Boverket mandatory provisions amending the board’s mandatory provisions and general recommendations (2011:10) on the application of European design standards (Eurocodes), EKS

Consolidated Version – as last amended by BFS 2015:6 EKS 10

Section A – General provisions

General

Article 1 This statute contains mandatory provisions and general recommendations for Chapter 3, Article 7 and 8, 1 of the Planning and Building Ordinance (2011:338), PBF. Those articles set out requirements on the mechanical resistance, stability and durability of structures as well as of the mechanical resistance in case of fire. The statute also contains mandatory provisions and general recommendations for Chapter 8, Article 7 of Planning and Building Act (2010:900), PBL, on retrofitting of buildings and general advice for Chapter 10, Article 5 on the developer’s responsibility in said Act. (BFS 2015:6).

General recommendation
Additional mandatory provisions and general recommendations on essential technical requirements for buildings are given in Boverket’s building regulations (BFS 2011:6).

Chapter 10, § 6 of the Planning and Building Ordinance states that the Swedish Transport Agency has the right to issue provisions on technical requirements for railways, subways, tramways, roads and streets and facilities that belong to them. (BFS 2015:6).

Provisions

Article 2 The provisions apply to
- the construction of a new buildings,
- retrofitting of buildings to the extent that follows from §§ 31–38, and
- earth and demolition works. (BFS 2015:6).

General recommendation
Chapter 1, Article 4 of the Swedish Planning and Building Act (2010:900), PBL, states that major renovation and extensions are also included in the concept of retrofitting to buildings. (BFS 2015:6).

The provisions similarly apply to applicable parts to the construction and modification of civil engineering works other than buildings, where shortcomings in the mechanical resistance, stability and durability of the structure may cause a risk of disproportionate damages. The provisions do not apply to rock tunnels and rock cavities. (BFS 2015:6).
General recommendation
Examples of risk of disproportionate damages include the risk of serious personal injury or the risk of serious damage to crucial public functions. (BFS 2015:6).

Minor deviation from the mandatory provisions of this statute

Article 3 The building committee may, in individual cases, allow minor deviation from the provisions of this statute on the condition that there are special reasons, that the construction project can still be assumed to be technically sound, and that there are no significant inconvenience from any other perspective. (BFS 2015:6).

General recommendation
If the building committee allows for minor deviations, this should be explained in the notification of commencement of work. (BFS 2015:6).

The general recommendations

Article 4 The general recommendations contain recommendations concerning the application of the mandatory provisions in this statute and indicate how someone can or should do to comply with the mandatory provisions.

The general recommendations may also contain some explanatory or editorial information.

The general recommendations are preceded by the words “General recommendations” which are printed using smaller, indented text next to the provision it refers to. (BFS 2015:6).

Terminology

Article 5 Terms that are not explained separately in PBL, in PBF or in this statute shall have the meaning given in the Swedish Centre for Terminology publication Planning and Building Terms 1994, TNC 95. (BFS 2015:6).

General recommendation
It should be noted that the Eurocodes also contain definitions. (BFS 2015:6).

Mechanical resistance

Article 6 Structures and structural elements shall with sufficient reliability have a mechanical resistance equal to or greater than the effect of action during construction and design working life. The construction works shall also have static equilibrium such that the effect of stabilising actions is equal to or greater than the effect of destabilising actions. (BFS 2015:6).

General recommendation
Examples effects of action that should be considered include bending moments, shear forces, tensile forces, compressive forces and instability phenomena such as warping and buckling. (BFS 2015:6).
Requirements in ultimate limit states

Reliability index

**Article 7** The reliability index, \( \beta \), defined in accordance with SS-ISO 2394, for a structural element in ultimate limit states shall be

\[ \geq 3.7 \] for reliability class 1,
\[ \geq 4.3 \] for reliability class 2,
\[ \geq 4.8 \] for reliability class 3.

The indicated \( \beta \)-values refer to the reference time 1 year.

Use of the specified reliability indexes in reliability classes 2 and 3 requires, as a precondition, design inspection according to Article 25.

Acceptance inspection of materials and products, and inspection of execution in accordance with Articles 26 and 27 is a condition for all verification that involves mechanical resistance. *(BFS 2015:6).*

**General recommendation**

If a probabilistic method is used, the rules regarding the partial factor method should provide guidance.

Specified partial factors in ultimate limit states are calculated according to the above specified \( \beta \)-values and are based on calibration according to the NKB-publication No 55, *Recommendations for loading and safety regulations for bearing structures, 1987.* [Guidance on load and safety regulations for load-bearing structures.]

The classification of structural elements into reliability classes in this statute only considers the risk of serious injuries to humans, while the definition of the Eurocode consequence classes to a certain extent also include social or environmental consequences of a failure.

Reliability classes under this statute are used to obtain reliability variations depending on the consequences of failure. The Eurocode consequence classes regulate the scope of execution, inspection and documentation. *(BFS 2015:6).*

Method of partial factors

**General recommendation**

**Article 8** Verification of mechanical resistance in this statute is based on the partial safety factor method. The values of the partial safety factors (\( \gamma_x \), \( \psi_n \), etc.) can be considered to be related to a probabilistic method and target values for reliability index \( \beta \). The value of \( \beta \) indicates how many standard deviations the formal ultimate limit is from the mean in a probabilistic model. Reliability class 1 requires a reliability index \( \beta \geq 3.7 \), which formally corresponds to a maximum permitted probability of failure of \( 10^{-4} \).

Reliability classes 2 and 3 require a reliability index of \( \beta \geq 4.3 \) and \( \beta \geq 4.8 \), respectively. This corresponds to a maximum permitted probability of failure of \( 10^{-5} \) and \( 10^{-6} \), respectively.

Characteristic values for permanent actions (e.g. self-weight) normally correspond to means. Characteristic values for (temporally) variable loads normally correspond to the 98 % fractile of the maximum values for a reference period of 1 year. This means that the characteristic load on average can be expected to be exceeded once during a 50 year period. The reference period of one year is natural for climatic loads such as snow load and wind load as well as traffic loads, for example; i.e. loads that exhibit seasonal variations. Even for other variable loads such as imposed loads on floor structures, the characteristic value should be perceived statistically in the same way, i.e. that the characteristic value formally can be assumed to be exceeded on average once per 50 years.
Characteristic strength for materials is normally defined as the 5% fractile. This means that for a very extensive series of tests, the value selected as the characteristic value is that which is undershot in a maximum of 5% of the test results. The degree of confidence that this value is correct is 75% for most materials. For masonry products however, mean values are used with 95% confidence. For reinforcing steel, the characteristic value is defined as the 5% fractile but with a confidence level of 90%.

(BFS 2015:6).

**Conflicting partial factors**

**Article 9** When partial factors that are based on the same fractile differ in this statute from those in other sources, the values in this statute shall be used for the verification of the mechanical resistance and stability of the structure. (BFS 2015:6).

**General recommendation**

Examples of the above type of sources could be product manuals or product specifications. (BFS 2015:6).

Classification of structural elements in reliability classes

**Article 10** Structural elements may be assigned to reliability class 1, if at least one of the following requirements is met

1. people are present only in exceptional cases, in, on, under or near the structure
2. the structural element is of the type that a failure cannot reasonably be expected to cause serious personal injury, or
3. the structural element has such properties that a failure does not lead to collapse, but only to the loss of serviceability. (BFS 2015:6).

**Article 11** Structural elements are to be assigned to reliability class 3 if the following conditions simultaneously apply

1. the structure is designed and used in such a way that many people often stay in, on, under or next to it,
2. the structural element is of the type that a collapse means a major risk of serious personal injury, and
3. the structural element has such properties that a failure results in immediate collapse. (BFS 2015:6).

**Article 12** The structural elements that are not covered by Articles 10 and 11 shall at least be assigned to reliability class 2. (BFS 2015:6).

**Article 13** Given the extent of the personal injuries that are likely to result from a failure of a structural element, the element is assigned to one of the following reliability classes

a) Reliability class 1 (low), minor risk of serious personal injury,
b) Reliability class 2 (normal), some risk of serious personal injury, or
c) Reliability class 3 (high), major risk of serious personal injury. (BFS 2015:6).

**General recommendation**

Examples of selection of reliability class for various building elements of different types of structures.
**A**

Two-and multi-storey residential buildings (excluding single-unit houses), office buildings, department stores, hospitals, and schools

The following structural elements should be assigned to reliability class 3:

- The building’s main structural system, including the structural elements that are indispensable for the stability of the system.
- Other structural elements such as columns, beams, and panels, whose failure would cause a floor surface $>150 \text{ m}^2$ to collapse.
- Stairs, balconies, galleries, and other structural elements which form part of the building’s escape routes.

The following structural elements should be assigned to reliability class 2:

- Floor beams not assigned to reliability class 3.
- Floors
- Roof constructions other than lightweight stressed skin bearing structures of non-brittle materials.
  - Those parts of heavy, exterior wall constructions (mass per area $\geq 50 \text{ kg/m}^2$), which are located higher than 3.5 metres above ground surface and which do not form part of the building’s main structural system.
  - Fastenings for external wall constructions which are located higher than 3.5 metres above the ground surface and which do not form part of the building’s main structural systems.
  - Heavy partition walls (mass per area $\geq 250 \text{ kg/m}^2$) that do not belong to the building’s main structural systems.
  - Fastening of heavy ceilings (mass per area $\geq 20 \text{ kg/m}^2$).
  - Stairs not assigned to reliability class 3.

The following structural elements should be assigned to reliability class 1:

- Lightweight stressed skin bearing roof structures (mass per area $\leq 50 \text{ kg/m}^2$) of non-brittle materials.
- Lightweight secondary exterior wall structures of non-brittle materials.
- All secondary exterior wall structures (such as wall studs) in the building’s ground floor.
- Lightweight, non-bearing interior walls.
- Fastening of lightweight ceilings.
- Plinth beams which do not bear a wall of reliability class 2 or 3.
- Floors on or slightly above ground.

**B**

One-story, hall-type buildings with large span roof construction ($\geq 15 \text{ metres}$) and used as sports halls, exhibition halls, meeting rooms, department stores, schools, and industrial facilities where many people gather
The following structural elements should be assigned to reliability class 3:
- The building’s main structural systems, including wind bracing and stabilising systems.
- Railings to stands etc. close to large differences in level and at which many people can gather.
- Constructions carrying large Bridge Cranes (≥ 15 metre span and ≥ 20 tonnes lifting capacity).

The following structural elements should be assigned to reliability class 2:
- Roof purlins and roof plates that do not have a bracing or stabilising function. Purlins and sheets can be assigned to reliability class 1 if they are fastened in such a way that the roof remains hanging in the event of a failure.
  - Fastening of heavy roof elements (mass per area ≥ 50 kg/m²).
  - Heavy partition walls (mass per area ≥ 250 kg/m²).
  - Heavy ceilings (mass per area ≥ 20 kg/m²).
- Beams for small telfers and girder cranes.

The following structural elements should be assigned to reliability class 1:
- Secondary exterior wall constructions (such as wall studs) with a maximum height of 6 metres.
- Lightweight roof elements.
- Lightweight interior walls.
- Fastening of lightweight ceilings.
- Plinth beams which do not bear a wall of reliability class 2 or 3.
  - Floors on or slightly above ground.

C Single-unit houses and other small buildings with one or two floors
The building’s main structural systems and the stairs should be assigned to reliability class 2. Otherwise, the reliability classes listed in point A can apply.

D One-story buildings with small span roof constructions (< 15 metres) and with the same uses as the buildings in point B
The building’s main structural systems should be assigned to reliability class 2. Otherwise, the reliability classes listed in point B can apply.

E Buildings that people rarely stay in or next to
The building’s main structural system should be assigned to reliability class 2 and its secondary structures to reliability class 1, provided that the fact that people rarely stay in or next to the building can with reasonable certainty be expected to continue in the future. All structural elements in small buildings not greater than single-unit houses can be assigned to reliability class 1.

F Geotechnical constructions
The reliability class for geotechnical structures depends, among other things, on the overlying structures. The foundation can in certain cases be assigned to a lower reliability class than the overlying structure. *(BFS 2015:6).*

**Article 14** For the ultimate limit state design using the partial factor method of SS-EN 1990 to SS-EN 1999, the reliability class for a structural element is taken into consideration by using the partial factor $\gamma_d$ as follows:

a) Reliability class 1: $\gamma_d = 0.83$.
b) Reliability class 2: $\gamma_d = 0.91$.
c) Reliability class 3: $\gamma_d = 1.0$.
*(BFS 2015:6).*

**Stability**

**Requirements in serviceability limit states**

**Article 15** Structures and structural elements shall have sufficient stability. *(BFS 2015:6).*

*General recommendation*

Structures, or structural elements in the finished building, shall have sufficient stability when troublesome

– ricketiness,
– swaying (oscillations),
– vibrations,
– cracking formation,
– deformations, and
– similar phenomena

occur solely to an acceptable extent.

When designing using a probabilistic method essentially in accordance with SS-ISO 2394, if there are no material-specific requirements, the probability of exceeding the serviceability limit state may be set at $\beta = 1.3$ to 2.3 depending on the type of serviceability limit state. A higher value should be used for irreversible consequences and a lower value can be used for reversible consequences from reaching the limit state.

Calculation of deformations and oscillations should be performed according to the elasticity theory with a calculation model which gives a reasonable description of the structure’s rigidity, mass, damping and boundary conditions. *(BFS 2015:6).*

**Durability**

**Article 16** Structural elements and materials that form part of the load-bearing structure shall either be naturally durable or made durable through protective measures and maintenance so that the requirements for ultimate and serviceability limit states are met over the structure’s working life. If permanent protection is not possible, anticipated changes in the properties shall be taken into consideration in the design. In case of preconditioned maintenance, structures shall be formed so that the affected parts would become accessible for regular maintenance and protective measures. *(BFS 2015:6).*

*General recommendation*
Additional requirements regarding materials or protective measures with regard to the impact on the indoor environment, local environment and microbial growth can be found in sections 6:11 and 6:5 in Boverket’s Building Regulations (BFS 2011:6), BBR. (BFS 2015:6).

