ANNEX 8

NATIONAL ANNEX

TO STANDARD

SFS-EN 1992-1-2 EUROCODE 2: DESIGN OF CONCRETE STRUCTURES

Part 1-2: General rules. Structural fire design

Preface

This National Annex is used together with Standard SFS-EN 1992-1-2:2004.

This National Annex sets out:

a) National parameters for the following paragraphs in Standard EN 1992-1-2 where national selection is permitted.

- 2.1.3 (2)
- 2.3 (2)P
- 3.2.3 (5)
- 3.2.4 (2)
- 3.3.3 (1)
- 4.1 (1)P
- 4.5.1 (2)
- 5.2 (3)
- 5.3.2 (2)
- 5.6.1 (1)
- 5.7.3 (2)
- 6.1 (5)
- 6.2 (2)
- 6.3.1 (1)
- 6.4.2.1 (3)
- 6.4.2.2 (2)

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

c) Complementary information which is not contradictory to the Eurocode Standard.

2.1.3 Parametric fire exposure

2.1.3(2)

No values are given for the average temperature rise $\Delta\theta_1$ and for the maximum temperature rise $\Delta\theta_2$ during the cooling phase of fire.

Explanation:

The requirement for separation function EI is only based on a standard fire and on temperature limits set by it.

The fire safety requirement is also deemed to be satisfied if the if the building is designed and executed based on design fire scenarios which cover the situations likely to occur in the said building. Satisfaction of the requirement is attested case-by-case taking into account the properties and use of the building (The National Building Code of Finland E1:1.3.2).

2.3 Design values of material properties

2.3(2)P

Recommended values $\gamma_{M,fi} = 1.0$ are used for partial safety factors of materials for both thermal and mechanical properties of concrete, reinforcing steel and prestressing steel.

2.4.2 Member analysis

2.4.2(3)

Note 1: Partial safety factors for load in accordance with the National Annex to Standard SFS-EN 1990 are used in Finland. An equivalent conforming to Fig. 2.1 in Standard SFS-EN 1992-1-2 is set out in Fig. 2.1(FI) below where the reduction factor has been calculated as a function of the load ratio $Q_{k,1}/G_k$ using values of partial safety factors used in Finland.

Note 2: As a simplification, the recommended value of $\eta_{fi} = 0.7$ may be used.

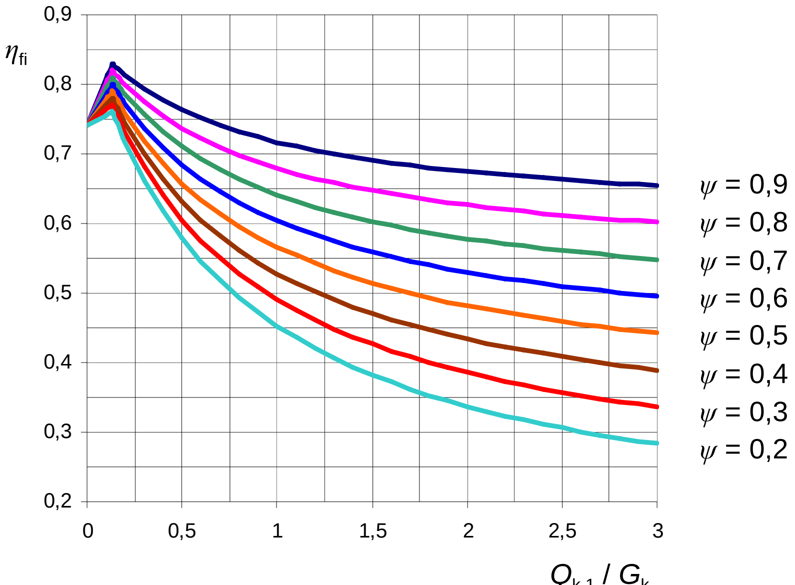

Fig. 2.1(FI) Variation of the reduction factor η_{fi} as a function of the load ratio $Q_{k,1} / G_k$ using values of partial safety factors of load in accordance with the National Annex to EN 1990

3.2.3 Reinforcing steel

3.2.3(5)

Class N (Table 3.2a) may be used for all reinforcing steels conforming to standards valid in Finland.

