ANNEX 16

NATIONAL ANNEX

TO STANDARD

SFS-EN 1995-1-1 EUROCODE 5: DESIGN OF TIMBER STRUCTURS
Part 1-1: Common rules and rules for buildings

Preface

This National Annex is used together with standard SFS-EN 1995-1-1:2004.

This National Annex gives:

a) Nationally determined parameters for the following clauses of EN 1995-1-1 where a national choice is allowed.

- 2.3.1.2(2)P
- 2.3.1.3(1)P
- 2.4.1(1)P
- 6.4.3(8)
- 7.2(2)
- 7.3.3(2)
- 8.3.1.2(4)
- 8.3.1.2(7)
- 9.2.4.1(7)
- 9.2.5.3(1)
- 10.9.2(3)
- 10.9.2(4)

b) Guidance on the use of the Annexes A, B and C.

In respect of mandatory reference standards under preparation, their latest prEN versions are applied.

2.3.1.2 Load-duration classes

2.3.1.2(2)P

Examples of load-duration assignment are given in Table 2.2(FI) below.

Table 2.2(FI) Examples of load-duration assignment

Load-duration class	**Loading**
Permanent	Self-weight Machinery, equipment and lightweight partition walls fixed permanently to the structure Earth pressure
Long-term	Storage loads (category E) Water tank load
Medium-term	Snow Uniformly distributed imposed loads on floors and balconies in categories A - D Imposed loads on garages and trafficable areas (categories F and G) Actions due to moisture variation
Short-term	Imposed loads on stairs Concentrated imposed load (Q_k) Horizontal loads on partition walls and parapets Maintenance load or load caused by persons on a roof (category H) Vehicle loads in category E Actions due to transport vehicles Installation loads
Instantaneous	Wind Accidental action

2.3.1.3 Service classes

2.3.1.3(1)

The following sets out additional information on the assignment of structures to service classes given in (2)P, (3)P and (4)P:

Timber structures in heated rooms or in corresponding moisture conditions belong to service class 1. Generally, any structures in thermal insulation and beams with their tension side within thermal insulation may also be included in service class 1.

Service class 2 includes dry timber structures outdoors. Structures should be in a covered and ventilated space and well protected underneath and on the sides from getting wet. For instance, timber structures in a ground floor and cold attic space are usually included in this service class.

Service class 3 includes timber structures exposed to weather, in a damp space outside or subject to the immediate effect of water. When assessing the durability of a timber structure, the service class 3 is further divided into two different sub-classes describing the degree of exposure to moisture (see EN 335-1:2005).

In addition to the average moisture content, attention should be paid to moisture variation in assignment of structures to service classes. The effect of moisture variation on a timber structure may be greater than the effect of high average moisture level. Particular attention should be paid in service class 1 to the risk of timber splitting.

2.4.1 Design value of material property

2.4.1(1)P

Values given in Table 2.3(FI) are used for strength and stiffness properties of materials.

Table 2.3(FI) Partial factors γ_M for material properties and resistances

Fundamental combinations:	
Solid timber and round timber generally	1,4
Coniferous sawn timber in strength class ≥ C35	1,25
Glued laminated timber, LVL	1,2
Wood-based panels	1,25
Connections	*)
Punched metal plate fasteners:	
- anchorage strength	1,25
- plate (steel) strength	1,1
Accidental combinations	1,0

*) In the calculation of the design resistance of a connection, the partial safety factor γ_M of the timber material is used. If two or more timber materials with different partial safety factors are connected together the highest γ_M value is used for the connection.

Alternatively, the lateral load-carrying capacity of metal dowel-type fasteners, $F_{v,Rd}$, may be calculated directly with the design values of the material properties. For the design values of embedment strength and axial withdrawal capacity, $f_{h,d}$ and $F_{ax,Rd}$, the partial and k_{mod} factors of the actual timber material are used in equation (2.14) of EN 1995-1-1. For the yield moment of steel fasteners the partial safety factor γ_M = 1,1 is used, hence $M_{y,Rd} = M_{y,Rk} /1,1$.

The resistances of steel members in a connection are verified according to Eurocode 3 with the partial safety factors of material properties given in the National Annex to EN 1993.