Materials

Article 17 Material for bearing structures, including soil and rock, shall have known, suitable, and documented properties with regard to those aspects that are of significance for their use. (BFS 2015:6).

Construction products with assessed characteristics

Methods of assessment

Article 18 In this statute, construction products with assessed characteristics refer to products that are manufactured for permanent incorporation in a structure and which either

a) are CE marked,

b) are type-approved and/or production controlled under the provisions of Chapter 8. Articles 22-23 of PBL,

c) have been certified by a certification body that is accredited for the purpose and for the product in question under regulation (EC) No 765/2008 of July 9, 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing regulation (EEC) No 339/93, or

d) have been manufactured in a factory whose manufacture, production control, and the result thereof for the construction product are continuously monitored, assessed, and approved by a certification body accredited for the purpose and the product in question in accordance with regulation (EC) No 765/2008.

In order for the construction product to be regarded as having assessed characteristics, when alternatives c) and d) above are used, verification shall be of sufficient scope and quality so as to ensure that the stated characteristics of materials and products match the reality. The verification shall at least correspond to what is specified for CE marking of a similar product. (BFS 2015:6).

General recommendation

The assessment of characteristics of a construction product under options a), c) or d) does not mean that the product has been evaluated against the Swedish requirements for structures in this statute or in Boverket’s Building Regulations (BFS 2011:6), BBR, but merely that the client/owner shall have confidence in the accompanying declaration of the characteristics of the product. (BFS 2015:6).

Where this statute refers to general recommendations or handbooks in which the terms type-approved or production controlled materials and products are used, these shall be replaced by the term construction products with assessed characteristics in accordance with this article. (BFS 2015:6).

Coexistence period

**Article 19** Harmonized standards and their coexistence periods are published in the Official Journal of the European Union. Other assessment methods than alternative a) in Article 18 apply under the coexistence period. After the coexistence period is alternative a) in Article 18 the only assessment method. This applies as well in cases where an ETA has been issued for the construction product. *(BFS 2015:6).*

Mutual recognition

**Article 20** As with the assessment in accordance with alternatives c) or d) in Article 18, an assessment issued by some other body within the European Union or European Economic Area or in Turkey would also be acceptable if the body is 1. accredited for the task against the requirements in regulation (EC) No 765/2008, or 2. can in some other way provide similar guarantees concerning technical and professional competence and guarantees of independence. *(BFS 2015:6).*

Design and execution

**Article 21** Structures shall 1. be designed and executed by qualified personnel in a professional manner, 2. be designed so that the work can be executed in such a manner that the intended design is achieved and so that the prescribed maintenance can be provided, and 3. be executed in accordance with established construction documents.

It shall be ensured, during execution, that deviations from nominal dimensions do not exceed the relevant tolerances indicated in the construction documents.

Deviations from the construction documents or actions that are not indicated on any construction documents, such as making holes, recesses, and slots, may only be performed after it has been established that the function of the structural element is not compromised. Consultation shall take place, to the extent deemed necessary, with the person responsible for the construction documents.

Provisional bracing shall be arranged for stabilisation during the installation period. *(BFS 2015:6).*

*General recommendation*

Projects in which different people execute different parts of the structural design should have a specifically designated person to coordinate the various parts. *(BFS 2015:6).*

Design by calculation and testing

Design

**Article 22** Design shall be based on calculation, testing or any combination thereof. However, calculation and testing are not required if they are obviously not needed. *(BFS 2015:6).*

*General recommendation*
Calculation and testing may be “obviously not needed” for the erection of simple structures such as smaller porches, garden sheds and the like. (BFS 2015:6).

Calculation models and calculation methods

**Article 23** Calculations shall be based on a calculation method that to a reasonable extent describes the behaviour of the structure in the limit states under consideration. If the uncertainty within a calculation method is high, it shall be taken into account. (BFS 2015:6).

*General recommendation*
Examples of factors that should be considered are:
1. yielding of supports, restraints, and bracing,
2. additional forces and additional moments due to deformities,
3. load eccentricities,
4. interaction between structures/structural elements,
5. time effects, and

Models and methods for testing

**Article 24** Planning, execution and evaluation of testing shall be performed in such a way that the structure obtain the same reliability, in terms of relevant limit states and load conditions, as if the verification was performed by calculation. (BFS 2015:6).

*General recommendation*
Verification of mechanical resistance by testing is mainly relevant when there is no calculation method or when the characteristics of the structure cannot be described with sufficient accuracy by calculations due to, e.g. a lack of input data.
In determining mechanical resistance by testing, the characteristic mechanical resistance should be defined as the lower of 5% fractile determined with a confidence level of 75%.
When high strength is unfavourable, such as the tensile strength of concrete under restrained conditions, the upper 5% fractile should be used determined with a confidence level of 75%.
In determining the deformation properties of a structure, the characteristic value should be defined as the 50% fractile determined with a confidence level of 75%.
SS-EN 1997-1 should be applied to the testing of piles and other geotechnical structures. (BFS 2015:6).

Inspection

Design inspection

**Article 25** Design inspection in this statute refers to the inspection of the design preconditions, construction documents, and calculations. (BFS 2015:6).

*General recommendation*
Design inspection is intended to eliminate major errors. The inspection should be performed by a person who has not previously participated in the project. The degree of organisational and financial direct or indirect
autonomy for the person performing the design inspection should be increased for projects of a more complex nature.

Design inspection should normally include verification that
a) the assumptions on which the design is based conform to the requirements that are set out for the building in question,
b) assumptions concerning the properties of building materials and soil and rock are appropriate,
c) assumptions concerning actions and environmental impact on materials are appropriate,
d) selected calculation models are appropriate,
e) selected calculation methods are appropriate,
f) graphical and/or numerical calculations are performed correctly,
g) selected testing methods are appropriate,
h) the calculation results are correctly transferred to the construction documents.

(AFS 2015:6).

Acceptance inspection of material and products

**Article 26** The client/owner must ensure that materials and construction products have such properties that the proper use of the materials and products in the structure will mean that they can meet the properties requirements in this statute and in Boverket’s Building Regulations (BFS 2011:6), BBR.

For the purposes of this statute, acceptance inspection refers to the control performed by the client/owner to ensure that materials and products have the expected properties when they are accepted at the construction site.

If the products have assessed characteristics in accordance with § 18, the acceptance inspection can be limited to identification, inspection of markings and examination of the product declaration that the goods have the expected characteristics.

If the characteristics of the construction products are not assessed in accordance with Article 18, verification shall be required through testing or by some other method approved in the European Union so that the characteristics are known and can be assessed before use. (BFS 2015:6).

**General recommendation**
Construction products whose characteristics have been assessed in accordance with alternatives a), c) or d) in Article 18 in this section, do not entail that the product is assessed against the Swedish requirements for structures in this statute or in Boverket’s Building Regulations (BFS 2011:6), BBR. Assessments of this type shall only mean that the client/owner shall have confidence in the accompanying declaration of the characteristics of the product. Guided by the product declaration, the client/owner can determine whether or not the construction product is suitable for the use in question.

For construction products with assessed characteristics, the client/owner is not required to carry out own testing of these characteristics. (BFS 2015:6).

Inspection of execution

**Article 27** For the purposes of this statute, inspection of execution refers to a check by the client/owner that
1. previously non-verifiable design requirements of significance for safety are met and that
2. the work is carried out in accordance with the relevant specifications, drawings, and other documentation.  
(BFS 2015:6).

*General recommendation*

The extent of the inspection during execution should be in proportion to the consequences of insufficient mechanical resistance in the construction works or the building element. The inspection should be more extensive if there are more serious consequences or risk of substandard execution. Structures and components that are difficult to execute should be inspected in particular. The breakdown of structural elements into reliability classes under Chapter 0 of Section B should serve as guidance in determining the extent of the inspection.

In the case of steel structures, the inspection during execution depends on the execution class concerned. Annex C to SS-EN 1993-1-1 should be applied.

In the case of aluminium structures, the inspection during execution depends on the execution class concerned. SS-EN 1999-1-1 should be applied.

In the case of geotechnical structures, the inspection during execution depends on the geotechnical category. SS-EN 1997-1 should be applied.  
(BFS 2015:6).

**Documentation**

Documentation of calculations and tests

**Article 28** Calculations and any tests performed for verification of the mechanical resistance of the structure shall be documented. The documentation shall be appropriate and complete so that the construction works can be correctly erected and inspected.  
(BFS 2015:6).

*General recommendation*

The documentation should have a layout that enables a third party to inspect it. It should be presented in one single document. 
(BFS 2015:6).

Structural design documentation

**Article 29** The mechanical resistance of a building shall be described in a separate document (the structural design documentation). The description shall present the conditions for the design and execution of the construction works. It shall also describe the structural behaviour of the load-bearing structure. The selected exposure classes and corrosion classes shall also be stated. In addition, the description shall indicate the current regulatory framework that has been applied. The description shall also include information regarding the design inspection and the party that performed it.  
(BFS 2015:6).

*General recommendation*

The conditions for the project design and execution that should be presented are, for example, the choices of loads and actions, load combinations, reliability classes, mechanical models and design working life. In section C, Chapter 1.1.2, Article 4 there is a specific requirement for documentation of the verification of mechanical resistance in the event of fire.  
(BFS 2015:6).
Documentation of Design inspection, Acceptance inspection of material and products and Inspection of execution

**Article 30** The results of the performed inspections shall be documented. Any deviations with associated measures shall be noted, along with other tasks that are significant for the quality of the completed structure. \((BFS\ 2015:6)\).

**Requirements for retrofitting of buildings**

**Article 31** When buildings are retrofitted they shall meet the requirements for mechanical resistance, stability and durability for the erection of new buildings as specified in this statute.

As an alternative to the Eurocodes, other verification models may be used if they provide a safety index that is equal to or higher than those specified in § 7 for each reliability class. \((BFS\ 2015:6)\).

*General recommendation*

Other verification models can be those that were applied when the building was erected. \((BFS\ 2015:6)\).

Departures from the safety index may be made if there are special motives in terms of the condition of the building and the extent of the retrofitting of the building. Rules on this can be found in § 34 of this Section.

The rules on materials, project design, execution, design work and inspection in this section apply mutatis mutandis to retrofitting of buildings. \((BFS\ 2015:6)\).

*General recommendation*

The requirements on mechanical resistance, stability and durability in Chapter 8, § 4 of the Swedish Planning and Building Act (PBL) and Chapter 3, § 7 of the Planning and Building Ordinance (PBF) apply to both the erection of new buildings and retrofitting of buildings. The requirements also apply to the erection and retrofitting of construction works other than buildings. Chapter 1, § 4 of PBL states that a retrofitting of a building is one or more measures that alter a building’s structure, function, mode of use, appearance or cultural historic value.

Chapter 8, § 7 of PBL states that, upon application of the requirements in the context of extensions and other retrofitting of buildings, account shall be taken of the extent of the retrofitting and the requirements of the building. In addition, consideration shall be taken of the provisions on cautiousness and prohibition against vitiation in Chapter 8 of PBL (Swedish Planning and Building Act). \((BFS\ 2015:6)\).

**Requirement for care and restrictions on retrofitting of buildings**

*General recommendation*

**Article 32** Chapter 8, Article 17 in PBL indicates that retrofitting of buildings shall be performed with care. Consideration shall be given to maintaining the building's character and architectural, historical, cultural, environmental and artistic values. The word “values” means that there are desirable properties that shall be retained. If the building is particularly valuable as specified in Chapter 8, Article 13 of PBL, it must not be distorted. This may lead to limitations to the technical solutions that may be possible to implement. Chapter 8, Article 7 of PBL and Chapter 3, Article 23 of PBF state that consideration shall be given to this in the application of
the technical property requirements for all retrofitting of buildings. This applies to major renovation, extension and other retrofittings. (BFS 2015:6).

Limitation to retrofitted part

General recommendation

Article 33  It follows from Chapter 8, Articles 2 and 5 of PBL that the requirements shall apply to the part of the building that is altered. The altered part refers to the part which is physically affected by the measures. For example, it is required that a hole cut into a wall be executed such that the mechanical resistance of the wall remains. However, one cannot impose requirements on the surrounding rooms. If there is a change of use for all or parts of a building, requirement may be imposed on the part whose use is altered.

Restrictions to the changed part do not apply if the entire building or a significant and definable part of the building is to undergo major renovation whereby it is significantly renewed (reconstructed). In this case the requirements in Chapter 8, Articles 2 and 5 shall apply to the whole building unless this is unreasonable. If it is unreasonable to apply the requirements to the entire building, they shall be applied to the entire part that is undergoing significant renewal through reconstruction. Even in these situations, you shall take into account the scale of the retrofitting and the building's conditions. (BFS 2015:6).

Consideration to the building’s conditions and the scope of the retrofitting

Article 34  On the presumption that a building can still be assumed to achieve acceptable characteristics in terms of mechanical resistance, stability and durability, then upon a retrofitting of the building, the applicable safety indices in this statute for the erection of new buildings may be adjusted if, for technical or economic reasons or due to the extent of the retrofitting, it is unjustifiable to take a particular action.

However, the retrofitting must never result in an unacceptable risk to human health or safety. (BFS 2015:6).

General recommendation

The developer should, at the technical consultation, the latest, present the reasons for adjusting a safety index. It should also be made clear as to how the caution requirement under Chapter 8, § 17 of the Swedish Planning and Building Act and the prohibition against vitiation under Chapter 8, § 13 of said Act have been met. This should be appropriately documented in the minutes of the consultation. (BFS 2015:6).

Article 35  In the case of retrofittings that entail increased action-effects on the load-bearing structure, the increased action-effects shall be taken into account. (BFS 2015:6).

General recommendation

In the case of retrofittings that entail increased action-effects on the load-bearing structure, calculation models other than those used for the erection of new buildings may be used, such as the calculation models that were used at the time when the building was erected. (BFS 2015:6).
Conditions of the building

*General recommendation*

**Article 36** An example of a technical reason is that it may not be viable to insert minimum reinforcement into an existing concrete structure.

