ANNEX 2

# NATIONAL ANNEX

# TO STANDARD

# SFS-EN 1991-1-1 EUROCODE 1: ACTIONS ON STRUCTURES

## Part 1-1: General actions. Densities, selfweight, imposed loads for buildings

Preface

This National Annex is used together with Standard SFS-EN 1991-1-1:2002.

This National Annex sets out:

a) the national parameters for the following paragraphs in Standard SFS-EN 1991-1-1 where national selection is permitted:

- 6.3.1.2(1)P (table 6.2)
- 6.3.1.2(10) & (11)
- 6.3.2.2(1)P (table 6.4)
- 6.3.3.2(1) (table 6.8)
- 6.3.4.2 (table 6.10) and
- 6.4(1) (table 6.12).

b) Guidance for the use of the informative annexes A and B.

6.3.1.2 Values of actions (residential, social, commercial and administration areas)

6.3.1.2(1)P

Table 6.2 (FI) provides values to be used in Finland. When necessary, greater values than the minimum values given in Table 6.2 can be used. The loading area for local effects $Q_k$ is 50 x 50 mm$^2$, when $Q_k$ – 2,0 kN, else 100 x 100 mm$^2$.

Table 6.2 (FI) Imposed loads on floors, balconies and stairs in buildings

| Categories of loaded areas | $q_k$ [kN/m$^2$] | $Q_k$ [kN] |
|---|---|---|
| Category A | | |
| – Floors | 2,0 | 2,0 |
| – Stairs | 2,0 | 2,0 |
| – Balconies | 2,5 | 2,0 |
| Category B | 2,5 | 2,0 |
| Category C | | |
| – C1 | 2,5 | 3,0 |
| – C2 | 3,0 | 3,0 |
| – C3 | 4,0 | 4,0 |
| – C4 | 5,0 | 4,0 |
| – C5 | 6,0 | 4,0 |
| Category D | | |
| – D1 | 4,0 | 4,0 |
| – D2 | 5,0 | 7,0 |

6.3.1.2(10)

The reduction factor $\alpha_A$ for categories A – E is given by equation (6.1 FI):

$$\alpha_A = \frac{5}{7}\alpha_0 + \frac{A_0}{A} \geq 1{,}0 \quad \text{with the restriction } \alpha_A \geq 0{,}7 \qquad \text{(6.1 FI)}$$

where
$\alpha_0$ is the factor according table A1.1 (FI) in the National Annex to standard EN 1990,
$A_0$ = 10,0 m$^2$ and
$A$ is the loaded area

According to clause 6.2.1(4) the reduction factor $\alpha_A$ can only be applied to floors, beams and roofs.

6.3.1.2(11)

The reduction factor $\alpha_n$ is given by equation (6.2 FI):

$$\psi_n = \frac{2 + (n - 2)\psi_0}{n} \qquad \text{(6.2 FI)}$$

where
$n$ is the number of storeys (> 2) above the loaded structural elements from the same category.
$\psi_0$ is the factor according table A1.1 (FI) in the National Annex to standard EN 1990).

According to clause 6.2.2(2) the reduction factor $\psi_n$ can only be applied to columns and walls.

6.3.2.2 Values for actions (areas for storage and industrial activities)

6.3.2.2(1)P (Table 6.4)

Table 6.4 (FI) provides values to be used in Finland.

Table 6.4 (FI) Imposed loads on floors due to storage

| Categories of loaded areas | $q_k$ [kN/m$^2$] | $Q_k$ [kN] |
|---|---|---|
| Category E1 | 7,5 | 7,0 |
| Note: The value of storage load is shown by appropriately located clearly visible and permanent sign. In the sign the load is given as kg/m$^2$. | | |

6.3.3.2 Values of actions (garages and vehicle traffic areas excluding bridges)

6.3.3.2(1) (Table 6.8)

Table 6.8 (FI) provides values to be used in Finland.

Table 6.8 (FI) Imposed loads on garages and vehicle traffic areas*)

| Categories of traffic areas | $q_k$ [kN/m$^2$] | $Q_k$ [kN] |
|---|---|---|
| Category F<br>Gross vehicle weight: –30 kN | 2,5 | 20 |
| Category G<br>30 kN –gross vehicle weight –160 kN | 5,0 | 90 |
| *) According to clause 6.3.3.1(1)P areas designed to categories F and G should be posted with appropriate warning signs.<br><br>If a sign I not posted, areas should be designed in addition to the axle load to an axle group load $Q_k$, equal to 190 kN. In an axle group load the minimum distance between axles can be taken as 1,2 metres. (The distribution of load ½ $Q_k$ is 400 x 400 mm$^2$).<br><br>Adjacent parking and roof structures should when necessary be designed also to loads from fire-fighting and rescue vehicles as well as for the concentrated load of both hydraulic platform and extension ladder vehicles. | | |

6.3.4.2 Values of actions (roofs)

6.3.4.2 (Table 6.10)

Table 6.10 (FI) provides values to be used in Finland.