6.4.3 Double tapered, curved and pitched cambered beams

6.4.3(8)

The tensile stresses perpendicular to grain in double tapered, curved and pitched cambered beams may be evaluated using equation (6.55), if the timber has a surface treatment preventing the moisture transfer. Otherwise equation (6.54) is applied.

7.2 Limiting values for deflections of beams

7.2(2)

When deflection of a structure or horizontal deflection of a building is harmful, the serviceability limits of deformations for the characteristic combinations of actions are according to table 7.2 unless due to the type of structure, purpose of use or nature of activity other values can be considered more appropriate. If the wind load is not the leading variable action (Q_{k1}), it may be disregarded in the loading combinations of serviceability limit states.

Table 7.2 - Limiting values for deflections. Deflection of cantilevers may be double.
ℓ is the span width and H is the height of the considered point in building.

Structure	w_{inst} [1)]	$w_{net,fin}$	w_{fin} [2)]
Main girders	$\ell/400$	$\ell/300$	$\ell/200$
Purlins and other secondary girders	-	$\ell/200$	$\ell/150$
Horizontal deflection of the building	-	$H/300$	-

[1)] Applied only to floor members
[2)] Relates to precambered structures and curved or angled structures between supports

7.3.3 Residential floors

7.3.3(2)

The following method is recommended for the vibration design of floors. This replaces clause 7.3.3 of EN 1995-1-1 with fulfilling all its criteria.

Vibrations caused by walking are taken into account in the serviceability limit state design of floors in residential, office and commercial buildings or of floors in other congregate areas.

For floors of residential or office areas with a fundamental frequency less than 9 Hz (f_1 < 9 Hz) a special investigation should be made.

For floors of residential or office areas with a fundamental frequency greater than 9 Hz ($f_1 \geq 9$ Hz) the following requirement should be satisfied, unless otherwise agreed with the client:

$$\delta \leq 0{,}5 \text{ mm} \qquad (7.3)$$

where δ is the maximum instantaneous deflection of floor beam caused by a vertical concentrated static force of 1 kN.

For small rooms, the allowed deflection of 0,5 mm may be increased by a factor k presented in figure 7.2.

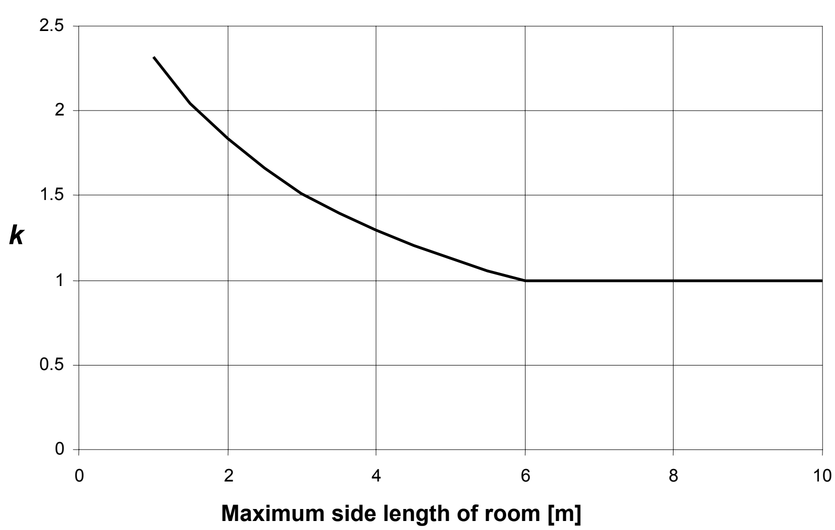

Figure 7.2 The increasing factor k for the deflection limit.

In the addition to deflection of floor beam δ, the local deflection of skin plate or floating floor may be at maximum 0,5 mm due to the point load of 1 kN.

For simply supported floor, the fundamental frequency may be calculated as

$$f_1 = \frac{\pi}{2\ell^2}\sqrt{\frac{(EI)_\ell}{m}} \tag{7.4-FI}$$

For two-way bearing floor, the fundamental frequency may be calculated as

$$f_1 = \frac{\pi}{2\ell^2}\sqrt{\frac{(EI)_\ell}{m}} \cdot \sqrt{1+\left[2\cdot\left(\frac{\ell}{b}\right)^2+\left(\frac{\ell}{b}\right)^4\right]\cdot\frac{(EI)_b}{(EI)_\ell}} \tag{7.5-FI}$$

where:

ℓ is the floor span, in m;

b is the width of room, in m;

$(EI)_\ell$ is the equivalent plate bending stiffness of the floor about an axis perpendicular to the beam direction, in Nm^2/m;

$(EI)_b$ is the equivalent plate bending stiffness of the floor about an axis parallel to the beam direction, in Nm^2/m;

m is the mass per unit area calculated as the sum of the self-weight of the floor and the quasi-permanent value of the imposed load ($\psi_2 q_k$), in kg/m^2.

The maximum deflection caused by the point load (F = 1 kN) may be calculated for a simply supported floor as

$$\delta = \min\begin{cases}\dfrac{F\ell^2}{42\cdot k_\delta\cdot(EI)_\ell}\\[2ex]\dfrac{F\ell^3}{48\cdot s\cdot(EI)_\ell}\end{cases} \tag{7.6-FI}$$

where:

$$k_\delta = \sqrt[4]{\frac{(EI)_b}{(EI)_\ell}} \qquad \text{with the restriction: } k_\delta \le b/\ell. \tag{7.7}$$

s is the spacing of floor beams, in m.

The expression (7.6-FI) may be used also for the two-way bearing floor. In that case the restriction $k_\delta \le b/\ell$ needs not to be applied.

These rules, as such, may also be applied for continuous floor beams and slabs. However, in that case the floor structure should not be continuous between different apartments.

8.3.1.2 Nailed timber-to-timber connections

8.3.1.2(4)

NOTE 2
The rules of clause 8.3.1.2(4) are used to determinate the lateral load-carrying capacity of nails in end grain.

8.3.1.2(7)

The rules of clause 8.3.1.2(7) are not applied to nailed joints.

9.2.4.1 General

9.2.4.1(7)

The simplified analysis of wall diaphragms is carried out using method A in accordance with clause 9.2.4.2 of EN 1995-1-1.

9.2.5.3 Bracing of beam and truss systems

9.2.5.3(1)

Values given in Table 9.2(FI) are used for modification factors in design of bracing.

Table 9.2(FI) Values of modification factors.

Modification factor	Value
k_s	$2+2\cos\left(\frac{180^\circ}{m}\right)$ *)
$k_{f,1}$	50
$k_{f,2}$	80
$k_{f,3}$	50

*) m is the number of bays each of length a; $m \geq 2$ (see Figure 9.9 of EN 1995-1-1).

10.9.2 Erection

10.9.2(3)

The maximum bow permitted after installation in bay of any truss member is $a_{bow,perm}$ = 15 mm. The maximum bow permitted in total length of chord $a_{bow,perm}$ = min(L/300; 50 mm), when L is the length of chord.

10.9.2(4)

The maximum permitted deviation of a truss from true vertical alignment $a_{dev,perm}$ = min(10 mm + H/200; 25 mm), when H is the height of the truss in the actual point, in mm.

Annex A
Block shear and plug shear failure at multiple dowel-type steel-to-timber connections

Informative Annex A of EN 1995-1-1 is applied in Finland for steel-to-timber connections in tension as normative with the following additions.

In conjunction with LVL equation (A.1) of EN 1995-1-1 is replaced by

$$F_{\mathrm{bs,Rk}} = \max\begin{cases} 1{,}25 A_{\mathrm{net,t}} f_{\mathrm{t,0,k}} \\ 0{,}7 A_{\mathrm{net,v}} f_{\mathrm{v,0,flat,k}} \end{cases}$$

where:

$f_{\mathrm{v,0,flat,k}}$ is the characteristic flatwise shear strength of LVL.

Block shear capacity shall be verified also for tension stressed two and multiple shear timber-to-timber joints. For timber-to-timber joints equation (A.3) of EN 1995-1-1 simplifies to form

$A_{\mathrm{net,v}} = L_{\mathrm{net,v}} t_1$.

Appendix B
Mechanically jointed beams

Informative Annex B may be used.

Appendix C
Built-up columns

Informative Annex C may be used.