in the first sentence and delete "pr" from "prEN 10080" in two places as follows:

“NOTE EN 10080 refers to a yield strength R_e , which includes the characteristic, minimum and maximum values based on the long-term quality of production. In contrast f_{yk} is the characteristic yield stress based on only that reinforcement required for the structure. There is no direct relationship between f_{yk} and the characteristic R_e . However the methods of evaluation and verification of yield strength given in EN 10080 provide a sufficient check for obtaining f_{yk} .”.

15) Modification to 3.4.3

Page 34, title of the clause, delete "prefabricated" as follows: “Properties of bed joint reinforcement”.

16) Modifications to 3.6.1.2

Page 35, paragraph "(1)", indent "(i)", definition of "K", add "l" between "and" and "or" as follows:

"K is a constant and, where relevant, modified according to 3.6.1.2(3) and/or 3.6.1.2(6)".

Page 36, paragraph "(2)", list, 2nd dash, replace the 2nd occurrence of the word "units" on the 2nd line with "concrete" as follows:

"— equation (3.3), for masonry made with thin layer mortar, in bed joints of thickness 0,5 mm to 3 mm, and clay units of Group 1 and 4, calcium silicate, aggregate concrete and autoclaved aerated concrete units;"

Page 36, paragraph "(2)", list, 3rd dash, delete "units" after "masonry" on the 1st line as follows:

"— equation (3.4), for masonry made with thin layer mortar, in bed joints of thickness 0,5 mm to 3 mm, and clay units of Group 2 and 3."

Page 36, paragraph "(2)", "NOTE", replace "0,5 m" with "0,5 mm" as follows:

"NOTE EN 998-2 gives no limit for the thickness of joints made of thin layer mortar; the limit on the thickness of bed joints of 0,5 mm to 3 mm is to ensure that the thin layer mortar has the enhanced properties assumed to exist to enable equations (3.3) and (3.4) to be valid. The mortar strength, f_m , does not need to be used with equation (3.3) and (3.4)."

Page 36, paragraph "(2)", equation "(3.2)", delete the multiplication dots from the equation as follows:

$$f_k = K f_b^{0,7} f_m^{0,3} \quad (3.2)$$

17) Modifications to 3.6.1.3

Page 38, paragraph "(1)", replace the 1st sentence:

"(1) The characteristic compressive strength of shell bedded masonry, made with Group 1 and Group 4 masonry units, may also be obtained from 3.6.1.2, provided that:"

with:

"(1) The characteristic compressive strength of shell bedded masonry may also be obtained from 3.6.1.2 using the normalised mean compressive strength of the units f_b that is obtained for normal bedding (thus not obtained from tests on units tested in accordance with EN 772-1 for shell bedded units), provided that:"

Page 38, paragraph "(2)", delete "made with Group 2 and Group 3 masonry units," from the 1st and 2nd lines as follows:

"The characteristic compressive strength of shell bedded masonry may be obtained from 3.6.1.2, provided that the normalised mean compressive strength of the units, f_b , used in the equation is that obtained from tests on units tested in accordance with EN 772-1 for shell bedded units."

18) Modifications to 3.6.2

Page 39, paragraph "(4)", "NOTE", replace "0,065" with "0,045" as follows:

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"NOTE The decision on whether to use $0,045f_b$ or f_{vlt} in a country, and the values or derivation of f_{vlt} related to e.g. the tensile strength of the units and/or overlap in the masonry, if that option is chosen, may be found in its National Annex."

Page 40, paragraph "(7)", title of "Table 3.4", replace "intitial" with "initial".

19) Modification to 3.6.4

Page 43, "Table 3.6", 1st row at the top, 3rd column, replace the header "M2-M5" with "M2-M4".

20) Modifications to 4.3.3

Page 46, paragraph "(2)", replace "EN ISO 1461" with "prEN 10348".

Page 47, paragraph "(3)", "NOTE", table, replace the title with the following one (by correcting the font size from 12 to 10 points and in bold as follows):

"Selection of reinforcing steel for durability".

Page 47, paragraph "(3)", "NOTE", table, change the font size of both superscripts "²" in footnote "^C" as follows:

^C Carbon steel should be galvanised with a minimum mass of zinc coating of 900 g/m^2 or galvanised with a minimum mass of zinc coating of 60 g/m^2 and provided with a bonded epoxy coating of at least $80 \text{ }\mu\text{m}$ thickness, with an average of $100 \text{ }\mu\text{m}$. See also 3.4."