Table 6.10 (FI) Imposed loads on roofs of category H

| Roof | $q_k$ [kN/m$^2$] | $Q_k$ [kN] |
|---|---|---|
| Category H | 0,4 | 1,0 |
| Note: $q_k$ may be assumed to act on an area not greater than 10 m$^2$. | | |

6.4 Horizontal loads on parapets and partition walls acting as barriers

6.4(1) (Table 6.12)

Table 6.12 (FI) provides values to be used in Finland.

Table 6.12 (FI) Horizontal loads on partition walls and parapets

| Loaded areas | $q_k$ or $Q_k$ |
|---|---|
| Category A | 0,5 kN/m |
| Categories B ja C1 | 0,5 kN/m |
| Categories C2 – C4 and D | 1,0 kN/m |
| Category C5 | 3,0 kN/m |
| Category E | 1,0 kN/m |
| Category F | see annex B *) |
| Category G | see annex B *) |
| Note: For areas of category E the horizontal loads depend on the occupancy. Therefore the value of $q_k$ is defined as a minimum value and should be checked for the specific occupancy.<br>*) Substitute to method given in annex B for structures not functioning as barriers a equivalent static force can be used. This force in Category F should not be less than 5 kN and in Category G not less than 25 kN. | |

# Annex A
# Tables for nominal density of construction materials, and nominal density and angles of response for stored materials

In Finland the values to be used for nominal density of construction materials, and nominal density and angles of repose for stored materials are those corresponding to real values. Unless better evidence is available can, instead of values in Annex A, values given in EN 1992 to EN 1999 or values in EN product standards be used provided that values in these documents are given. Concerning timber materials product standards should not be used, instead for dry softwood and products made out of it by gluing (i.e. gluelam, laminated veneer lumber, veneer and laminboard) a value 5,0 kN/m$^3$ is used for density.

# Annex B
# Vehicle barriers and parapets for car parks

Annex B is used in Finland when designing structures for impact barriers.

ANNEX 1

# NATIONAL ANNEX

# TO STANDARD

# SIS OF STRUCTURAL DESIGN

Preface

This national annex is used together with Standard SFS-EN 1990:2002.

This national annex sets out:

a) the national parameters for the following paragraphs in Annex A1 to Standard SFS-EN 1990 where national selection is permitted:

- A1.2.2 (Table A.1.1)
- A1.3.1 (1) Tables A1.2(A), (B) and (C)
- A1.3.1(5)
- A1.3.2 (Table A.1.3)

b) Guidance for the use of the informative annexes B, C and D.

# Annex A1
# Application to buildings

A.1.2.2 Values of $\psi$ factors

A1.2.2(1)

Table A1.1 (FI) provides values for the symbols of Table A1.1 of EN 1990. The national annex to standard SFS-EN 1993-3-1 is complied with in respect of masts.

Table A1.1: (FI) Values of $\psi$ factors for buildings

| Load | $\psi_0$ | $\psi_1$ | $\psi_2$ |
|---|---|---|---|
| Imposed loads in buildings, category (see EN 1991-1-1) | | | |
| Category A: areas in residential buildings | 0,7 | 0,5 | 0,3 |
| Category B: office areas | 0,7 | 0,5 | 0,3 |
| Category C: congregation areas | 0,7 | 0,7 | 0,3 |
| Category D: shopping areas | 0,7 | 0,7 | 0,6 |
| Category E: storage areas | 1,0 | 0,9 | 0,8 |
| Category F: traffic area, vehicle weight ≤ 30 kN | 0,7 | 0,7 | 0,6 |
| Category G: traffic area, 30 kN < vehicle weight ≤ 160kN | 0,7 | 0,5 | 0,3 |
| Category H: roofs | 0 | 0 | 0 |
| Snow loads on buildings (see EN 1991-1-3)*), when | | | |
| $s_k$ < 2,75 kN/m$^2$ | 0,7 | 0,4 | 0,2 |
| $s_k$ ≥ 2,75 kN/m$^2$ | 0,7 | 0,5 | 0,2 |
| Ice loads **) | 0,7 | 0,3 | 0 |
| Wind loads on buildings (see EN 1991-1-4) | 0,6 | 0,2 | 0 |
| Temperature (non-fire) in buildings (see EN 1991-1-5) | 0,6 | 0,5 | 0 |

*) Outdoor terraces and balconies $\psi_0$ = 0 combined with categories A, B, F and G.
Note: In case there are different categories of loads in one building, which cannot clearly be separated into different sections, values for $\psi$ factors giving the most unfavourable effect should be used.
**) Added in the Finnish National Annex

*Commentary: Characteristic values of ice loads are given among others in ISO 12494:2001.*

A1.3.1 Design values of actions in persistent and transient design situations

A.1.3.1(1)

For the design of buildings the Tables A1.2(A) (FI), A1.2 (B) (FI) and 1.2(C) (FI) provide values to be used in Finland for the symbols of Tables A1.2(A), A1.2(B) and A1.2(C) of EN 1990.

*Commentary: Multiplication factor $K_{FI}$ is used only in combinations of actions for persistent or transient design situations according to clause 6.4.3.2. The factor is not used in fatigue or serviceability limit state design situations.*

Table A1.2(A) (FI) Design values of actions (EQU) (Set A)

| Persistent and transient design situations | Permanent actions | | Leading variable action (*) | Accompanying variable actions (*) | |
|---|---|---|---|---|---|
| | Unfavourable | Favourable | | Main (if any) | Others |
| (Eq. 6.10) | 1,10 $K_{FI}G_{kj,sup}$ | 0,90 $G_{kj,inf}$ | 1,50 $K_{FI}Q_{k,1}$ | | 1,50$K_{FI}$ $\psi_{0,i}Q_{k,I}$ |

(*) Variable actions are those considered in Table A1.1

$K_{FI}$ depends on the reliability class given in table B2 of Annex B as follows:

In reliability class RC3 $K_{FI}$ = 1,1
In reliability class RC2 $K_{FI}$ = 1,0
In reliability class RC1 $K_{FI}$ = 0,9.

The reliability classes are associated with the consequence classes CC3 … CC1 given in Annex B.

Table A1.2(B) (FI) Design values of actions (STR/GEO) (Set B)

| Persistent and transient design situations | Permanent actions | | Leading variable action (*) | Accompanying variable actions (*) | |
|---|---|---|---|---|---|
| | Unfavourable | Favourable | | Main (if any) | Others |
| (Eq. 6.10a) | $1{,}35K_{FI}\ G_{kj,sup}$ | $0{,}90\ G_{kj,inf}$ | | | |
| (Eq. 6.10b) | $1{,}15K_{FI}\ G_{kj,sup}$ | $0{,}90\ G_{kj,inf}$ | $1{,}5K_{FI}\ Q_{k,1}$ | | $1{,}5\ K_{FI}\ \psi_{0,i}Q_{k,i}$ |

(*) Variable actions are those considered in Table A1.1

Note 1. This can be expressed as a design formula in such a way that the most unfavourable of the two following expressions is used as a combination of loads when it should be noted that the latter expression only contains permanent loads:

$$\begin{cases} 1{,}15\,K_{FI}\,G_{kj,sup} + 0{,}9\,G_{kj,inf} + 1{,}5\,K_{FI}\,Q_{k,1} + 1{,}5\,K_{FI}\sum_{i>1}\psi_{0,i}\,Q_{k,i} \\ 1{,}35\,K_{FI}\,G_{kj,sup} + 0{,}9\,G_{kj,inf} \end{cases}$$

$K_{FI}$ depends on the reliability class given in table B2 of Annex B as follows:

In reliability class RC3 $K_{FI} = 1{,}1$
In reliability class RC2 $K_{FI} = 1{,}0$
In reliability class RC1 $K_{FI} = 0{,}9$.

The reliability classes are associated with the consequence classes CC3 … CC1 given in Annex B.

Note 2: See also standards SFS-EN 1992 to SFS-EN 1999 for $\gamma$ values to be used for imposed deformations.

Note 3: The characteristic values of all permanent actions from one source are multiplied by $\gamma_{G,sup}$ if the total resulting action effect is unfavourable and $\gamma_{Q,inf}$ if the total resulting action effect is favourable. For example, all actions originating from the self weight of the structure may be considered as coming from one source; this also applies if different materials are involved.

Note 4: For particular verifications, the values for $\gamma_G$ and $\gamma_Q$ may be subdivided into $\gamma_g$ and $\gamma_q$ and the model uncertainty factor $\gamma_{sd}$. A value of $\gamma_{sd}$ = 1,05 … 1,15 can be used in most common cases.

Note 5: In respect of geotechnical design of foundations, see standard SFS-EN 1997-1 with its National Annex.

Table A1.2(C) (FI) Design values of actions (STR/GEO) (Set C)

| Persistent and transient design situation | Permanent actions | | Leading variable action (*) | Accompanying variable actions (*) |
|---|---|---|---|---|
| | Unfavourable | Favourable | | |
| (Eq. 6.10) | $1{,}0K_{FI}\ G_{kj,sup}$ | $1{,}0\ G_{kj,inf}$ | $1{,}3\ K_{FI}Q_{k,1}$ | $1{,}3\ K_{FI}\psi_{0,i}Q_{k,I}$ |

(*) Variable actions are those considered in Table A1.1

$K_{FI}$ depends on the reliability class given in table B2 of Annex B as follows:

In reliability class RC3 $K_{FI} = 1{,}1$
In reliability class RC2 $K_{FI} = 1{,}0$
In reliability class RC1 $K_{FI} = 0{,}9$.

The reliability classes are associated with the consequence classes CC3 … CC1 given in Annex B.

A.1.3.1 (5)

Approach 2 is used in Finland. For verifications of stability of slopes and the total stability Approach 3 is used.

Concerning geotechnical design of foundations see also standard SFS-EN 1997-1 with the National Annex.

A.1.3.2 Design values of actions in the accidental and seismic design situations

A1.3.2.(1)

Table A1.3 (FI) provides values to be used in Finland for the symbols of Table 1.3 of SFS-EN 1990.

Table A1.3 (FI) Design values of actions for use in accidental and seismic combinations of actions

| Design situation | Permanent actions | | Leading accidental or seismic action | Accompanying variable actions (*) | |
|---|---|---|---|---|---|
| | Unfavourable | Favourable | | Main (if any) | Others |
| Accidental (Eq. 6.11a/b) | $G_{kj,sup}$ | $G_{kj,inf}$ | $A_d$ | $\psi_{11}Q_{k1}$ (**) | $\psi_{2,i}\ Q_{k,i}$ |
| Seismic(***) (Eq. 6.12a/b) | $G_{kj,sup}$ | $G_{kj,inf}$ | $\gamma_I A_{Ek}$ or $A_{Ed}$ | | $\psi_{2,i}\ Q_{k,i}$ |

(*) Variable actions are those considered in Table A1.1.
(**) When the main action is other than snow, ice or wind action, the value $\psi_{21}$ is however used.
(***) The seismic design situation should be used only when specified by the client. See also standard SFS-EN 1998-1.

# Annex B
# Management of structural reliability for construction works

The informative annex B is used in Finland concerning consequence classes and $K_{FI}$ factor.

*Commentary: Load factors $K_{FI}$ are not used in fatigue design. Standard SFS- EN 1993-1-9 gives consecuences classes for fatigue loaded structures, which can applied.*

B3.1 Consequences classes

B3.1(1)

Table B1 (FI) of Annex B is given below:

Table B1 (FI) Definition of consequences classes

| Consequences Class | Description | Examples of buildings and civil engineering works |
|---|---|---|
| CC3 | High consequence for loss of human life, or economic, social or environmental consequences very great | The load bearing system[1)] with its bracing parts in buildings which are often occupied by a large number of people for example<br>– residential, office and business buildings with more than 8 storeys[2)]<br>– concert halls, theatres, sports and exhibitions halls, spectator stands<br>– heavily loaded buildings or buildings with long spans.<br>Special structures such as high masts and towers. Ramps as well as embankments and other structures in areas of fine-grained soils in environments sensitive to adverse effects of displacements. |
| CC2 | Medium consequence for loss of human life, economic, social or environmental consequences considerable | Buildings and structures not belonging to classes CC3 or CC1. |
| CC1 | Low consequence for loss of human life and economic, social or environmental consequences small or negligible | 1- and 2-storey buildings, which are only occasionally occupied by people for example warehouses.<br>Structures, which when damaged, don't pose major risk, for example<br>– low basement floors without cellar rooms<br>– roofs, under which there is a load bearing floor and the loft is low<br>– walls, windows, floors and other similar structures, which are mainly loaded horizontally by air pressure difference and which do not have a load bearing or stabilizing function in the load bearing system. |

| | | |
|---|---|---|
| | | – sheeting in structural classes II and III of SFS-EN 1993-1-3<br>– sheeting in structural class I of SFS-EN 1993-1-3 for loads vertical to surface causing bending [3]. |

[1] roofs and floors are however in class CC2 if they do not form a part of the stiffening system of the whole structure. When the structure is composed of independent parts, the consequence class of each part is determined separately.
[2] underground floors included.
[3] does not apply to loads, which are induced when sheeting is used to transfer shear forces parallel to the surface of the sheeting (diaphragm action) or normal forces.

## Annex C
## Basis for partial factor design and reliability analysis

Informative Annex C may be used in Finland.

## Annex D
## Experimental design

Informative Annex D may be used in Finland.