Singapore Standard SS EN 1992-1-1:2008

Eurocode 2 : Design of concrete structures
– Part 1-1 : General rules and rules for buildings

AMENDMENT NO. 1

December 2020

1. Modification to the National Foreword, Page v

In the section "National choices is allowed in EN 1992-1-1 through the following clauses", between "6.4.4 (1)" and "6.4.5 (3)", *add* "6.4.5 (1)".

2. Modification to 3.3.2, Properties, Page 42

In Paragraph (2)P, *replace* "strength to proof strength (f_{pk} /$f_{p0,1k}$)" with "strength to proof strength (f_p / $f_{p0,1})_k$".

3. Modification to 3.3.4, Ductility characteristics, Page 43

In Paragraph (5), *replace* "f_{pk} /$f_{p0,1k} \geq k$" with "$(f_p / f_{p0,1})_k \geq k$".

4. Modification to 6.4.5, Punching shear resistance of slabs and column bases with shear reinforcement, Page 105

In Paragraph (1), *replace:*

"(1) Where shear reinforcement is required it should be calculated in accordance with Expression (6.52):

$$v_{Rd,cs} = 0{,}75\ v_{Rd,c} + 1{,}5\ (d/s_r)\ A_{sw}\ f_{ywd,ef}\ (1/(u_1\ d))\ \sin\alpha \qquad (6.52)$$

where

A_{sw}	is the area of one perimeter of shear reinforcement around the column [mm^2]
s_r	is the radial spacing of perimeters of shear reinforcement [mm]
$f_{ywd,ef}$	is the effective design strength of the punching shear reinforcement, according to $f_{ywd,ef} = 250 + 0{,}25\ d \leq f_{ywd}$ [MPa]
d	is the mean of the effective depths in the orthogonal directions [mm]
α	is the angle between the shear reinforcement and the plane of the slab

If a single line of bent-down bars is provided, then the ratio d / s_r in Expression (6.52) may be given the value 0,67."

with the following text:

"(1) Where shear reinforcement is required it should be calculated in accordance with Expression (6.52):

$$v_{Rd,cs} = 0{,}75\ v_{Rd,c} + 1{,}5\ (d / s_r)\ A_{sw}\ f_{ywd,ef}\ [1 / (u_1\ d)]\ \sin\alpha \leq k_{max} \cdot v_{Rd,c} \qquad (6.52)$$

where

A_{sw}	is the area of one perimeter of shear reinforcement around the column [mm^2];
s_r	is the radial spacing of perimeters of shear reinforcement [mm];
$f_{ywd,ef}$	is the effective design strength of the punching shear reinforcement according to $f_{ywd,ef} = 250 + 0,25\, d \leq f_{ywd}$ [MPa];
d	is the mean of the effective depths in the orthogonal directions [mm];
α	is the angle between the shear reinforcement and the plane of the slab;
$v_{Rd,c}$	according to 6.4.4;
k_{max}	is the factor, limiting the maximum capacity that can be achieved by application of shear reinforcement.

NOTE ─ The value of k_{max} for use in a country may be found in its National Annex. The recommended value is 1,5.

If a single line of bent-down bars is provided, then the ratio d / s_r in Expression (6.52) may be given the value 0,67.".

5. Modification to 11.6.4.2, Punching shear resistance of slabs or column bases with shear reinforcement, Page 191

In Paragraph (1), *replace* the whole Expression (11.6.52) with the following one:

"$v_{lRd,cs} = 0,75\, v_{lRd,c} + 1,5\, (d / s_r)\, A_{sw}\, f_{ywd,ef}\, [1 / (u_1\, d)] \sin\alpha \leq k_{max} \cdot v_{lRd,c}$ (11.6.52)".

6. Modification to 12.6.5.2, Simplified design method for walls and columns, Page 197

Replace the whole Paragraph (1):

"(1) In absence of a more rigorous approach, the design resistance in terms of axial force for a slender wall or column in plain concrete may be calculated as follows:

$$N_{Rd} = b \times h_w \times f_{cd,pl} \times \Phi \qquad (12.10)$$

where

N_{Rd}	is the axial resistance
b	is the overall width of the cross-section
h_w	is the overall depth of the cross-section
Φ	Factor taking into account eccentricity, including second order effects and normal effects of creep; see below

For braced members, the factor Φ may be taken as:

$$\Phi = 1,14 \times (1–2e_{tot}/h_w) – 0,02 \times l_o/h_w \leq (1–2 \times e_{tot}/h_w) \qquad (12.11)$$

where:

$e_{tot} = e_o + e_i$

e_o is the first order eccentricity including, where relevant, the effects of floors (e.g. possible clamping moments transmitted to the wall from a slab) and horizontal actions;

e_i is the additional eccentricity covering the effects of geometrical imperfections, see 5.2"

with the following text:

"(1) In absence of a more rigorous approach, the design resistance in terms of axial force for a slender wall or column in plain concrete may be calculated as follows:

$$N_{Rd} = b \cdot h_w \cdot f_{cd,pl} \cdot \Phi \quad (12.10)$$

where

N_{Rd} is the axial resistance;

b is the overall width of the cross-section;

h_w is the overall depth of the cross-section;

Φ is the factor taking into account eccentricity, including second order effects; see below.

For braced members, the factor Φ may be taken as:

$$\Phi = 1{,}14 \cdot (1 - 2 \cdot e_{tot} / h_w) - 0{,}02 \cdot l_0 / h_w \le 1 - 2 \cdot e_{tot} / h_w \quad (12.11)$$

where:

$$e_{tot} = e_0 + e_i + e_\varphi \quad (12.12)$$

e_0 is the first order eccentricity including, where relevant, the effects of floors (e.g. possible clamping moments transmitted to the wall from a slab) and horizontal actions. In determination of e_0 an equivalent first order end moment M_{0e} can be used, see 5.8.8.2 (2);

e_i is the additional eccentricity covering the effects of geometrical imperfections, see 5.2;

e_φ is the eccentricity due to creep.

In some cases, depending on slenderness, the end moment(s) can be more critical for the structure than the equivalent first order end moment M_{0e}. In such cases Expression (12.2) should be used.".

7. Modification to H.1.2, Bracing system without significant shear deformations, Page 215

In Paragraph (4), *replace* the whole Expression (H.4):

"$$\xi = 7{,}8 \cdot \frac{n_s}{n_s + 1{,}6} \cdot \frac{1}{1 + 0{,}7 \cdot k} \quad \text{(H.4)}$$"

with the following one:

"$$\xi = 7{,}8 \cdot \frac{n_s}{n_s + 1{,}6} \cdot \frac{1}{1 + 3.9k} \quad \text{(H.4)}$$"