Page 48, paragraph "(4)", "NOTE", table, replace the title with the following one (by correcting the font size from 12 to 10 points and in bold as follows):

"Recommended values for the minimum concrete cover c_{nom} for carbon reinforced steel".

21) Modification to 5.5.1.3

Page 56, paragraph "(2)", "Table 5.1", header, 2nd column, replace "pier thickness" with "pier depth".

22) Modifications to 5.5.5

Page 63, paragraph "(7)", "NOTE", definition for " μ ", replace the cross-references to "6.3.1.(4)" and "6.5.2.(9)" respectively with "6.3.1(4)" and "6.6.2(9)" as follows:

" μ is the orthogonal ratio of the design flexural strengths of the masonry, f_{xd1}/f_{xd2} , see 3.6.3 or $f_{xd1,app}/f_{xd2}$, see 6.3.1(4) or $f_{xd1}/f_{xd2,app}$, see 6.6.2(9);".

Page 64, paragraph "(10)", replace the whole paragraph with the following one:

"(10) In a laterally loaded panel or free standing wall built of masonry set in mortar designations M2 to M20, and designed in accordance with 6.3, the dimensions should be limited to avoid undue movements resulting from deflections, creep, shrinkage, temperature effects and cracking.

NOTE The limiting values may be obtained from Annex F."

23) Modifications to 6.1.2.2

Page 66, paragraph "(1)", under "(i) At the top or bottom of the wall (ϕ_i)", replace the definition of " e_{init} " with:

" e_{init} is the initial eccentricity with a sign that increases the absolute value of e_i (see 5.5.1.1);".

Page 66, paragraph "(1)", under "(ii) In the middle of the wall height (ϕ_m)", delete the second "," and "from annex G" from the first sentence as follows:

"By using a simplification of the general principles given in 6.1.1, the reduction factor within the middle height of the wall ϕ_m , may be determined using e_{mk} , where:".

Page 67, paragraph "(1)", under "(ii) In the middle of the wall height (ϕ_m)", equation "(6.7)", replace the equation with:

$$e_m = \frac{M_{md}}{N_{md}} + e_{hm} + e_{init} \quad (6.7).$$

Page 67, paragraph "(1)", under equation "(6.7)", definition of " e_{init} ", replace:

" e_{init} is the initial eccentricity (see 5.5.1.1);"

with:

" e_{init} is the initial eccentricity with a sign that increases the absolute value of e_m (see 5.5.1.1);".

Page 67, very end of paragraph "(1)", after:

" ϕ_∞ is the final creep coefficient (see note under 3.7.4(2))",

add the following "NOTE":

"NOTE ϕ_m , may be determined from Annex G, using e_{mk} as expressed above."

24) Modification to 6.1.3

Page 69, very end of paragraph "(3)", replace "1.0" with "1,0" as follows: "strength of masonry, f_d (i.e. β is taken to be 1,0).".

25) Modification to 6.3.2

Page 73, end of paragraph "(6)", last dash, add "in the considered direction" between "ratio" and "does not" as follows:

"— the slenderness ratio in the considered direction does not exceed 20."

26) Modification to 6.4.2

Page 74, paragraph "(1)", 1st line, replace " e_{hi} " with " e_{he} ".

27) Modification to 6.5

Page 75, paragraph "(4)", definition of " W_{Ed} ", add "is the" before "design value" as follows:

" W_{Ed} is the design value of the horizontal load, per unit area, to be transferred;"

28) Modifications to 6.6.2

Page 76, paragraph "(1)P", equation "(6.21)", replace " \geq " with " \leq " as follows:

$$E_d \leq R_d \quad (6.21)$$

Page 77, paragraph "(5)", equations "(6.24a)" and "(6.24b)", replace "0.4" and "0.3" respectively with "0,4" and "0,3" as follows:

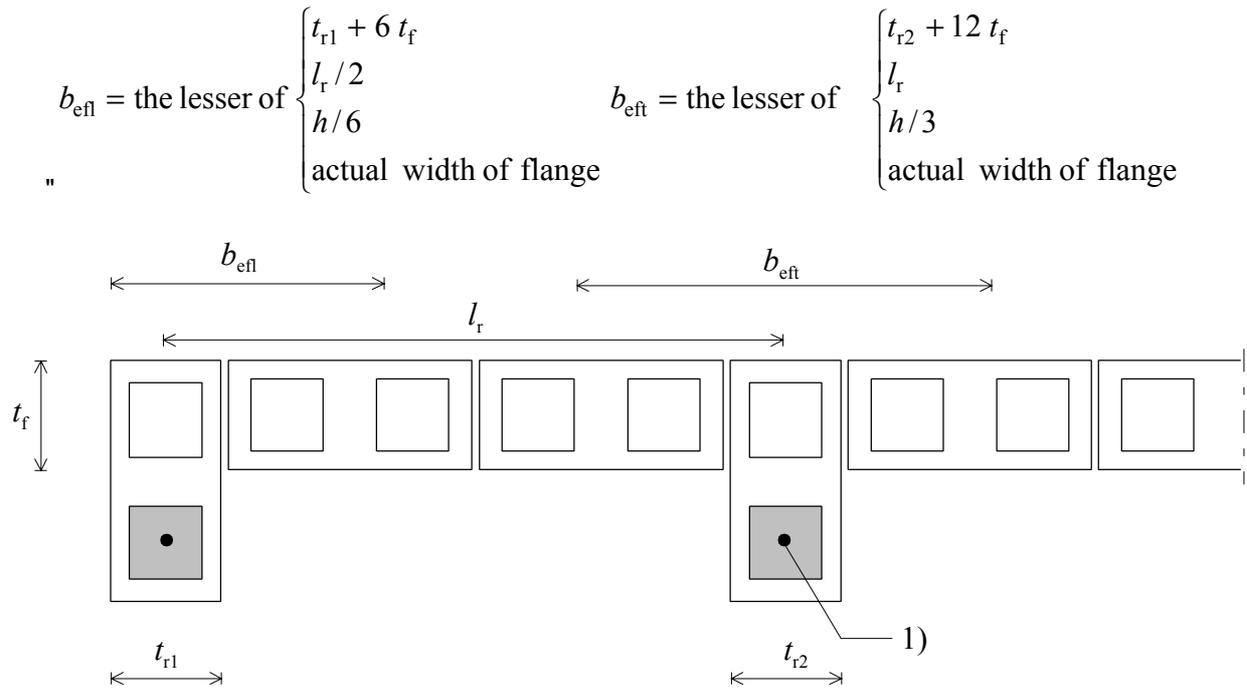
$$M_{Rd} \leq 0,4 f_d b d^2 \quad \text{for Group 1 units other than lightweight aggregate units} \quad (6.24a)$$

and

$$M_{Rd} \leq 0,3 f_d b d^2 \quad \text{for Group 2, 3 and 4 and Group 1 lightweight aggregate units.} \quad (6.24b)$$

29) Modification to 6.6.3

Page 79, paragraph "(1)", replace:



Key

- 1) reinforcement

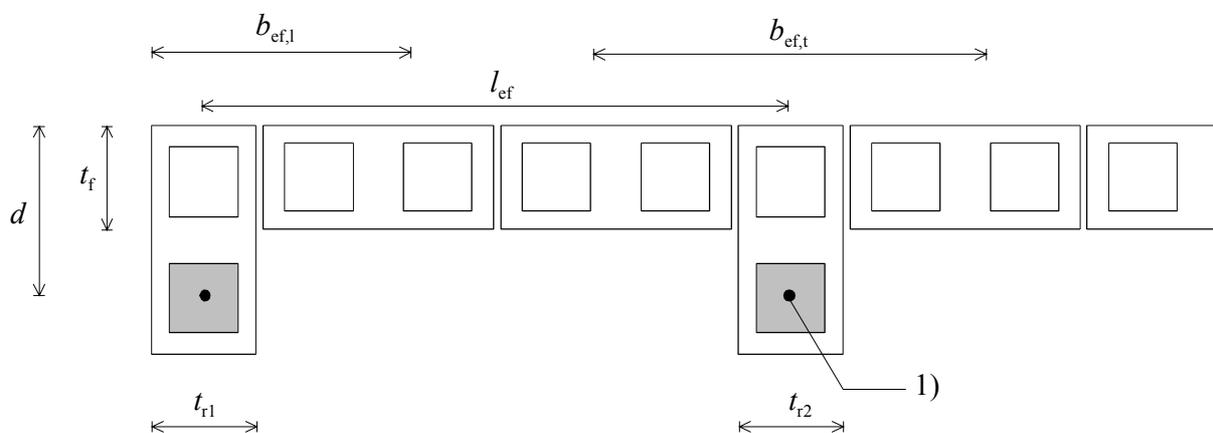
Figure 6.6 — Effective width of flanges

where:

- b_{efl} effective width of a flanged member;
- b_{eft} effective width of a flanged member;
- h clear height of a masonry wall;
- l_r clear distance between lateral restraints;
- t_f thickness of a flange;
- t_{ri} thickness of a rib, i .

with:

$$b_{ef,l} = \text{the lesser of } \begin{cases} t_{r1} + 6 t_f \\ l_{ef} / 2 \\ h / 6 \\ \text{actual width of flange} \end{cases} \quad b_{ef,t} = \text{the lesser of } \begin{cases} t_{r2} + 12 t_f \\ l_{ef} \\ h / 3 \\ \text{actual width of flange} \end{cases}$$



Key

1) reinforcement

Figure 6.6 — Effective width of flanges

where:

- $b_{ef,l}$ effective width of a L-shaped flanged member;
- $b_{ef,t}$ effective width of a T-shaped flanged member;
- d effective depth of the member;
- h clear height of a masonry wall;
- l_{ef} effective distance between lateral restraints;
- t_f thickness of a flange;
- t_{ri} thickness of a rib, i .

30) Modifications to 6.6.4

Page 80, paragraph "(1)", replace the symbol " A_{yd} " with " f_{yd} " as follows:

" f_{yd} is the design strength of the reinforcing steel;"

Page 81, paragraph "(2)", equations "(6.31a)" and "(6.31b)", replace "0.4" and "0.3" respectively with "0,4" and "0,3":

$$M_{Rd} \leq 0,4 f_d b d^2 \quad \text{for Group 1 units other than lightweight aggregate units} \quad (6.31a)$$

and

$$M_{Rd} \leq 0,3 f_d b d^2 \quad \text{for Group 2, 3 and 4 and Group 1 lightweight aggregate units;} \quad (6.31b)''.$$

31) Modification to 6.7.3

Page 85, paragraph "(3)", equation "(6.42)", replace "s" with "s":

$$V_{Rd2} = 0,9 d \frac{A_{sw}}{s} f_{yd} (1 + \cot \alpha) \sin \alpha \quad (6.42)''.$$

32) Modification to 7.2

Page 88, paragraph "(5)", end of the sentence, delete "in accordance with Annex F" and add:

"NOTE The limiting values may be obtained from Annex F."

as follows:

"(...) are limited.

NOTE The limiting values may be obtained from Annex F."

33) Modification to 8.1.1

Page 89, replace paragraph "(2)" with the following:

"(2) Masonry mortars for use in reinforced masonry, other than bed joint reinforced masonry, should not have a compressive strength, f_m , less than 4 N/mm², and for use in bed joint reinforced masonry, not less than 2 N/mm²."

34) Modification to 8.1.2

Page 90, paragraph "(2)", replace "Note" with "NOTE".

35) Modification to 8.1.5

Page 91, paragraph "(1)", replace twice "a thickness" with "an actual thickness" as follows:

"(1) Bed joints and perpend joints made with general purpose and lightweight mortars should have an actual thickness not less than 6 mm nor more than 15 mm, and bed and perpend joints made with thin layer mortars should have an actual thickness not less than 0,5 mm nor more than 3 mm."

36) Modification to 8.2.2

Page 92, paragraph "(1)", replace "using Table 4.1" with "according to 4.3.3(3)" as follows:

"(1) To allow bond strength to develop where reinforcing steel, selected according to 4.3.3(3), is located in mortar in bed joints:"

37) Modification to 8.2.3

Page 93, paragraph "(2)", add "(out-of-plane)" between "lateral" and "loads" as follows:

"(2) In walls where reinforcing steel is provided in the bed joints to enhance resistance to lateral (out-of-plane) loads, the total area of such reinforcement should not be less than 0,03 % of the gross cross-sectional area of the wall (i. e. 0,015 % in each face)."

38) Modification to 8.2.5.1

Page 94, paragraph "(4)", equation "(8.1)", delete " γ_M " as follows:

$$l_b = \frac{\phi f_{yd}}{4 f_{bod}} \quad (8.1)$$

39) Modification to 8.2.7

Page 98, paragraph "(5)", replace reference to "6.5.3" with "6.6.3".

40) Modification to 8.5.2.3

Page 100, paragraph "(2)", replace reference to "6.3.3(2)" with "6.5(4)".

41) Modification to 8.6.2

Page 101, paragraph "(1)", in the 2nd line and also in the "NOTE", replace " $t_{ch,v}$ " with " $t_{ch,v}$ ".