Economic factors to be considered are those arising from the building’s location and design or technical conditions in general. A low liquidity, however, is not a reason for consideration. *(BFS 2015:6).*

Scope of the retrofitting of buildings

*General recommendation*

**Article 37** The assessment of the scope of the retrofitting may be based on how much of the building is affected and on the consequences of the technical property requirements and the building’s cultural values. A penetration in a wall can often be regarded as a minor retrofitting of buildings, but if this is done in a fire compartment’s boundary or a load-bearing structure, the consequences could be significantly greater. Equally, the repainting of a historically valuable interior may have major consequences for cultural values.

In the event of extensive retrofittings, there are often few or no remaining existing conditions that can motivate a different application of the amending regulations other than the corresponding mandatory provisions for the construction of a new building. The same applies for newly added building elements and extensions.

Normally, higher requirements should be imposed when all or part of the building is assigned a new use compared to when the retrofitting of buildings does not entail any change of use. If the retrofitting is made to give a historically valuable building a new use, there may be more reason to adjust the safety index. However, the starting point must be to choose a use that makes it possible to both retain the building’s cultural values and satisfy the technical property requirements. *(BFS 2015:6).*

Preliminary investigation for retrofitting of buildings

*General recommendation*

**Article 38** Retrofitting of buildings should be preceded by a preliminary investigation which should demonstrate how work on the building’s load-bearing structure affects its mechanical resistance. The preliminary investigation should also clarify the building’s cultural value and other qualities and shortcomings.

The preliminary investigation should be made early enough so that its results can form the basis for the subsequent design. The scope of the preliminary investigation should be adapted to the scope of the measures and the nature of the object. *(BFS 2015:6).*

The application of the Eurocodes

**Article 39** The design and erection of construction works shall make use of such European standards (Eurocodes) as those cited in article 41 to prove compliance with the essential requirement mechanical resistance, stability and durability.

This statute sets out the Nationally Determined Parameters that apply in Sweden for the use of Eurocodes.
In cases where no particular national choice has been made in this statute, the recommendation in the Eurocode apply.

Despite the first paragraph above, as an alternative to the Eurocodes, other calculation methods may be used if they provide a reliability index that is equal to or higher than those specified in article 7 for each reliability class. *(BFS 2015:6).*

**Article 40** Unless otherwise specified in this statute for the respective standards in following chapters, the paragraphs in the standards that are marked with the letter P (principles) after the paragraph number shall be considered to be provisions and the remaining paragraphs (recommendations) shall be considered to be general advice.

Unless otherwise specified in the following chapters, the respective standards retain their informative nature in the context of national application. *(BFS 2015:6).*

**Article 41** The mandatory provisions in this statute refer to the standards and issues stated in the table below. Amendment (A) and corrections (AC), listed in the table, shall be used.

Unless otherwise indicated, the figure and table references in this statute refer to figures and tables in the associated standard.

<table>
<thead>
<tr>
<th>Chapter</th>
<th>English designation, title and version</th>
<th>EN standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter</td>
<td>English designation, title and version</td>
<td>EN standard</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Chapter</td>
<td>English designation, title and version</td>
<td>EN standard</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

**Article 42** Any standard which transposes the EN standard in question into a national standard in another country, without amending the content, is considered to be equivalent to the Swedish edition (SS-EN) of this EN standard. (BFS 2015:6).
General recommendation

Article 43  In the case of translations of the standards that do not conform to the European Committee for Standardisation’s English version, then the English version should serve as guidance, unless otherwise specified in this statute. (BFS 2015:6).
Section B – EN 1990 – Basis of structural design

Chapter 0 – Application of SS-EN 1990 – Basis of structural design

Specifically about the standard

Article 1 In addition to the paragraphs that are marked with the letter "P" after the paragraph number in SS-EN 1990, Articles 6.4.3.1(3) and 6.4.4(1) are to be considered as mandatory provisions. *(BFS 2015:6)*.

Execution, consequence and reliability classes

Article 2 Annex B is not to be applied to differentiation of the reliability of construction works. Differentiation of the reliability of the structure based on the risk of personal injuries shall be done in accordance with Section A, Articles 7–14 and Articles 4–10 in this chapter. *(BFS 2015:6)*.

*General recommendation*

Otherwise, structural elements can be divided into execution classes in order to control the execution and extent of inspection and documentation. This can be done on the basis of reliability classes, geotechnical classes and consequence classes. *(BFS 2015:6)*.

Nationally Determined Parameters

Article 13 Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A1.2.2(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A1.3.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.1.3.1(5)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.1.3.2(1) Table A1.3</td>
<td>National choice made</td>
</tr>
<tr>
<td>Annex D</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

Paragraph A1.1(1)

*General recommendation*

Article 4 Structural elements with design working life category 4 as per 2.3, table 2.1 in SS-EN 1990 – which are assigned to reliability class 2 or 3 and which are not accessible for inspection and maintenance – should be designed for a working life of 100 years unless the construction works are of such a nature that it is evident that the intended design working life is shorter. *(BFS 2015:6).*

Paragraph A1.2.2(1)

Article 5 The values of \( \psi \)-factors in table B-1 apply.

<table>
<thead>
<tr>
<th>Load</th>
<th>( \psi_0 )</th>
<th>( \psi_1 )</th>
<th>( \psi_2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imposed load in buildings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category A: residential rooms and spaces</td>
<td>0.7</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Category B: office premises</td>
<td>0.7</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Category C: places of assembly</td>
<td>0.7</td>
<td>0.7</td>
<td>0.6</td>
</tr>
</tbody>
</table>
### Table B-2
**Design values of actions (EQU) (Set A)**

<table>
<thead>
<tr>
<th>Persistent and transient d. s (^1)</th>
<th>Permanent actions</th>
<th>Leading variable action</th>
<th>Accompanying variable actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unfavourable</td>
<td>Favourable</td>
<td>Main</td>
</tr>
<tr>
<td>(Eq. 6.10)</td>
<td>(\gamma_d 1.1 G_{k,\text{sup}})</td>
<td>0.9 (G_{k,\text{inf}})</td>
<td>When the load is unfavourable: (1.5 Q_{k,1})</td>
</tr>
</tbody>
</table>

\(^1\) Design situations

(BFS 2015:6).

### Article 6
Design values of actions in the ultimate limit states (EQU), set A, shall comply with Table B-2. Partial factor \(\gamma_d\) is determined in Articles 7-14 in Section A.

### Paragraph A1.3.1(1)

#### Article 7
Equations 6.10a and 6.10b shall be applied in the ultimate limit states, which do not include geotechnical actions with design values for actions in accordance with Table B-3. Partial factor \(\gamma_d\) is determined in Section A, Articles 7-14.

When 6.10a is applied it is not permitted to include permanent actions only.

### Table B-3
**Design values of actions (STR/GEO) (Set B)**

<table>
<thead>
<tr>
<th>Persistent and transient d. s (^1)</th>
<th>Permanent actions</th>
<th>Leading variable action</th>
<th>Accompanying variable actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unfavourable</td>
<td>Favourable</td>
<td>Main</td>
</tr>
<tr>
<td>(Eq. 6.10a)</td>
<td>(\gamma_d 1.35 G_{k,\text{sup}})</td>
<td>1.00 (G_{k,\text{inf}})</td>
<td>When the load is Unfavourable: (1.5 \psi_0 Q_{k,1})</td>
</tr>
</tbody>
</table>

\(^1\) Design situations

(BFS 2015:6).
<table>
<thead>
<tr>
<th>Persistent and transient d. s</th>
<th>Permanent actions</th>
<th>Leading variable action</th>
<th>Accompanying variable actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unfavourable</td>
<td>Favourable</td>
<td>Main</td>
</tr>
<tr>
<td></td>
<td>$\gamma_d 1.35 P_k$</td>
<td>$1.00 P_k$</td>
<td>When the load is favourable: 0</td>
</tr>
<tr>
<td>(Eq. 6.10b)</td>
<td>$\gamma_d 0.89\cdot1.35 G_k^{sup}$</td>
<td>$1.00 G_k^{inf}$</td>
<td>When the load is Unfavourable: $\gamma_d 1.5 Q_{k,1}$</td>
</tr>
<tr>
<td></td>
<td>$\gamma_d 1.35 P_k$</td>
<td>$1.00 P_k$</td>
<td>$\gamma_d 1.4 Q_{k,1}$</td>
</tr>
</tbody>
</table>

1 Design situations
(BFS 2015:6).

**Article 8** When Table A1.2(C) in the standard (Set C) is applicable, the design values of loads are to be determined using the parameters specified in Table B-4. Partial factor $\gamma_d$ is determined in Section A, Articles 7-14.

**Table B-4** Design values of actions (STR/GEO) (Set C)

<table>
<thead>
<tr>
<th>Persistent and transient d. s</th>
<th>Permanent actions</th>
<th>Leading variable action</th>
<th>Accompanying variable actions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unfavourable</td>
<td>Favourable</td>
<td>Main</td>
</tr>
<tr>
<td>(Equivalent 6.10)</td>
<td>$\gamma_d 1.10 G_k^{sup}$</td>
<td>$1.00 G_k^{inf}$</td>
<td>When the load is Unfavourable: $\gamma_d 1.4 Q_{k,1}$</td>
</tr>
</tbody>
</table>

1 Design situations
(BFS 2015:6).

**Paragraph A.1.3.1(5)**

**Article 9** When the verification of structural elements involves geotechnical actions as well as resistance of the ground, design method 2 or 3 shall be used with design values in accordance with Table B-3 or B-4 respectively. (BFS 2015:6).

*General recommendation*
Design methods for verification of different types of geo-structures are shown in Chapter 7.1, Article 15. (BFS 2015:6).

**Paragraph A.1.3.2(1) Table A1.3**

**Article 10** For accidental design situations, the main accompanying variable action shall be set to its frequent value ($\psi_1 Q_1$). (BFS 2015:6).

*General recommendations*
For accidental load cases in accordance with Eq. 6.11 in SS-EN 1990, the reduction factor $\alpha_A$ for area reduction should not be combined with the reduction factor for accompanying imposed load, $\psi$. (BFS 2013:10).
Application of annex D

Article 11  Table D.1 in SS-EN 1990 may not be applied when the characteristic values of material parameters and the like are produced from a small sample size test performed on an infinite population. Instead, Table B-5 shall be applied for values of $k_n$. The coefficient of variation shall be regarded as unknown.

Characteristic value of the strength parameter, $X_k$, shall be calculated as follows:

$$X_k = \bar{x} - k_n \cdot \sigma$$

where
- $\bar{x}$ is the sample mean,
- $k_n$ is a coefficient according to Table B-5 for $n$ samples, and
- $\sigma$ is the sample’s standard deviation.

<table>
<thead>
<tr>
<th>$N$</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>$k_n$</td>
<td>3.15</td>
<td>2.68</td>
<td>2.46</td>
<td>2.34</td>
<td>2.25</td>
<td>2.19</td>
<td>2.14</td>
<td>2.10</td>
<td>2.07</td>
<td>2.05</td>
<td>2.03</td>
<td>2.01</td>
</tr>
<tr>
<td>$N$</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>100</td>
<td>$\infty$</td>
</tr>
<tr>
<td>$k_n$</td>
<td>1.99</td>
<td>1.98</td>
<td>1.96</td>
<td>1.95</td>
<td>1.94</td>
<td>1.93</td>
<td>1.89</td>
<td>1.87</td>
<td>1.85</td>
<td>1.83</td>
<td>1.76</td>
<td>1.64</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

Article 12 – 32 has been repealed by (BFS 2015:6).

Section C – EN 1991 – Actions on structures

Chapter 1.1.1 - Application of SS-EN 1991-1-1 – General actions – Densities, self-weight, imposed loads for buildings

Nationally Determined Parameters

<table>
<thead>
<tr>
<th>Article 1</th>
<th>Overview of national choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paragraph in the standard</td>
<td>Comments</td>
</tr>
<tr>
<td>5.2.3(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>5.2.3(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>5.2.3(4)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.3.1.1 Table 6.1</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.3.1.2(1)P Table 6.2</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.3.1.2(10)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.3.2.2(1)P Table 6.4</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.3.3.2(1), Table 6.8</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.4(1)P Table 6.12</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).
Paragraph 5.2.3(2)
Article 2 The nominal depth of ballast shall be 600 mm.

Paragraph 5.2.3(3)
Article 3 The deviations shall be set to ± 10 %.

Paragraph 5.2.3(4)
Article 4 The deviations shall be set to ± 10 %.

Article 5 has been cancelled through (BFS 2015:6)

Paragraph 6.3.1.1 Table 6.1
Article 6 The areas in category C2 shall be assigned to category C5 if the fixed seats can be removed without significant difficulty, and if the area is such that large gatherings of people can take place.

Article 7 Category A is to be supplemented by the following two sub-categories
- Attic floor I: Floors in attic spaces with at least 0,6 m clear height and with a fixed staircase to the loft
- Attic floor II: Floors in attic spaces with at least 0,6 m clear height and with access via a hatch of a maximum size of 1 x 1 m.

Paragraph 6.3.1.2(1)P Table 6.2
Article 8 The values of imposed loads that shall be applied to floors, stairs, and balconies in categories A to D in buildings are given in Table C-1 and in Article 9.

<table>
<thead>
<tr>
<th>Category</th>
<th>Imposed load on floors etc. in buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: residential rooms and spaces</td>
<td>( q_k [\text{kN/m}^2] )</td>
</tr>
<tr>
<td>- Floors</td>
<td>2.0</td>
</tr>
<tr>
<td>- Stairs</td>
<td>2.0</td>
</tr>
<tr>
<td>- Balconies b)</td>
<td>3.5</td>
</tr>
<tr>
<td>- Attic floor I</td>
<td>1.0</td>
</tr>
<tr>
<td>- Attic floor II</td>
<td>0.5</td>
</tr>
<tr>
<td>B: office premises</td>
<td>2.5</td>
</tr>
</tbody>
</table>

C: areas where people may congregate a)
- C1: Spaces with tables, etc. e.g. rooms in schools, cafés, restaurants, canteens, reading rooms, reception areas.
- C2: Spaces with fixed seats, e.g. churches, theatres or cinemas, conference halls, lecture halls, places of assembly, waiting rooms, and waiting rooms at railway stations.
- C3: Unobstructed spaces for people on the move, e.g. museums, exhibition halls, etc. and communications facilities in public buildings, hotels, hospitals, and railway stations.
- C4: Spaces where physical activity may occur, e.g. dance halls, gymnasiums, theatre stages.
- C5: Spaces where large gatherings may be present, such as in buildings designed for public gatherings such
as concert halls, sports halls including standing stands, terraces, communication facilities, and platforms for railways.

<table>
<thead>
<tr>
<th>D: business premises</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1: Premises intended for retail.</td>
</tr>
<tr>
<td>4.0</td>
</tr>
<tr>
<td>D2: Premises in department stores.</td>
</tr>
<tr>
<td>5.0</td>
</tr>
</tbody>
</table>

a Note 6.3.1.1 (2) in EN 1991-1-1. The values in the table do not include dynamic effects.
b On balconies, terraces and stands in stadiums imposed loads need not be assumed to act simultaneously as snow load. (BFS 2015:6).

**Article 9** For balconies in connection with floors in category B, the same load shall be applied as for balconies in category A. For balconies in connection with floors in categories C to D, the same load shall be applied as for the floor.

For stairs in connection with floors in categories B, C1, C2, C3, C4, D1 and D2 the load as per category C3 is applied. For stairs in connection with floors in category C5, the same load for the stairs is applied for the floor.

**Paragraph 6.3.1.2 (10)**

*General recommendations*

**Article 9a** Reduction factors for imposed loads, $\alpha_A$ and $\alpha_n$, can be combined in action set B for Categories A and B when the action effect is assessed using Eq. 6.10b, Table B-3. The factors can even be combined in action set C for categories A and B when the action effect is assessed using Eq. 6.10 Table B-4. (BFS 2013:10).

**Paragraph 6.3.2.2 (1)P Table 6.4**

**Article 10** The values that are to be applied as imposed loads on floors in category E1 are:

- $q_k = 5.0 \text{ kN/m}^2$
- $Q_k = 7.0 \text{ kN}$

**Paragraph 6.3.3.2 (1), Table 6.8**

**Article 11** The recommended values for imposed load shall be applied in categories G and F. Given below are some imposed loads from vehicles that are not covered by categories G and F. These loads shall be applied where they are relevant.

Buildings into which a few loaded heavy vehicles of public roads or streets can be expected to drive, such as for loading or unloading, shall be designed for a load group ($\psi = 0$) in accordance with the following Figure C-1. Load fields shall be placed in the most unfavourable way in the area where the vehicle can drive. In addition, the effect of a braking force $Q_k = 100 \text{ kN}$ in the longitudinal direction of the load field shall be taken into account.

Floors in garages for the parking of large vehicles such as buses and refuse collection vehicles shall be designed to withstand the load of the heaviest type of vehicle that can be envisaged with regard to the total space in the garage. For this load, the load reduction factor $\psi$ shall be set to 1.0.

Floors for yards in which only emergency vehicles, small goods vehicles or work vehicles may be expected to drive shall be designed for 40% of a load group ($\psi = 0$) as follows in Figure C-1 and for the effect of a braking force $Q_k = 50 \text{ kN}$. As for the placement of the load group and braking force, the details indicated above for a few loaded heavy vehicles of public road and street traffic shall apply.
If a special vehicle with a design determined by its functions is found in a building, such as a bus or cargo terminal, fire station or aircraft hangar, the structural elements shall be designed for both the vehicle’s wheel load as well as the additional load due to the dynamic contribution. These loads shall be determined according to vehicle type and nature of the trafficked surface, e.g. in terms of roughness. Load reduction factor $\psi$ shall normally be set to 1.0.

*General recommendation*

A lower value for the load reduction factor $\psi$ for special vehicles may be used if it is justified by the nature of the activity. The dynamic contribution should in such cases be assumed to be at least 25 %, if it is not shown through a special examination that a lower value is justified.

Columns, walls, and similar structures, which may be subjected to collisions, shall be at least designed for a concentrated horizontal load $Q_k = 5 \text{ kN} \ (\psi = 0)$. 

Paragraph 6.4(1)P, Table 6.12

**Article 12** In areas of category C5, the edges of a balcony below the railing shall be designed for concentrated load of 3.0 kN acting at a discretionary point. In addition, the recommended values in Table 6.12 for the horizontal loads on partition walls and railings acting as barriers shall be applied. *(BFS 2013:10).*

*General recommendations*

The recommended load shall be placed at the most unfavourable location for the individual structural part. *(BFS 2013:10).*
Chapter 1.1.2 – Application of SS-EN 1991-1-2 – Actions on structures exposed to fire

General

*General recommendation*

**Article 1** The design of mechanical resistance in the event of fire should follow from the process for fire design described in SS-EN 1990 5.1.4. In this section, the fire load is specified per m$^2$ of floor area, see also Article 15.

**Fire safety class**

**Article 2** Structural elements shall be assigned to fire safety classes in accordance with Table C-2, based on the risk of personal injury if the structural element collapses during a fire. The following shall be taken into account when making the assessment:

a) the risk that individuals, such as people evacuating the building or rescue personnel, being present in the damaged area,

b) secondary effects that may arise, such as progressive collapse of adjacent parts of the load bearing system,

c) the impact on functions of the building that have a significant effect on the ability for evacuation and emergency response.

**Table C-2** Fire safety class is defined in accordance with the following table

<table>
<thead>
<tr>
<th>Fire safety class</th>
<th>Risk of personal injury following collapse of structural element</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Insignificant</td>
</tr>
<tr>
<td>2</td>
<td>Slight</td>
</tr>
<tr>
<td>3</td>
<td>Moderate</td>
</tr>
<tr>
<td>4</td>
<td>Large</td>
</tr>
<tr>
<td>5</td>
<td>Very large</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

*General recommendation*

Examples of the factors to be considered include the type of building and occupancy, as described in Section 5:22 in Boverket’s Building Regulations (BFS 2011:6), BBR.

Examples of appropriate classifications of structural elements are provided in Tables C-3–C-5.

*(BFS 2015:6).*
<table>
<thead>
<tr>
<th>Fire safety class</th>
<th>Examples of structural elements in a Br1 building</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Certain structural elements in safety class 1, eaves of buildings with up to four stories or non-load bearing interior walls.</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Landings and flights of stairs that serve as escape routes, balconies without common load bearing elements.</td>
</tr>
<tr>
<td>4</td>
<td>Certain structural elements in safety class 2, floors in buildings up to eight floors and certain structural elements in safety class 3 in buildings with a maximum of four storeys.</td>
</tr>
<tr>
<td>5</td>
<td>Certain structural elements in safety class 3 in buildings with 5 or more storeys. Structural elements belonging to the building’s main structural system and are located below the top basement level.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fire safety class</th>
<th>Examples of structural elements in a Br2 building</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Certain structural elements in safety class 1, eaves, non-bearing interior walls, canopies or balconies without a common structural element. Secondary structures such as purlins, roofing sheets that only transfer load etc. that are not designed to contribute to the overall stability of the structure. Structural elements belonging to the building’s main structural systems, which are not located below the uppermost basement level, and which in the event of collapse do not result in a total collapsed area* larger than 300 m² in buildings with operations that belong to occupancy class 1 (Vk1) or a total collapsed area* larger 150 m² collapsed area in buildings with operations that belong to occupancy class 2 (Vk2). As an alternative to the permitted collapse area, a main structural system with a bearing length of ≤ 30 m in Vk1 and roof trusses with a bearing length of ≤ 15 m in Vk2, respectively, can be assigned to fire safety class 1. However, this requires that any secondary structures do not have longer bearing lengths than those indicated here.</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Structural elements belonging to the building’s main structural system. Landings and flights of stairs that serve as escape routes and are located below the top basement level.</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Structural elements belonging to the building’s main structural system that are located below the top basement level.</td>
</tr>
</tbody>
</table>

* Collapsed area, for a column, refers to the entire area that the building element (the column) supports and bears a load from. In the case of a roof truss, that
means the entire distance to its other seating and the entire distance to adjacent trusses on both sides of the truss that is supported by the column. Collapsed area is calculated similarly for other structural members.

Secondary framing systems in the roof framework of Br2 buildings that have a lateral stabilising function can be assigned to fire safety class 1. This applies on the condition that the building will remain stable even when roofing sheets, purlins, or the like are assumed to have collapsed in two adjacent bays for a stretch of half of the pitch, though a maximum of 15 meters. Secondary structures outside of the collapse area can be regarded as unaffected by the fire when the overall stability of the building is verified.

<table>
<thead>
<tr>
<th>Table C-5</th>
<th>Fire safety class in Br3-building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire safety class</td>
<td>Examples of structural elements in a Br3 building</td>
</tr>
<tr>
<td>1</td>
<td>Structural elements in Br3-buildings not classified as fire safety class 2–5 in this table.</td>
</tr>
<tr>
<td>2</td>
<td>Structural elements belonging to the building’s main structural systems in residential buildings.</td>
</tr>
<tr>
<td>3</td>
<td>Landings and flights of stairs that serve as escape routes and are located below the top basement level.</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Structural elements belonging to the building’s main structural system that are located under the top basement level.</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

**Article 3** Building elements needed to maintain the function of a fire compartment boundary or other separating construction shall be designed so that the function is maintained for the intended period of time. (BFS 2015:6).

**General recommendations**

Examples of appropriate classification are provided by Table C-6.

Requirements for fire compartments follow from Section 5:53 in Boverket’s Building Regulations (BFS 2011:6), BBR.

<table>
<thead>
<tr>
<th>Table C-6</th>
<th>Fire safety class and fire compartments and sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire safety class</td>
<td>Examples of structural elements required to maintain fire compartment or section boundaries*</td>
</tr>
<tr>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Structural elements required to maintain separating structures corresponding to fire resistance class EI 15.</td>
</tr>
<tr>
<td>3</td>
<td>Structural elements required to maintain separating structures corresponding to fire resistance class EI 30.</td>
</tr>
<tr>
<td>4</td>
<td>Structural elements required to maintain separating structures corresponding to fire resistance class EI 60.</td>
</tr>
<tr>
<td>5</td>
<td>Structural elements required to maintain separating structures corresponding to fire resistance class EI 90.</td>
</tr>
</tbody>
</table>

* Fire compartment boundaries intended for spaces with a fire load higher than 800 MJ/m² may require a higher fire safety class or design in a higher fire resistance class. See also Section 5:53 in Boverket’s Building Regulations (BFS 2011:6), BBR.
A stairway which constitutes the only escape route in a building shall always be designed for accidental actions. (BFS 2015:6).

**General recommendations**

Designing for accidental action should be done according to method a) in Section 3.3(2) of EN 1991-1-7 and § 2a of Chapter 1.1.7 below if there is no specified accidental action. If there is a specified accidental action, the stairway shall be designed for it if it provides greater action-effect than the unspecified. (BFS 2015:5).

**Documentation**

**Article 4** The description of the design of mechanical resistance in the event of fire shall be included in the fire protection documentation that shall be prepared in accordance with Section 5:12 in Boverket’s Building Regulations (BFS 2011:6), BBR.

**General recommendation**

A fire protection documentation should include a description of the assumptions of the mechanical resistance in the event of fire as well as the structural design in the event of fire.

**Nationally Determined Parameters**

**Article 5** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4(4) Note 1</td>
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</tr>
<tr>
<td>2.4(4) Note 2</td>
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</tr>
<tr>
<td>3.1(10)</td>
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</tr>
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<tr>
<td>Annex A</td>
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</tr>
<tr>
<td>Annex C</td>
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</tr>
<tr>
<td>Annex E</td>
<td>National choice made</td>
</tr>
<tr>
<td>Annex F</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).
**Paragraph 2.4(4) Note 1**

*Nominal temperature - time curve*

**Article 6** Upon designing according to classification (nominal temperature - time curve), the structural elements shall be designed to ensure that a collapse does not occur during the time period specified in Table C-7 with a fire load as described in Section 4.2 of SS-EN 13501-2. The first column \(f \leq 800 \text{ MJ/m}^2\) in Table C-7 may be applied for residential and commercial properties, schools, hotels, car garages, grocery shops, apartment storage rooms and comparable fire compartments without special investigation.

<table>
<thead>
<tr>
<th>Fire safety class</th>
<th>Fire resistance class at fire load (f) (MJ/m(^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(f \leq 800 \text{ MJ/m}^2)</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>R15</td>
</tr>
<tr>
<td>3</td>
<td>R30 (R15(^*))</td>
</tr>
<tr>
<td>4</td>
<td>R60</td>
</tr>
<tr>
<td>5</td>
<td>R90 (R60(^*))</td>
</tr>
</tbody>
</table>

\(^*\) Upon installation of an automatic water sprinkler system in accordance with Section 5:252 and 5:2521 in Boverket Building Regulations (2011:6).

**Paragraph 2.4(4) Note 2**

*Natural fire model*

**Article 7** When designing according to a natural fire model, structural elements shall be designed for a fire progression as described in Table C-8.

<table>
<thead>
<tr>
<th>Fire safety class</th>
<th>Fire progression</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>15 minutes (part of a full fire progression, excluding the decay phase)</td>
</tr>
<tr>
<td>3</td>
<td>30 minutes (part of a full fire progression, excluding the decay phase)</td>
</tr>
<tr>
<td>4</td>
<td>Full fire progression (including the decay phase).</td>
</tr>
<tr>
<td>5</td>
<td>Full fire progression with 50 % increased fire load (including the decay phase).</td>
</tr>
</tbody>
</table>

**General recommendation**

The design should be performed for a fully developed fire. If it can be shown that a flashover cannot occur, the design can be performed for a local fire.

If the likelihood of a flashover in a building in Br2 or Br3 can be shown to be less than 0,5 %, given that a fire has occurred, the building only needs to be designed for a local fire. This can for example be shown with at least two independent technical systems with a guaranteed reliability, see also Article 10. It may also be possible to show that no flashover can occur based on a low fire load.

The criterion for determining if flashover occurs is that the average temperature of the gas layer exceeds 500 °C or that the incident heat flux at floor level exceeds 20 kW/m\(^2\). *(BFS 2015:6).*
**Fully developed fire**

**Article 8** The fire progression and temperature development in a fire compartment shall be calculated for a fully developed fire using heat and mass balance equations (model of natural fire progression).