Class X (table 3.2b) may be used with the following additional conditions:
Strength characteristics at elevated temperatures are determined, as applicable, by applying Standard SFS-EN 10002-5.
Strength characteristics of reinforcing steel at elevated temperatures are subject to initial type testing at temperatures 300°C, 400°C, 450°C, 500°C and 550°C.
Requirements for 0.2% proof strength $R_{p0.2}$ are given in Table 3.2(FI) where f_{yk} is nominal yield strength or 0.2% proof stress of the reinforcing steel at room temperature.

Table 3.2(FI) Strength requirements of reinforcing steel at elevated temperatures

Temperature (°C)	$R_{p0.2}$ (% f_{yk})
300	87
400	80
450	70
500	60
550	45

3.2.4 Prestressing steel

3.2.4(2)

Both classes A or B may be used in Finland.

3.3.3 Thermal conductivity

3.3.3(1)

Lower limit is used for thermal conductivity.

4.1 General

4.1(1)P

No additional rules for the use of advanced calculation methods are given.

4.5.1 Explosive spalling

4.5.1(2)

When considering a risk of explosive spalling, the value $k = 2.5\%$ is used as a limit value.

5.2 General design rules

5.2(3)

No deviating values are given for the load level, $\eta_{fi} = 0.7$ is valid.

5.3.2 Method A

5.3.2(2)

Note 1: The limit value of $e_{max} = 0.4h$ (and b) is used for eccentricity.

5.6.1 General

5.6.1(1)

Class WC is used for web thickness.

5.7.3 Continuous solid slabs

5.7.3(2)

No additional rules on rotation capacity on supports are given.

6.1 General

6.1.(5)

When reducing the strength of high strength concrete at elevated temperatures, Class FI in accordance with Table 6.1(FI) is used for all strength classes of concrete.

Table 6.1(FI) Reduction of strength at elevated temperatures

Temperature of concrete θ °C	$f_{c,\theta}/f_{ck}$ Class FI
20	1.00
50	1.00
150	0.75
300	0.75
800	0.15
900	0.08
1000	0.04
1100	0.01
1200	0.00

6.2 Spalling

6.2(2)

Method A: Not used

Method B: May be used

Complementary information to Method B:
Types of concrete with the following characteristics have been shown to be acceptable:
- cement CEM I 42,5 (or 52,5) R
- maximum content of silica fume 10% of the weight of cement,
- natural aggregate and

- after the concrete has attained about 60% of its nominal strength, it is allowed to dry, i.e. no long-term moisture curing may be used.

Method C: May be used

Method D: May be used

6.3 Thermal properties

6.3(1)

Note 1: A lower limit value is used for thermal conductivity of high strength concrete in accordance with paragraph 3.3.3.

6.4.2.1 Columns and walls

6.4.2.1(3)

For Class FI, factor k = 1.3 is used. Class FI is defined in Table 6.1(FI) above.

6.4.2.2 Beams and slabs

6.4.2.2(2)

The factors k_m in Table 6.2N are not valid for Class FI (defined in Table 6.1(FI) above). More accurate methods are used instead, e.g. 400ºC isotherm as for columns and walls in paragraph 6.4.2.1.

6.4.3 Tabulated data

6.4.3(1)

Complementary information:
Axis distance of reinforcement may be adjusted by using more accurate methods in paragraph 5.2. When taking into account that thermal conductivity for high strength concrete according to the Finnish National Annex is the same as for normal strength concrete, the outcome of the use of more accurate methods is that there is no need to increase the axis distance by factor k.

Annex A
Temperature profiles

Annex may be used

Annex B
Simplified calculation methods

Annex may be used, but not for parametric fire.

Annex C
Buckling of columns under fire conditions

Annex is used in connection with Method B.

Annex D
Calculation methods concerning shear, torsion and anchorage

Annex is not used unless the results are separately verified.

Annex E
Simplified calculation method for beams and slabs

Annex may be used, unless there are more detailed calculations.