42) Modification to 8.6.3

Page 101, paragraph "(1)", in the 3rd line and also in the "NOTE", replace " $t_{ch,h}$ " with " $t_{ch,h}$ ".

43) Modifications to Annex C

Page 107, paragraph "(2)", 3rd sentence, replace " l_2 " with " I_2 " and replace " l_1 " with " I_1 " as follows: "may be calculated from equation (C.1) and the end moment at node 2, M_2 , similarly but using $E_2 I_2 / h_2$ instead of $E_1 I_1 / h_1$ in the numerator."

Page 107, paragraph "(2)", equation "(C.1)", replace " h_3 " and " h_4 " respectively with " l_3 " and " l_4 " as follows:

$$M_1 = \frac{\frac{n_1 E_1 I_1}{h_1}}{\frac{n_1 E_1 I_1}{h_1} + \frac{n_2 E_2 I_2}{h_2} + \frac{n_3 E_3 I_3}{l_3} + \frac{n_4 E_4 I_4}{l_4}} \left[\frac{w_3 l_3^2}{4(n_3 - 1)} - \frac{w_4 l_4^2}{4(n_4 - 1)} \right] \quad (C.1)$$

Page 107, paragraph "(2)", just under the definition of " E_i ", replace the "NOTE" with the following one:

"NOTE It will normally be sufficient to take the values of E as $1\,000 f_k$ for all masonry members."

Page 107, paragraph "(2)", definition of " I_i ", replace:

" I_i is the second moment of area of member j , where $j = 1, 2, 3$ or 4 (in the case of a cavity wall in which only one leaf is loadbearing, I_i should be taken as that of the loadbearing leaf only);"

with:

" I_i is the second moment of area of member i , where $i = 1, 2, 3$ or 4 (in the case of a cavity wall in which only one leaf is loadbearing, I_i should be taken as that of the loadbearing leaf only);"

Pages 108 and 109, paragraph "(3)", replace " k_m " with " k_m " in the description of " η " and in equation "(C.2)" as follows:

" η may be obtained experimentally, or it may be taken as $(1 - k_m/4)$,

where:

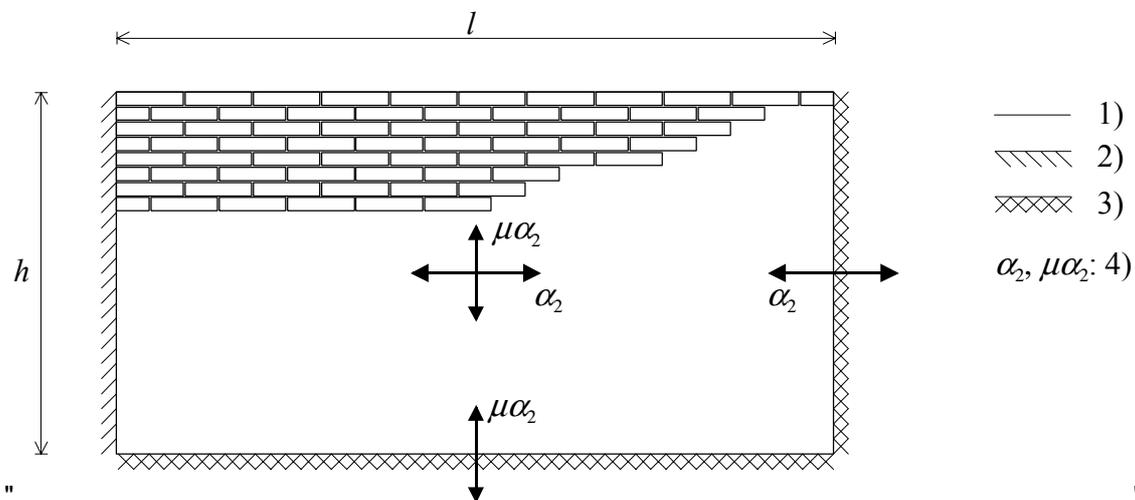
$$k_m = \frac{n_3 \frac{E_3 I_3}{l_3} + n_4 \frac{E_4 I_4}{l_4}}{n_1 \frac{E_1 I_1}{h_1} + n_2 \frac{E_2 I_2}{h_2}} \leq 2 \quad \text{(C.2)}$$

44) Modifications to Annex E

Page 112, title of the annex, replace " α_1 " with " α_2 " as follows:

"Bending moment coefficients, α_2 , in single leaf laterally loaded wall panels of thickness less than or equal to 250 mm"

Page 112, "Figure E.1", replace the figure with the following one:



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Page 112, "Figure E.1", key "4)", delete " $\alpha_2, \mu\alpha_2$:" as follows:

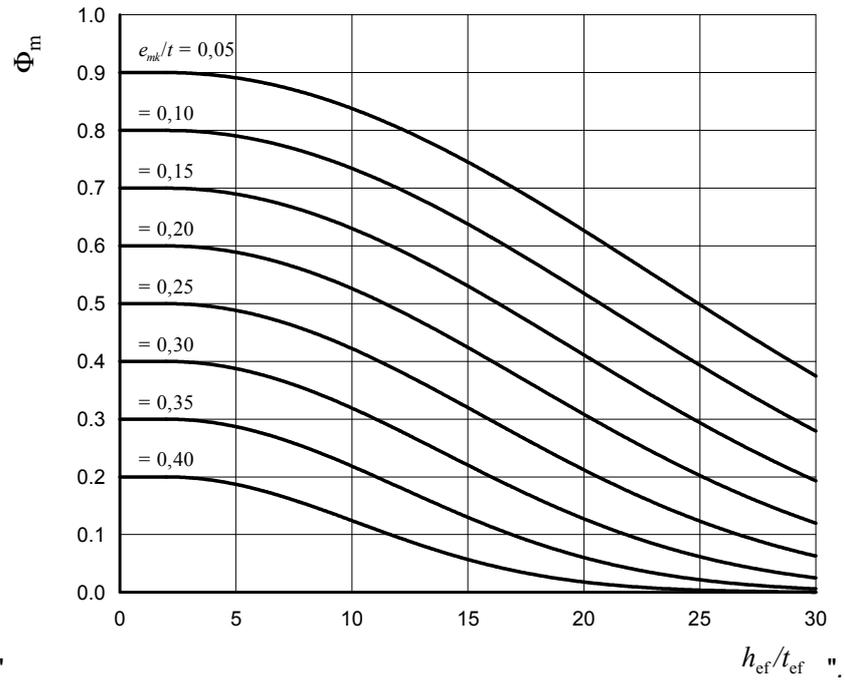
"4) moment coefficients in the indicated directions".

45) Modifications to Annex G

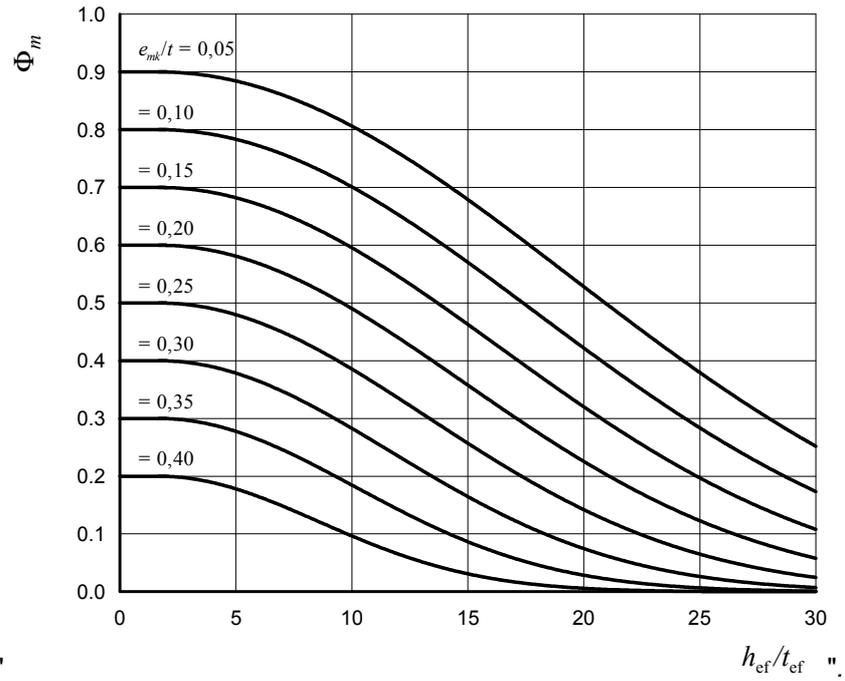
Page 119, paragraph "(1)", equation "(G.1)", replace the equation with the following:

$$\Phi_m = A_1 e^{-\frac{u^2}{2}} \quad (G.1)$$

Page 120, "Figure G.1", replace the figure with the following one:



Page 120, "Figure G.2", replace the figure with the following one:



46) Modification to Annex H

Page 121, "Figure H.1", replace the figure with the following one:

