Corrections and clarifications to Fire Safety in Timber Buildings - May 2013

Available at www.sp.se/FSITB

Corrections are given in red.

Page 30 Table 3.5
The unit in column 3 shall be: Temp. rise, °C

Page 91, line 5 from below

$$\Delta t_2 = 0,22 t_{prot,1} - 0,1 t_{prot,0,2} + 4,7 = 0,22 \times 30 - 0,1 \times 11,40 \ +4,7 = 5,5 \text{ min}$$

Page 113, Figure 6.20 b
$h_{char,2b}$ *shall be* $h_{char,3}$

Page 117, from line 13

The notional charring depth at 60 minutes is:

$$d_{char,n} = \beta_0 (t_f - t_{ch}) k_s k_n k_2 + \beta_0 (t - t_f) k_s k_n k_3$$

$$= 0,65 \times (50,7\text{-}28) \times 1,3 \times 1,5 \times 0,94 + 0,65 \times (60\text{-}50,7) \times 1,3 \times 1,5 \times 2,825 = 60,3 \text{ mm}$$

The dimensions of the residual cross-section of the studs are

$$b_r = 45 \text{ mm}$$

$$h_r = 145 - \ 60,3 = 84,7 \text{ mm}$$

Determination of design value of axial resistance in fire in accordance with EN 1995-1-2 [6.1], Annex C:
Calculate the modification factors for fire (for compressive strength and modulus of elasticity respectively): see EN 1995-1-2, Expressions (C.13) and (C.14):

$$k_{mod,fc,fi} = a_0 - a_1 \frac{d_{char,n}}{h} = 0,55 - 0,40 \times \frac{60,3}{145} = 0,38$$

$$k_{mod,E,fi} = b_0 - b_1 \frac{d_{char,n}}{h} = 0,60 - 0,84 \times \frac{60,3}{145} = 0,24$$

The design values of compressive strength and modulus of elasticity are, see Expressions (6.19) and (6.22):

$$f_{c,d,fi} = k_{mod,fc,fi} \, k_{fi} \frac{f_{c,k}}{\gamma_{M,fi}} = 0,38 \times 1,25 \times \frac{21}{1,0} = 10,07 \text{ N/mm}^2$$

$$E_{d,fi} = k_{mod,E,fi} \, k_{fi} \frac{E_{05}}{\gamma_{M,fi}} = 0,24 \times 1,25 \times \frac{7400}{1,0} = 2200 \text{ N/mm}^2$$

With EN 1995-1-1, Expressions (6.21) to (6.29), we get

$$\lambda_y = \frac{\ell_y}{i} = \frac{\ell_y \sqrt{12}}{h_r} = \frac{2800 \sqrt{12}}{84,7} = 114,52$$

$$\lambda_{rel,y} = \frac{\lambda_y}{\pi} \sqrt{\frac{k_{mod,fc,fi} \, f_{c,0,k}}{k_{mod,E,fi} \, E_{0,05}}} = \frac{114,52}{\pi} \sqrt{\frac{0,38 \times 21}{0,24 \times 7400}} = 2,47$$

$$\beta_c = 0,2$$

$$k_y = 0,5 \ 1 + \beta_c \ \lambda_{rel,y} - 0,3 \ + \lambda_{rel,y}^2 \ = 0,5 \times \ 1 + 0,2 \ 2,47 - 0,3 \ + 2,47^2 \ = 3,767$$

$$k_{c,y} = \frac{1}{k_y + \sqrt{k_y^2 - \lambda_{rel,y}^2}} = \frac{1}{3,767 + \sqrt{3,767^2 - 2,47^2}} = 0,151$$

The design value of the axial load resistance of one stud is

$$N_{d,fi} = A_r \, k_{c,y} \, f_{c,d,fi} = \ 45 \times 84,7 \ \times 0,151 \times 10,07 = 5.796 \text{ N} = 5,8 \text{ kN}$$

Page 118, line 4

$d_{ef} = d_{char,n} + d_0 = 60,3 + 28,0 = 88,3$ mm

The effective depth of the cross-section is

$h_{r,ef} = 145 - 88,3 = 56,7$ mm

With $k_{mod,fc,fi} = 1,0$, the design value of compressive strength in fire is calculated as

$$f_{c,d,fi} = k_{mod,fc,fi}\, k_{fi} \frac{f_{c,k}}{\gamma_{M,fi}} = 1,0 \times 1,25 \times \frac{21}{1,0} = 26,25 \text{ N/mm}^2$$

With EN 1995-1-1 [6.16], Expressions (6.21) to (6.29), we get

$$\lambda_y = \frac{\ell_y}{i} = \frac{\ell_y \sqrt{12}}{h_{r,ef}} = \frac{2800\sqrt{12}}{56,7} = 171,1$$

$$\lambda_{rel,y} = \frac{\lambda_y}{\pi}\sqrt{\frac{k_{mod,fc,fi}\, f_{c,0,k}}{k_{mod,E,fi}\, E_{0,05}}} = \frac{171,1}{\pi}\sqrt{\frac{1,0 \times 21}{1,0 \times 7400}} = 2,90$$

$\beta_c = 0,2$

$$k_y = 0,5\,[1 + \beta_c\,(\lambda_{rel,y} - 0,3) + \lambda_{rel,y}^2] = 0,5 \times [1 + 0,2\,(2,90 - 0,3) + 2,90^2] = 4,965$$

$$k_{c,y} = \frac{1}{k_y + \sqrt{k_y^2 - \lambda_{rel,y}^2}} = \frac{1}{4,965 + \sqrt{4,965^2 - 2,90^2}} = 0,111$$

The design value of the axial load resistance of one stud is

$N_{d,fi} = A_1\, k_{c,y}\, f_{c,d,fi} = 45 \times 56,7 \times 0,112 \times 26,25 = 7.501$ N $= 7,5$ kN

Page 121, last line
Add clarification:

The strength of finger joints in the fire situation according to 6.6.4.5 shall be considered. For finger-jointed flanges the load-bearing capacity is modified by means of the factor $k_{mod,fj,fi}$.

Page 158, line 4
Delete the word "~~as~~"

Page 168, Table 9.1
The spacing between lines 5 and 6 shall be as follows:

Type	Description	Classification EN 13501-2
Gypsum boards	Single layer ≥ 10 mm gypsum fibre board on timber battens 45 x 10 mm, butt joints [9.3]	K_2 10
	Two layers 12,5 mm gypsum board type F according EN 520, butt joints, displaced layers [9.4] Single layer 18 mm gypsum fibre board, butt joints [9.5]	K_2 30
	Two layers 18 mm gypsum board type F according EN 520, butt joints, displaced layers [9.6]	K_2 60
	Two layers 18 mm gypsum fibre board, butt joints, displaced layers [9.7]	

Please report further items to be corrected to tratek.bibliotek@sp.se