*General recommendation*
A fully developed fire should be verified using a model of natural fire progression as described in SS EN 1991-1-2, Annex A.

For the design of a fully developed fire, uncertainties with respect to ventilation conditions, such as leaks, should be taken into account. To account for leaks, an opening factor of at least 0,02 (m$^{1/2}$) should be used. *(BFS 2013:10).*

**Local fire**

**Article 9** The fire progression and temperature development in the event of a local fire shall be calculated taking into account the conditions likely to occur in the building.

*General recommendation*
A local fire should be calculated in accordance with SS-EN 1991-1-2, Annex C.

For the design of a local fire, account should be taken to the height and location of the fuel in the room.

**Technical systems**

**Article 10** The effect of permanently installed technical systems that reduce the likelihood of flashover, limit the temperature in the fire room or otherwise limit or extinguish the fire may be approved for the design provided that the total probability of failure is not increased. A prerequisite for taking technical systems into account is that their reliability is ensured.

The risk-reducing effect of such technical systems can be considered by reducing the fire load in the design of a complete fire progression or by reducing the local fire used for the design. The reliability of the system shall be considered.

*General recommendation*
When designing for complete fire progression, the fire load can be multiplied by a factor of 0,6, provided that an automatic sprinkler system has been installed in accordance with Section 5:252 and 5:2521 in Boverket’s Building Regulations (BFS 2011:6), BBR. *(BFS 2013:10).*

**Paragraph 3.1(10)**

**Article 11** Either a nominal temperature-time curve or a natural fire model may be used for the design of structures in the event of fire. Only a nominal temperature time curve may be used for classification of fire resistance.

**Paragraph 4.3.1(2)**

**Article 12** In accordance with Article 11, Chapter 0 in Section B of this statute, the major variable action shall, in case of fire, be set to its frequent value ($\psi_1 Q_1$). *(BFS 2013:10).*

*General recommendations*
In areas where people may congregate, for category C, $\psi_1$ can be set to 0.50 in the fire model.

Additional rules regarding the combination factors can be found in Section B, Chapter 0, Article 11. *(BFS 2015:6).*
Application of informative annexes

General recommendation
Article 13  Annex A should be applied.

General recommendation
Article 14  Annex C should be applied for determining a local fire.

Article 15  Annex E must not be applied.
The design value for the fire load shall be the value included in 80% of the observed values in representative statistical material.

General recommendation
Fire load should be determined in accordance with Boverket's general recommendations (2013:11) about fire loads. (BFS 2013:10).

Article 16  Annex F must not be applied.
Chapter 1.1.3 – Application of EN 1991-1-3 – Snow load

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
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<td>2(4)</td>
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</tr>
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<td>3.3(1) Note 2</td>
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</tr>
<tr>
<td>3.3(3) Note 3</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.1(1) Note 2</td>
<td>National choice made</td>
</tr>
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<td>4.1(2)</td>
<td>National choice made</td>
</tr>
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<td>4.2(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.3(1)</td>
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</tr>
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<td>National choice made</td>
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<td>National choice made</td>
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<td>National choice made</td>
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<td>5.2(8)</td>
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</tr>
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<tr>
<td>5.3.5(1) Note 2</td>
<td>National choice made</td>
</tr>
<tr>
<td>5.3.6(1) Note 1</td>
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</tr>
<tr>
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</tr>
<tr>
<td>A(1) Note 1</td>
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</tr>
<tr>
<td>D(2) Note 2</td>
<td>National choice made</td>
</tr>
<tr>
<td>Annex C</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

**Paragraph 1.1(2)**

*General recommendation*

**Article 2** Snow loads at altitudes above 1,500 m above sea level should be determined for each separate project where this is relevant with regard to the prevailing conditions.

**Paragraph 1.1(3)**

**Article 3** The exceptional load cases B1, B2 and B3 in Annex A need not be taken into account, as exceptional snow load is not relevant for Swedish conditions.

*General recommendation*

Where the client/owner wishes to have higher than normal reliability for a structure on open terrain where high wind loads may occur in connection with snowfall, the structure may, however, be even verified for load case B2 with regard to exceptional snow drift.
Where verification is carried out for an exceptional snow drift, the snow load may be regarded as an accidental action.

**Paragraph 1.1(4)**

*General recommendation*

**Article 4** In cases where the client/owner chooses to also verify load-mechanical resistance for exceptional snow drift under the general advice to § 3, Annex B may be used. (*BFS 2015:6*).

**Paragraph 2(3), 2(4), 3.3(1) Note 2, 3.3(3) Note 3**

**Article 5** The exceptional load cases B1, B2 and B3 in Annex A need not be taken into account, as exceptional snow load is not relevant for Swedish conditions.

*General recommendation*

Where the client/owner wishes to have higher than normal reliability for a structure on open terrain where high wind loads may occur in connection with snowfall, the structure may, however, also be verified for load case B2 with regard to exceptional snow drift.

In those cases where exceptional snow drift is also verified, the snow load may be regarded an accidental action. (*BFS 2015:6*).

**Paragraph 4.1(1)**

**Article 6** Annex C must not be applied. Snow load on the ground with a mean return period of 50 years as shown in Figure C-2 of this chapter shall be used. (*BFS 2015:xx*).
Figure C-2  Snow load on the ground: Snow zones for ground snow load, $s_k$, which with a probability of 0.98 is not exceeded once a year (equivalent to 50 year mean return period) based on measured data from 148 meteorological stations.
(BFS 2015:6).
Paragraph 4.1(2)

Article 7  A minimum snow load on the ground in accordance with Article 6 shall be applied on structures, unless the client/owner bases the snow load on their own statistical analysis of a series of snow load data. In such case, the measurements shall include data on the annual maximums of at least 30 years if the design working life of the construction works is intended for 50 years or more. (BFS 2015:xx).

General recommendation
The characteristic snow load, with a mean return period of 50 years, should be determined with a probability theory model that is based on extreme value distribution of the measured snow load.

If the intended design working life of the structure is considerably shorter than 50 years, a snow load with a return period corresponding at least to the intended design working life may be used. (see Article 17a). (BFS 2015:6).

Paragraph 4.2(1)

General recommendation
Article 8  See Article 6, Chapter 0 in Section B. (BFS 2015:6).

Paragraph 4.3(1)

Article 9  The exceptional load cases B1, B2 and B3 in Annex A need not be taken into account, as exceptional snow load is not relevant for Swedish conditions. (BFS 2015:6).

General recommendation
Where the client/owner wishes to have higher than normal reliability for a load bearing structure on open terrain where high wind loads may occur in connection with snowfall, the bearing structure may, however, also be verified for load case B.2 with regard to exceptional snow drift.

In those cases where exceptional snow drift is also verified, the snow load may be regarded as an accidental action. The recommended value for $C_{ext}$. 2.0, should be used. (BFS 2015:6).

Paragraph 5.2(2)

General recommendation
Article 10  In cases where the client/owner also chooses to verify the load-mechanical resistance for exceptional snow drift in accordance with Article 3, Annex B should be used together with the load models specified therein if they are relevant to the building in question. (BFS 2015:6).

Paragraph 5.2(5) Note 2

General recommendation
Article 11  Beyond the load models specified in the standard, a load distribution caused by snow clearing should be taken into consideration if it is not covered by the roof shape coefficients in Section 5.3 of the standard and if it is deemed critical for the mechanical resistance or stability of the structure.

Snow removal does not reduce the prescribed snow load for the design of the supporting structure. (BFS 2015:6).
Paragraph 5.2(7)

*General recommendation*

**Article 11a**  The chosen exposure factor $C_e$ should not be lower than 1.0.  
*(BFS 2015:6)*.

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Paragraph 5.2(8)

*General recommendation*

**Article 12**  ISO 4355 or the Boverket handbook, Snö och vindlast [Snow and wind load], (BSV 97, 2nd edition) may be used to determine $C_t$.  
For $U \leq 1.0$, $C_t$ should be set to 1.0.  
For $U > 1.0$, $C_t$ can be set to 0 if the roof pitch is $\geq 45^\circ$ and the roof lacks snowguards.  
For roofs with snowguards, $C_t$ should not be set lower than 0.70.  
*(BFS 2015:6)*.

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Paragraph 5.3.3(4)

*General recommendation*

**Article 12a**  For pitched roofs, Figure 5.1 in SS-EN 1991-1-3 should be replaced with Figure C-3a.  
For snow loads on pitched roofs, form factors as shown in Figure C-3b may be used instead of those in Figure 5.3 of SS-EN 1991-1-3.  
There is no reduction of the snow load for pitched roofs with snow fences and a pitch in excess of 22.5º.  
*(BFS 2015:6)*.

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*Figure C-3a  Form factors for gable roofs.*

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**Figure C-3a**  Form factors for gable roofs.
Figure C-3b  Load distribution on gable roofs.

Paragraph 5.3.4(3)

General recommendation

Article 13  In cases where exceptional snow drift is also verified according to Article 3, Annex B may be used. (BFS 2015:6).

Paragraph 5.3.4(4)

Article 13a  In the case of multi-span roofs where the sum of the angles $\alpha_1$ and $\alpha_2$ is greater than 60º, the snow load shape coefficient $\mu_2$ should be set at 1.6. (BFS 2015:6).

Paragraph 5.3.5(1) Note 1

Article 14  The upper value for $\mu_3$ shall be set to 1.6. (BFS 2013:10).

Paragraph 5.3.5(1) Note 2

Article 14a  In the case of cylindrical roofs with snow fences, the upper limit value for $\mu_3$ should be set at 2.0. (BFS 2015:6).

Paragraph 5.3.6(1) Note 1

General recommendation

Article 14b  In the case of a porch roof abutting and close to taller construction works, $\mu_w$ may be restricted to 2.0 if the roof protrudes less than 3 metres from the wall and the wall above the porch roof is more than 5 metres. For other situations, the recommended limit values are used. (BFS 2015:6).

Paragraph 5.3.6(3), 6.2(2)

General recommendation

Article 15  In cases where exceptional snow drift is also verified according to Article 3, Annex B may be used. (BFS 2015:6).
Paragraph 6.3(1)

*General recommendation*

**Article 16** Snow overhanging the edge of a roof should be taken into account for sites located above 400 m above sea level. At sites located below 400 m above sea level, the overhanging snow can be disregarded.

The load due to the overhanging snow can be determined using equation (6.4) for sites located above 800 m above sea level. For sites located between 400 and 800 m above sea level, this load can be determined by rectilinear interpolation between the load value 0 at 400 m and the load value as given by Eq. (6.4) at 800 m. *(BFS 2013:10)*.

Paragraph 6.3(2)

*General recommendation*

**Article 16a** When calculating the load of snow overhanging the edge of a roof, $s_e$, $k = 2.3$ can be used.

Overhanging snow load per metre, $s_e$, need not be assigned a value higher than 5 kN/m.

If the roof is fitted with snowguards at the edges, the snow load per metre need not be assigned a value higher than 3 kN/m. *(BFS 2015:6)*.

Paragraph A(1) Note 1

*General recommendation*

**Article 17** The exceptional load models B.1, B.2, and B.3 need not be applied in Sweden. See also Articles 3–5, Article 9, Article 10, and Article 15. *(BFS 2015:6)*.

Paragraph D(2) Note 2

*General recommendation*

**Article 17a** Annex D may be applied to determine snow loads on the ground for mean return periods other than 50 years. The coefficient of variation can then be set to 0.60 for $s_k \leq 1.0$ kN/m² and to 0.35 for $s_k \geq 3.0$ kN/m². For intermediate values of $s_k$ the coefficient of variation can be determined through interpolation. *(BFS 2015:6)*.

**Application of informative annexes**

**Article 18** Annex C must not be applied. See Article 6.
Chapter 1.1.4 – Application of EN 1991-1-4 – Wind action

**Nationally Determined Parameters**

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
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<td>Annex E.1</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

**Paragraph 4.2(1)P Note 2**

**Article 2** Figure C-4 is a map of the reference wind speeds to be used when design wind load is calculated.  
*BFS 2015:6.*
The reference wind speed $v_b$ in m/s, i.e. mean wind speed over 10 minutes at a height of 10 metres above the ground with a roughness length $z_0 = 0.05$ and with a return period of 50 years.
Paragraph 4.2(2)P Note 1
Article 3  The effect of altitude is taken into account in the reference wind speeds in Article 2.

Paragraph 4.2(2)P Note 3

General recommendation
Article 3a  For wind loads during the construction phase and for temporary structures, the season factor $C_{\text{season}}$ may be selected according to Table C-10b. If the structure remains erected for longer than one month, the highest value of $C_{\text{season}}$ is to be used.

Table C-10 b.  Season factor wind load during the construction phase and for temporary buildings

<table>
<thead>
<tr>
<th>Month</th>
<th>$C_{\text{season}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1.00</td>
</tr>
<tr>
<td>February</td>
<td>0.83</td>
</tr>
<tr>
<td>March</td>
<td>0.82</td>
</tr>
<tr>
<td>April</td>
<td>0.75</td>
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<tr>
<td>May</td>
<td>0.69</td>
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<tr>
<td>June</td>
<td>0.66</td>
</tr>
<tr>
<td>July</td>
<td>0.62</td>
</tr>
<tr>
<td>August</td>
<td>0.71</td>
</tr>
<tr>
<td>September</td>
<td>0.82</td>
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*(BFS 2015:6)*.

Paragraph 4.3.1(1) Note 1

General recommendation
Article 4  The effect of topography has not been taken into account.

Paragraph 4.3.4(1)

Article 5  The method in A.4 must not be applied.

General recommendation
The effect of large and considerably higher neighbouring buildings should be based on wind tunnel tests.

Paragraph 4.3.5(1)

Article 6  The method in A.5 must not be applied.

General recommendation
Determination of the effect of closely spaced buildings and obstacles should be based on wind tunnel tests.

Paragraph 4.5(1) Note 1

General recommendation
Article 7  Expression 4.8 and Figure 4.2 are replaced by the following expression and Figure C-5 upon application. Velocity pressures calculated according to the expression are presented in Table C-10a for the case $c_0(z) = 1.0$. These velocity pressures should be applied when it is not necessary to account for the topography according to Annex A.3. *(BFS 2013:10)*.
A prerequisite for the validity of the expression is that $z$ is greater than or equal to $z_{\text{min}}$ for the terrain category in question (see Table 4-1 in SS-EN 1991-1-4).

$$q_p(z) = \left[1 + 6 \cdot I_v(z)\right] \cdot \left[k \cdot \ln\left(\frac{z}{z_0}\right) \cdot c_0(z)\right] \cdot q_b$$

$$I_v(z) = \frac{1}{c_0(z) \cdot \ln\left(\frac{z}{z_0}\right)}$$

where

$I_v(z)$ the turbulence intensity at height $z$

$k_v$ terrain factor

$z_0$ roughness length

c(z) topography factor according to Annex A.3. In cases where it is not necessary to account for the topography according to Appendix A.3 $c(z) = 1,0$ can be used and the above expression will then read

$$q_p(z) = c_v(z) \cdot q_b$$

Where $c_v(z)$ given in figure C-5.

**Figur C-5** Exposure factor $c_v(z)$ for $c_0 = 1,0$ and $k_1 = 1,0$

---

**Tabell C-10a** Karakteristiskt hastighetstryck $q_p(z)$ i kN/m$^2$ på höjden $z$ för $v_b = 21–26$ m/s med $c_v(z)$ enligt 7 § och $p = 1,25$ kg/m$^2$

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| 2          | 0,60    | 0,52| 0,39| 0,35| 0,32|
| 4          | 0,70    | 0,63| 0,50| 0,35| 0,32|
| 8          | 0,81    | 0,74| 0,61| 0,43| 0,32|
| 12         | 0,87    | 0,81| 0,69| 0,50| 0,35|
| 16         | 0,92    | 0,86| 0,74| 0,56| 0,40|
| 20         | 0,96    | 0,90| 0,78| 0,60| 0,45|
| 25         | 1,00    | 0,94| 0,83| 0,65| 0,49|
| 30         | 1,03    | 0,98| 0,87| 0,69| 0,53|
| 35         | 1,06    | 1,01| 0,90| 0,72| 0,56|
| 40         | 1,08    | 1,03| 0,93| 0,75| 0,59|
| 45         | 1,11    | 1,06| 0,95| 0,77| 0,62|
| 50         | 1,13    | 1,08| 0,97| 0,80| 0,64|
| 55         | 1,14    | 1,10| 0,99| 0,82| 0,67|
| 60         | 1,16    | 1,11| 1,01| 0,84| 0,69|
| 65         | 1,18    | 1,13| 1,03| 0,86| 0,71|
| 70         | 1,19    | 1,15| 1,05| 0,88| 0,72|
| 75         | 1,20    | 1,16| 1,06| 0,89| 0,74|
| 80         | 1,22    | 1,17| 1,08| 0,91| 0,76|
| 85         | 1,23    | 1,19| 1,09| 0,92| 0,77|
| 90         | 1,24    | 1,20| 1,10| 0,94| 0,78|
| 95         | 1,25    | 1,21| 1,12| 0,95| 0,80|
| 100        | 1,26    | 1,22| 1,13| 0,96| 0,81|

<p>| 23         |         |   |   |   |   |
| 2          | 0,65    | 0,57| 0,43| 0,38| 0,35|
| 4          | 0,76    | 0,68| 0,54| 0,38| 0,35|
| 8          | 0,88    | 0,81| 0,67| 0,47| 0,35|</p>
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| 24         | 2     | 0.71     | 0.62 | 0.46 | 0.41 | 0.38 |
| 2          | 0.83  | 0.75     | 0.59 | 0.41 | 0.38 |
| 4          | 0.96  | 0.88     | 0.73 | 0.51 | 0.38 |
| 8          | 1.04  | 0.96     | 0.82 | 0.60 | 0.42 |
| 12         | 1.10  | 1.02     | 0.88 | 0.66 | 0.48 |
| 16         | 1.14  | 1.07     | 0.93 | 0.72 | 0.53 |
| 20         | 1.19  | 1.12     | 0.99 | 0.77 | 0.59 |
| 25         | 1.23  | 1.16     | 1.03 | 0.82 | 0.63 |
| 30         | 1.26  | 1.20     | 1.07 | 0.86 | 0.67 |
| 35         | 1.29  | 1.23     | 1.10 | 0.89 | 0.71 |
| 40         | 1.32  | 1.26     | 1.13 | 0.92 | 0.74 |
| 45         | 1.34  | 1.28     | 1.16 | 0.95 | 0.77 |
| 50         | 1.36  | 1.31     | 1.18 | 0.98 | 0.79 |
| 55         | 1.38  | 1.33     | 1.21 | 1.00 | 0.82 |
| 60         | 1.40  | 1.35     | 1.23 | 1.02 | 0.84 |
| 65         | 1.42  | 1.36     | 1.25 | 1.04 | 0.86 |
| 70         | 1.43  | 1.38     | 1.27 | 1.06 | 0.88 |
| 75         | 1.45  | 1.40     | 1.28 | 1.08 | 0.90 |
| 80         | 1.46  | 1.41     | 1.30 | 1.10 | 0.92 |
| 85         | 1.47  | 1.43     | 1.31 | 1.11 | 0.93 |
| 90         | 1.49  | 1.44     | 1.33 | 1.13 | 0.95 |
| 95         | 1.50  | 1.45     | 1.34 | 1.15 | 0.97 |

<p>| 25         | 2     | 0.77     | 0.67 | 0.50 | 0.45 | 0.41 |
| 2          | 0.90  | 0.81     | 0.64 | 0.45 | 0.41 |
| 8          | 1.04  | 0.95     | 0.79 | 0.55 | 0.41 |</p>
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| 26         | 2     | 0,84 | 0,73 | 0,55 | 0,49 | 0,44 |
| 4          | 0,98  | 0,87 | 0,69 | 0,49 | 0,44 |
| 8          | 1,13  | 1,03 | 0,86 | 0,60 | 0,44 |
| 12         | 1,22  | 1,13 | 0,96 | 0,70 | 0,49 |
| 16         | 1,29  | 1,20 | 1,04 | 0,78 | 0,56 |
| 20         | 1,34  | 1,26 | 1,10 | 0,84 | 0,63 |
| 25         | 1,40  | 1,32 | 1,16 | 0,90 | 0,69 |
| 30         | 1,44  | 1,37 | 1,21 | 0,96 | 0,74 |
| 35         | 1,48  | 1,41 | 1,25 | 1,00 | 0,79 |
| 40         | 1,51  | 1,44 | 1,29 | 1,04 | 0,83 |
| 45         | 1,54  | 1,48 | 1,33 | 1,08 | 0,87 |
| 50         | 1,57  | 1,51 | 1,36 | 1,11 | 0,90 |
| 55         | 1,60  | 1,53 | 1,39 | 1,15 | 0,93 |
| 60         | 1,62  | 1,56 | 1,42 | 1,17 | 0,96 |
| 65         | 1,64  | 1,58 | 1,44 | 1,20 | 0,99 |
| 70         | 1,66  | 1,60 | 1,46 | 1,22 | 1,01 |
| 75         | 1,68  | 1,62 | 1,48 | 1,25 | 1,03 |
| 80         | 1,70  | 1,64 | 1,51 | 1,27 | 1,06 |
| 85         | 1,71  | 1,66 | 1,52 | 1,29 | 1,08 |
| 90         | 1,73  | 1,67 | 1,54 | 1,31 | 1,10 |
| 95         | 1,74  | 1,69 | 1,56 | 1,33 | 1,11 |
| 100        | 1,76  | 1,71 | 1,58 | 1,34 | 1,13 |

*(BFS 2015:6).*
Paragraph 6.1(1)

**General recommendation**

**Article 8**  $c_s c_d$ should not be separated.

When calculating $c_s c_d$, the expression below should be used instead of Expression (6.1) in SS-EN 1991-1.4.

$$
c_s c_d = \frac{1 + 2k_p I_v(z_x) \sqrt{B^2 + R^2}}{1 + 6I_v(z_x)}
$$

If for some reason there is a need to separate $c_s c_d$, the following expression should be used instead of expressions (6.2) and (6.3) in SS-EN 1991-1.4.

$$
c_s = \frac{1 + 6I_v(z_x) \sqrt{B^2}}{1 + 6I_v(z_x)}
$$

$$
c_d = \frac{1 + 2k_p I_v(z_x) \sqrt{B^2 + R^2}}{1 + 6I_v(z_x) \sqrt{B^2}}
$$

(BFS 2015:6).

Paragraph 6.3.1(1) Note 3

**General recommendation**

**Article 9**  $k_p, B$ and $R$ can be calculated using the following equations

$$
k_p = \sqrt{2\ln(vT)} + \frac{0.6}{\sqrt{2\ln(vT)}}: k_p = 3.0$" for statiska konstruktioner

$$
v = n_{1,x} \frac{R}{\sqrt{B^2 + R^2}}
$$

$$
B^2 = \exp \left[ -0.05 \left( \frac{h}{\delta_{\text{ref}}} \right) + \left( 1 - \frac{b}{h} \right) \left( 0.04 + 0.01 \left( \frac{h}{\delta_{\text{ref}}} \right) \right) \right]
$$

$$
R^2 = \frac{2\pi F \phi_b \phi_h}{\delta_s + \delta_u}
$$

$$
F = \frac{4 \gamma_C}{\left( 1 + 70.8 \gamma_C \right)^{\frac{3}{2}}}
$$

$$
\gamma_C = \frac{150 n_{1,x}}{v_m(h)}
$$

$$
\phi_h = \frac{1}{1 + \frac{2 n_{1,x} h}{v_m(h)}}
$$

$$
\phi_b = \frac{1}{1 + \frac{3.2 n_{1,x} b}{v_m(h)}}
$$
Paragraph 6.3.2(1)

*General recommendation*

**Article 10**  The method below should be applied to calculate sways in the first mode of a cantilevered structure with constant mass along the structure’s main axis. The maximum acceleration is given by the expression

\[ \ddot{X}_{\text{max}}(z) = \kappa \sigma_x(z) \]

\( \sigma_x(z) \) is the standard deviation of the acceleration, which is expressed as

\[ \sigma_x(z) = \frac{3I_x(h) R q_m(h) b c_t \phi_{1,x}(z)}{m} \]

\[ \phi_{1,x}(z) = \left( \frac{z}{h} \right)^{1.5} \]

\( q_m(h) = \text{velocity pressure at height } h \)

To determine the comfort requirements, wind speed can be calculated for a return period on average of once every five years in accordance with ISO 6897, which gives criteria for “responses of people to horizontal motion of structures in the frequency range 0.063 to 1 Hz”. Wind speed may be calculated from:

\[ v_{Ta} = 0.75 v_{50} \sqrt{1 - 0.2 \ln \left( -\ln \left( 1 - \frac{1}{T_a} \right) \right)} \]

where \( T_a \) is the number of years.

Over a 5 year period, the characteristic wind speed is given by:

\[ v_{Ta} = 0.855 v_{50} \]

where \( v_{50} \) is the characteristic value of the reference wind speed, a value that is exceeded annually with a probability of 2%. That corresponds to a mean return period of 50 years. *(BFS 2015:6).*

Paragraph 7.2.1(1) Note 2

*General recommendation*

**Article 11**  The pressure coefficient \( c_{pe,10} \) can be used for areas larger than 1 m² when the wind load on the supporting structure as a whole is assessed. For the wind load on fasteners, anchors, etc. for securing/fixing façades and roofs, \( c_{pe,1} \) shall be used, irrespective of whether the load area is 1 m² or more. *(BFS 2015:6).*

Paragraph 7.2.2(1) Note

*General recommendation*

**Article 12**  For sidewalls and leeward walls, the pressure can be determined on the basis of the actual velocity pressure distribution \( q_{pe(z)} \) according to the expression in Article 7 above and with the height of the building as the reference height when integrating velocity pressure over the walls.

For a structure, i.e. most buildings, where no consideration needs to be given to its dynamic properties, the velocity pressure for each “strip” (zone) can be taken from Table C-10a. However, the velocity pressures in Table C-
10 are slightly higher at each level than if one were to integrate over the height of the building. (BFS 2015:6).

Paragraph 7.2.8(1)

**General recommendation**

**Article 13** Figure 7.11 should not be applied. Pressure coefficients in Figure C-6 should apply.

**Figure C-6** Pressure coefficients for arched roof

![Diagram](image-url)

When dimensioning the external cladding and its fasteners within zone A, the pressure coefficient should be increased by 30%. For the other zones, the pressure coefficients even include the external cladding and its fasteners.
When dimensioning the external cladding and its fasteners within zone A, the pressure coefficient should be increased by 30%. For the other zones, the pressure coefficients even include the external cladding and its fasteners.
Paragraph 8.4.2(1) Note 1

*General recommendation*

**Article 14** No simplified calculation methods are given.

**Application of informative annexes**

General recommendation
The Boverket handbook, Snö och vindlast [Snow and wind load] (BSV 97, 2nd edition) may be used for vortex shedding. (BFS 2015:5).
Chapter 1.1.5 – Application of EN 1991-1-5 – Thermal actions

Nationally Determined Parameters

**Article 1** Overview of national choices

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*(BFS 2015:6)*

**Paragraph 5.3(2) Table 5.1, 5.2, and 5.3**

*General recommendation*

**Article 2** The recommended values should also be applied north of latitude 55°N.

**Paragraph 7.2.1(1)P**

**Article 3** The isotherm maps of maximum and minimum air temperature in Figures C-7 and C-8 in this chapter shall be used. These maps apply to local height above sea level.
Figur C-7  Hourly maximum air temperature which, with a probability of 0.98, is not exceeded once a year (equivalent to a 50 year recurrence interval), based on measured data from 148 meteorological stations.
Figur C-8  Hourly minimum air temperature which, with a probability of 0.98, is not exceeded once a year (equivalent to a 50 year recurrence interval), based on measured data from 148 meteorological stations.
Paragraph A.1(1)

Article 4 The isotherm maps of maximum and minimum air temperature in Figures C-7 and C-8 in this chapter shall be used. These maps apply to local height above sea level. (BFS 2015:6).

Paragraph A.2(2)

Article 5 When applying Section A.2, the coefficients shall be set to $k_1 = 0.80; k_2 = 0.0513; k_3 = 0.60$ and $k_4 = -0.103$. (BFS 2015:6).
Chapter 1.1.6 – Application of EN 1991-1-6 – Actions during execution

Nationally Determined Parameters

**Article 1** Overview of national choices

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*(BFS 2015:6).*
Chapter 1.1.7 – Application of EN 1991-1-7 – Accidental actions

Nationally Determined Parameters

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(BFS 2015:6).

General recommendations
Additional rules regarding partial factors for combinations of actions can be found in Section B, Chapter 0, Article 10.

Section 9.10 of SS-EN 1992-1-1 has general rules on tying systems for concrete structures that apply regardless whether designing for accidental actions is required or not. In addition, specific rules apply for accidental actions in accordance with SS-EN 1991-1-7 and division of construction works into consequence classes in accordance with Annex A with rules on horizontal and vertical joints regarding tying forces.

The above also applies to composite constructions, i.e. if the construction works do not have to be designed for accidental loads; still the requirements on tying forces according to SS-EN 1992-1-1 apply. (BFS 2015:6).

Paragraph 3.2(1) Note 3

Article 2 The risk level must not be higher than that which corresponds to the safety index $\beta = 3.1$ for accidental actions and $\beta = 2.3$ for progressive collapse for the reference period of one year.

Paragraph 3.3(2) Note 1

Article 2a 34 kN/m² shall be used for walls and floor structures when design key element are designed. In the case of columns, beams and roof trusses, distributed load from connecting, non-structural components shall be taken into account. (BFS 2015:6).

General recommendation
For columns, beams and roof trusses, at least 100 kN/m should be assigned unless another load is deemed more appropriate.
A column or wall that shall prevent a floor structure from being lifted by a load acting on the bottom side of the floor structure must be anchored against the resultant upward force. *(BFS 2015:6)*.

**Paragraph 3.3(2) Note 2**

*General recommendation*

**Article 3** The maximum acceptable limit of a localised failure for intermediate floors and flat roofs in buildings should be the least of 15% of the joist/beam area or a total of 100 m² in a maximum of two adjacent floors. This acceptable limit of localised failure applies to consequence classes 2a, 2b and 3. A larger area is acceptable for buildings in consequence class 1.

When assessing the acceptable limit of localised failure of secondary structures in roofs (purlins, cantilevered corrugated sheets, etc.), it should be assumed that a bay has lost its mechanical resistance over a length of half of the pitch, though not more than 10 m. This damaged area is included in the total damaged area, together with resultant damages in adjacent bays, when the size of the localised failure is determined. If load transfer cannot occur because, e.g. a certain moment distribution is critical for the behaviour and mechanical resistance of the structure, a different type of static structural design should be selected.

The permitted size of local failure for other construction works may be determined by a risk assessment in accordance with Annex B. *(BFS 2015:6)*.

**Paragraph 3.3(2) Note 3**

*General recommendation*

**Article 4** For buildings and other facilities, the developer is free to choose their approach to restrict local failures or the consequences thereof. However, it is unsuitable to choose different approaches for different building elements in the same building as the consequences might then be unclear. *(BFS 2015:6)*.

**Paragraph 3.4(1) Note 4**

**Article 5** Buildings and other facilities shall be classified based on the consequences of a collapse. Table A1 in Annex A is used for the classification of buildings. *(BFS 2015:6)*.

**Paragraph 4.1(1) Note 1**

*General recommendation*

**Article 6** For lightweight structures that are designed so as to reduce the risk of vehicle impact with, for example, a clear height above the road of > 5.3 m and > 5.9 m above the upper edge of a railway line, the action of vehicle impact may be set equal to zero.

**Paragraph 4.3.1(1) Note 1**

*General recommendation*

**Article 7** For structures over roads, the values for “Motorways, etc.” in Table 4.1 should be applied. For structures adjacent to roads, the values in Table 4.1 may be applied, whereby the client/owner may specify an appropriate traffic category for the individual project. As an alternative to the actions in Table 4.1, actions may be calculated in accordance with Annex C. *(BFS 2015:6)*.

**Paragraph 4.3.2(1) Note 1**

*General recommendation*
Article 8  For structures, the client/owner may specify the values of forces and clear heights for the individual project. If no values are specified, Table 4.2 and a height of 5.2 m should be applied. (BFS 2015:6).

Paragraph 4.3.2(1) Note 3

General recommendation

Article 9  \( h_0 \) should be set to 5.2 m and \( h_1 \) should be set to 6.0 m. \( b \) is then 0.8 m.

Article 10  has been repealed by (BFS 2015:6).

Paragraph 4.5(1)

Article 11  The rules in this section should be applied to structures adjacent to all types of rail traffic, unless a different requirement is proved to be more accurate.

Paragraph 4.6.1(3) Note 1 and 4.6.2(1)

General recommendation

Article 12  Table C.4 (or C.3) in Annex C should be applied for the classification of ships.

Paragraph 4.6.3(5)

General recommendation

Article 13  If no further information is provided, at least 5 % of the value \( F_{\text{as}} \) should be applied.

Application of informative annexes

Annex A

Article 13a  Recommended strategies under Section A.4, Recommended strategies, shall be applied to buildings and mutatis mutandis to other facilities depending on the classification of the construction works. (BFS 2015:6).

General recommendation

Article 14  Sections A.5, A.6 and A.7 in Annex A are tailored to structures made of heavy material. For structures made of lightweight material, values other than the minimum values (75, 75, 60, 60, and 100 kN, respectively) given for expressions A1, A2, A3, A4, and A5 may be applied if they are demonstrated to be more accurate.

For building frames where it is not possible to carry large concentrated actions, as an alternative to the minimum values for the capacity of individual connectors/fasteners, an equivalent capacity may be spread out over a longer stretch. A suitable minimum value in these cases can be 25 kN/m. (BFS 2015:6)

Annex B

General recommendation

Article 15  For structures that are classified as consequence class 3, Annex B can serve as the basis for how a risk analysis can be carried out. The party who carries out the risk analysis should have experience in that field of work. (BFS 2015:6).
Chapter 1.2 – has been repealed by (BFS 2015:6).
Chapter 1.3 Application of SS-EN 1991-3 - Load from cranes and machinery

Nationally Determined Parameters

**Article 1** Summary of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1(2)</td>
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<td>2.5.3(2)</td>
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</tr>
<tr>
<td>A2.3(1)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

**Paragraph 2.1(2)**

*General recommendations*

**Article 2** Information on loads from the crane supplier should be the basis for final verification. *(BFS 2013:10).*

**Paragraph 2.5.2.1 (2)**

*General recommendations*

**Article 3** The eccentricity $e$ may be set equal to zero. *(BFS 2013:10).*

**Paragraph 2.5.3 (2)**

*General recommendations*

**Article 4** The maximum number of cranes working independently should be considered in the design. These may be limited according to Table C-12. The figure on the right refers to column/support between two shop bays.

Fatigue from multiple cranes on the same crane runway can, alternatively, be taken into account by multiplying by a factor of 1.10 the wheel pressure from the crane that produces the greatest action-effect.

<table>
<thead>
<tr>
<th>Table C-12</th>
<th>Maximum number of cranes to be considered when they work independently of each other.</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Cranes in each runway</td>
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<tr>
<td>------------</td>
<td>------------------------</td>
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<tr>
<td>Vertical crane action</td>
<td>2</td>
</tr>
<tr>
<td>Horizontal crane action</td>
<td>1</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*
Paragraph A2.3 (1)

General recommendations

Article 5 In case of load combination of cranes working independently, the loads shall be considered as independent of each other. \( \psi \) - factors for crane loads should be selected according to Table C-13.

<table>
<thead>
<tr>
<th>( \psi )</th>
<th>Vertical load</th>
<th>Horizontal load</th>
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</thead>
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<td>( \psi_0 )</td>
<td>0.8</td>
<td>0.5</td>
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<tr>
<td>( \psi_1 )</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>( \psi_2 )</td>
<td>The relationship between the permanent crane load and the total crane load</td>
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</table>

(BFS 2013:10).
Chapter 1.4 – Application of SS-EN 1991-4 – Silos and tanks

Nationally Determined Parameters

<table>
<thead>
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<th>Comments</th>
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<td>B.3(2)</td>
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<tr>
<td>B.3(3) and B.3(4)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

**Paragraph A.4(3)**

*General recommendations*

**Article 2** Load combination factors $\psi$ for snow and wind loads should be taken from Section B, Chapter 0, Article 5. Otherwise, the recommended values should also be used. *(BFS 2015:6).*

Application of informative annexes

**Annex A and B**

**Article 3** Upon national application, the informative Annexes A and B are to be treated as normative. *(BFS 2015:6).*

**Paragraph B.3(2)**

**Article 4** The following value shall be used:

$\gamma_F = 1.4$

*(BFS 2013:10).*

**Paragraph B.3(3) and B.3(4)**

**Article 5** The recommended values shall be used. *(BFS 2013:10).*
Section D – Application of EN 1992 – Design of concrete structures

Chapter 2.1.1 – Application of EN 1992-1-1 – General rules

General

Durability

General recommendation

Article 1 Additional rules on durability can be found in Section A.

Exposure classes applicable for the most common types of environmental actions are specified in SS-EN 206:2013. SS 13 70 03 describes appropriate measures to achieve durability of concrete.

Requirements for concrete cover regarding corrosion protection are set out in Table D-1 below in § 10. (BFS 2015:6).

Fatigue

General recommendation

Article 2 For the general effect of cyclic loading in fatigue calculations, SS-EN 1992-2 may as well be used for construction works other than bridges.

Fatigue of compressed concrete in flexural cross sections with or without normal force can be treated in the following manner. The mechanical resistance shall be calculated for a reduced compressive strength $u_{cf}$ as shown in Figure D-1, which gives an upper limit for the corresponding effect of fatigue load. The reduction factor $u$ is determined as shown in Figure D-2. The value shall be given by the intersection point of the curve for the current number of cyclic loadings and a line from the origin with a slope corresponding to $M_1 / M_2$, where $M_1$ and $M_2$ are the minimum and maximum moments of fatigue load respectively. In case of moment and normal force, the slope can instead be set to $\sigma_1 / \sigma_2$, where $\sigma_1$ and $\sigma_2$ are the compression stresses at the edges, which in this context can be calculated for uncracked cross section and with linear distribution. This applies even if the stress changes between tension and compression, whereby $\sigma_1 / \sigma_2$ becomes negative.

Figure D-1 Assumptions for verification of fatigue of flexural and/or compressed cross sections.
Reinforcement

General recommendation

Article 3 In order to facilitate a ductile behaviour in the event of failure, the reinforcement characteristic strain at maximum force shall not be less than 3.0 % and the characteristic value for the quotient between the ultimate strength and the yield strength shall be at least 1.08. These values refer to the 0.1 fractile.

In constructions where the impact of yielding of support or restraint forces is negligible, reinforcement with a minimum characteristic strain at maximum force of 2.5 % may be used.

Inspection

General recommendation

Article 4 Depending on the choice of execution class, the extent of the inspection should be at least equivalent to that specified in SS-EN 13670 for each structural element. In the event of strength testing of existing concrete structures, SS-EN 13791 should be used with the following complementary additions. Evaluation in accordance with the standard’s Section 7.3.3 is replaced with SS-ISO 12491, Section 7.4 with associated Table 6, \( p = 0.95 \) and \( \gamma = 0.75 \). (BFS 2015:6).

Minimum amount of crack control reinforcement

General recommendation

Article 4a In the model in SS-EN 1992-1-1, in paragraph 7.3.2 (2) for calculation of the minimum amount of crack control reinforcement, \( k \) can be set to 0.90 for \( h_{\text{liv}} \) or \( b_{\text{fläns}} \leq 200 \) mm [liv means web and fläns means...
flange]. For $h_{lv}$ or $b_{fläns} \geq 680$ mm, $k$ can be set to 0.50. For intermediate values of $h_{lv}$ or $b_{fläns}$, interpolation may be performed. *(BFS 2015:6).*
## Nationally Determined Parameters

### Article 5  Overview of national choices

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</table>
Paragraph 2.3.3(3)

*General recommendation*

**Article 6** The value of $d_{jnt}$ should be determined for each individual case.

Paragraph 2.4.2.1(1), 2.4.2.2(1), 2.4.2.2(2), 2.4.2.2(3), 2.4.2.3(1), 2.4.2.4(1), 2.4.2.4(2), and 2.4.2.5(2)

**Article 7** The recommended values shall be used.

Paragraph 3.1.2(2)P

**Article 8** $C_{max}$ shall be set to C100/115.

Paragraph 3.1.2(4)

*General recommendation*

**Article 9** $k_t$ can be set to 1.0.

Paragraph 3.2.2(3)P

**Article 9a** Reinforcement with yield strength $400 \leq f_{yk} \leq 500$ MPa can be used without restrictions other than those specified in this statute and in SS-EN 1992-1-1.

Reinforcement with yield strength $500 < f_{yk} \leq 600$ MPa can be used if the relative rib area, $f_r \geq 0.11$. *(BFS 2015:6).*

Paragraph 4.4.1.2(5)

*General recommendation*

**Article 10** When determining the necessary minimum concrete cover, account should be taken of the intended service life. The service life classes L100, L50, and L20 refer to structures with an expected service life of 100, 50, and 20 years respectively.

For reinforcing steel with a diameter of not less than 4 mm, that is not prestressing steel and that is not cold-formed reinforcing steel with a permanent stress above 400 MPa, the concrete cover, $c_{min,dur}$, pursuant to Table D-1 should be used.

For reinforcing steel with a diameter less than 4 mm, for prestressing steel and for cold-formed reinforcing steel with a permanent stress above 400 MPa, and for sheaths in case of post-stressed reinforcing steel, the values for the cover given in Table D-1 should be increased by 10 mm.

For values of $vt_{tst}$ other than those given in Table D-1, the required minimum concrete cover may, in individual cases, be calculated in accordance with the guidelines in SS EN 206-1, Annex J.

**Table D-1** *Minimum concrete cover, $c_{min,dur}$ with regard to durability of reinforcement*
<table>
<thead>
<tr>
<th>Exposure class</th>
<th>Max $vct_{ekv}$</th>
<th>L 100</th>
<th>L 50</th>
<th>L 20</th>
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<tbody>
<tr>
<td>X0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>XC1</td>
<td>0,90</td>
<td>15</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>0,60</td>
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<td>10</td>
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<td>XC2</td>
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<td>25</td>
</tr>
</tbody>
</table>

\(^1\) The specified concrete cover applies to a chloride concentration in sea water of not more than 0,4 % (east coast). For higher chloride concentrations, specific values for the minimum concrete cover may be given in each individual case. (BFS 2013:10).

For structures in exposure class XA1–XA3 specific values for the minimum concrete cover may be given in each individual case.
Paragraph 4.4.1.2(7) and 4.4.1.2(8)

General recommendation

Article 11 Unless a different value is considered justified, the recommended value should be used.

Paragraph 4.4.1.3(4)

General recommendation

Article 12 The following values should be used

– $k_1 = c_{\min} + 15 \text{ mm}$,
– $k_2 = c_{\min} + 65 \text{ mm}$.

Paragraph 5.10.1(6)

General recommendation

Article 13 Method D, in combination with at least one of the other methods, should be used.

Paragraph 5.10.8(3)

Article 14 The recommended values for $\gamma_{P_{\text{sup}}}$ and $\gamma_{P_{\text{inf}}}$ shall be used.

Paragraph 6.2.3(2)

General recommendation

Article 15 When determining the shear force capacity of non-prestressed structures, the condition $1,0 \leq \cot \theta \leq 2,5$ should be met. When determining the shear force capacity of prestressed structures, the condition $1,0 \cot \theta \leq 3,0$ should be met.

Paragraph 6.4.5(1)

Article 15a $k_{\text{max}}$ shall be set to 1.6. *(BFS 2015:xx).*

Paragraph 6.4.5(3)

General recommendation

Article 16 $v_{Rd_{\text{max}}}$ should be determined as follows

\[ v_{Rd_{\text{max}}} = 0.5 \cdot v \cdot f_{\text{cd}} \] *(BFS 2015:xx).*

Article 17 *was repealed by* *(BFS 2013:10).*

Paragraph 6.8.7(1)

General recommendation

Article 18 $k_1$ should be set to 1.0 and for $N$ the recommended value should be used.

Paragraph 7.2(5)

General recommendation

Article 19 $k_3$ should be set to 1.0. For $k_4$ and $k_5$ the recommended values should be used.

Paragraph 7.3.1(5)

General recommendation

Article 20 Unless otherwise justified, the value of $w_{\text{max}}$ calculated for a quasi-permanent combination of actions should be restricted to the value in Table D-2. If the tensile stress does not exceed $f_{\text{cd}} / \zeta$ the concrete may be
regarded as uncracked. The values of the crack safety factor \( \zeta \) in Table D-3 should be applied.

For frequent combination of actions, no requirements are given regarding crack width limitation.

**Table D-2**  
Permitted crack width \( w_k \) (mm)

<table>
<thead>
<tr>
<th>Exposure class</th>
<th>Corrosion sensitivity(^1)</th>
<th>Little corrosion sensitivity(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L 100 L 50 L 20</td>
<td>L 100 L 50 L 20</td>
</tr>
<tr>
<td>X0</td>
<td>- - -</td>
<td>- - -</td>
</tr>
<tr>
<td>XC1</td>
<td>0.40 0.45 -</td>
<td>0.45 -</td>
</tr>
<tr>
<td>XC2</td>
<td>0.30 0.40 0.45</td>
<td>0.40 0.45 -</td>
</tr>
<tr>
<td>XC3, XC4</td>
<td>0.20 0.30 0.40</td>
<td>0.30 0.40 -</td>
</tr>
<tr>
<td>XS1, XS2, XD1, XD2</td>
<td>0.15 0.20 0.30</td>
<td>0.20 0.30 0.40</td>
</tr>
<tr>
<td>XS3, XD3</td>
<td>0.10 0.15 0.20</td>
<td>0.15 0.20 0.30</td>
</tr>
</tbody>
</table>

\(^1\) Corrosion-sensitive reinforcing steel is any reinforcing steel with a diameter ≤ 4 mm, prestressing steel or cold-formed reinforcing steel with a permanent stress greater than 400 MPa. All other reinforcing steel is slightly corrosion-sensitive.

\(^2\) When determining a permitted crack width, account should be taken of the intended service life. The service life classes L100, L50, and L20 refer to structures with an expected service life of 100, 50, and 20 years respectively. *(BFS 2015:6).*

### 7.3.2(4)

**General recommendation**

**Article 21**  
When determining the permitted tensile stress before the need to insert minimum reinforcement to limit the crack width, account should be taken of the intended service life. The value should be determined as follows:

\[
\sigma_{ct,p} = \frac{f_{ctk}}{\zeta}
\]

where the values of the crack safety factor \( \zeta \) in Table D-3 are used.

**Table D-3**  
Crack safety factor \( \zeta \)

<table>
<thead>
<tr>
<th>Exposure Class</th>
<th>L 100(^1)</th>
<th>L 50</th>
<th>L 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0, XC1</td>
<td>0.9</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>XC2</td>
<td>1.0</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>XC3, XC4</td>
<td>1.2</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>XS1, XS2, XD1, XD2</td>
<td>1.5 1.2</td>
<td>1.0</td>
<td></td>
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<tr>
<td>XS3, XD3</td>
<td>1.8</td>
<td>1.5</td>
<td>1.2</td>
</tr>
</tbody>
</table>

\(^1\) The service life classes L100, L50, and L20 refer to structures with an expected service life of at least 100, 50, and 20 years respectively. *(BFS 2015:6).*

If verification concerns cracking prior to 28 days after casting, \( f_{ctk} \) should be replaced by \( f_{ctk}(t) \).

### Paragraph 7.3.4(3)

**General recommendation**
**Article 22**  
$k_3$ should be set to $7 \phi/c$. As regards $k_4$ the recommended value should be applied.

**Paragraph 8.3(2)**

*General recommendation*

**Article 23**  
Weldable reinforcement that has been bend-tested in accordance with SS-EN ISO 15630-1 can be bent with a bending radius, i.e. internal radius of curvature, which is not less than 0,75 times the mandrel diameter used in the bending test, provided that bending is done at temperatures above 0 °C. Otherwise, the recommended values should be applied.

**Paragraph 9.2.1.1(1) Note 2**

*General recommendation*

**Article 23a**  
The recommended amount of minimum reinforcement $A_{s,\text{min}}$ according to expression (9.1N) in SS-EN 1992-1-1 should be selected for beams. In the case of beams where a risk of brittle failure can be accepted, $A_{s,\text{min}}$ can be set to the required area in ultimate limit state. For slabs, according to 9.3 in SS-EN 1992-1-1, $A_{s,\text{min}}$ can be set to the required area in ultimate limit state, provided that transverse reinforcement is used. If the ultimate limit calculation shows that transverse reinforcement is not needed, a transverse reinforcement according to 9.3.1.1(2) in SS-EN 1992-1-1 should be used. If the ultimate limit calculation shows that reinforcement is not needed in any direction, minimum reinforcement equivalent to at least 25 % of the amount according to Expression (9.1N) should be used in both directions. *(BFS 2015:6).*

**Paragraph 9.2.1.1(3)**

*General recommendation*

**Article 24**  
$A_{s,\text{max}}$ can be assumed to be unlimited.

**Paragraph 9.2.2(4)**

*General recommendation*

**Article 25**  
If the shear reinforcement that is not designed as closed stirrups comprises of bent up or bent down longitudinal reinforcing, $\beta_s$ should be set to 0. Otherwise, the recommended value should be applied.

**Paragraph 9.2.2(5)**

*General recommendation*

**Article 26**  
The recommended value should be applied. If the fire resistance is lower than R30 and no shear reinforcement is required, $\rho_{e,\text{min}}$ can be set to zero. Otherwise, the recommended method for determination of $A_{s,\text{min}}$ is used. *(BFS 2015:6).*

**Paragraph 9.2.2(7)**

*General recommendation*

**Article 27**  
$b_{h,\text{max}}$ should be set to $0,75 d (1+cota)$.

**Paragraph 9.5.2(2)**

*General recommendation*

**Article 28**  
$A_{s,\text{min}}$ should be set to $0,002A_c$.  

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Paragraph 9.5.2(3)

General recommendation

Article 29  $A_{s,\text{max}}$ can be assumed to be unlimited.

Paragraph 9.6.2(1) Note 1

General recommendation

Article 30  In the case of walls with a slenderness ratio, $h/b$, less than 18, $A_{s,vmin} = 0$ can be used, where $b$ represents wall thickness and $h$ represents the wall’s buckling length. For other walls, $A_{s,vmin} = 0.001 \cdot A_c$ should be applied. (BFS 2015:6).

Paragraph 9.6.3(1)

General recommendation

Article 30a  Horizontal reinforcement parallel to the wall surfaces should not be less than 25% of the vertical reinforcement area. (BFS 2015:6).

Paragraph 9.8.4(1)

General recommendation

Article 31  $q_2$ should be set to the ground pressure that would cause splitting in concrete with the geometry in question and $\vartheta_{\text{min}}$ should be set to the recommended value.

Paragraph 9.8.5(3)

General recommendation

Article 32  $A_{s,bpm\text{min}}$ should be set to the recommended value. (BFS 2013:10).

Paragraph 9.10.2.2(2)

General recommendation

Article 33  $Q_2$ can be assumed to be unlimited and $q_1$ should be set to the recommended value. (BFS 2013:10).

Paragraph 9.10.2.3(4)

General recommendation

Article 34  $q_4$ can be assumed to be unlimited and $q_3$ should be set to the recommended value.

Paragraph 11.3.5(1)P

Article 35  $\alpha_{cc}$ shall be set to 1,0.

Paragraph 11.3.5(2)P

Article 36  $\alpha_{ct}$ shall be set to 1,0.

Paragraph 11.6.4.2(2)P

General recommendation

Article 36a  $v_{Rd,\text{max}}$ should be determined according to

$v_{Rd,\text{max}} = 0.5 \cdot v \cdot f_{cd}$

(BFS 2015:xx)

Paragraph 12.3.1(1)

General recommendation

Article 37  The value for $\alpha_{cc,pl}$ should be set to 1,0 and the value for $\alpha_{ct,pl}$ to 0,5.

Paragraph A.2.1(1), A.2.1(2), A.2.2(1), A.2.2(2), and A.2.3(1)

Article 38  Recommended value shall be used.
Paragraph C.1(1)

**Article 38a** In the case of ribbed steel with a yield strength $f_{yk} \leq 500$ MPa, the minimum relative rib area is listed in Table C.2N in SS-EN 1992-1-1. (BFS2015:6).

*General recommendation*

**Article 38b** The recommended value of $\beta$ should be used when designing for fatigue. (BFS 2015:6).

**Paragraph C.1(3) Note 1**

*General recommendation*

**Article 39** If at least 8 tests are carried out, $a = 40$ MPa should be used for $f_{yk}$ and $a = 0$ for $k$ and $\varepsilon_{uk}$. (BFS 2013:10).

**Paragraph C.1(3) Note 2**

*General recommendation*

**Article 40** The values in Table D-4 should be used.

**Table D-4 Upper and lower limits on test results**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum value $^1$</th>
<th>Maximum value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f_{yk}$</td>
<td>$0.97 \ C_v$</td>
<td>Unlimited</td>
</tr>
<tr>
<td>$K$</td>
<td>$0.98 \ C_v$</td>
<td>Unlimited</td>
</tr>
<tr>
<td>$\varepsilon_{uk}$</td>
<td>$0.95 \ C_v$</td>
<td>Unlimited</td>
</tr>
</tbody>
</table>

$^1$ Application is conditional upon at least 8 tests being carried out. (BFS 2013:10).

**Paragraph J.3(3)**

*General recommendation*

**Article 41** $k_2$ should be set to $0.5 \ a_0 z_0$.

**Application of informative annexes**

**Article 42** Annex E must not be used.
Chapter 2.1.2 – Application of EN 1992-1-2 – Structural fire design

Nationally Determined Parameters

<table>
<thead>
<tr>
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<th>Overview of national choices</th>
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<td>Comments</td>
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<tr>
<td>6.3(1)</td>
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</tr>
</tbody>
</table>

**Paragraph 2.1.3(2)**

*General recommendation*

**Article 2** The values for the average temperature rise and the maximum temperature rise during the cooling phase should be set to
- $\Delta \theta_1 = 180$ K,
- $\Delta \theta_2 = 220$ K.

**Paragraph 3.2.4(2)**

*General recommendation*

**Article 3** Class A should be used.

**Paragraph 3.3.3(1)**

*General recommendation*

**Article 4** The lower limit value should be used.

**Paragraph 4.1(1)P**

*General recommendation*

**Article 5** Advanced methods of calculation under Section 4.3 in SS-EN 1992-1-2 may be used.

**Paragraph 5.2(3)**

**Article 6** The value of $\eta_0$ shall be determined in accordance with 2.4.2.

**Paragraph 5.6.1(1)**

*General recommendation*

**Article 7** Class WB should be applied.

**Paragraph 6.2(2)**

*General recommendation*

**Article 8** The method B, C or D may be used.

**Paragraph 6.3(1)**

*General recommendation*

**Article 9** Unless otherwise indicated by testing, the upper limit value in accordance with Section 3.3.3 in SS-EN 1992-1-2 should be used.
Chapter 1.2 – has been repealed by (BFS 2015:6).
Chapter 2.3 - Application of EN 1992-3 - Liquid retaining and containment structures

Nationally Determined Parameters

<table>
<thead>
<tr>
<th>Article 1 Summary of national choices¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paragraph in the standard</td>
</tr>
<tr>
<td>-</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*
Section E – Application of EN 1993 – Design of steel structures

Chapter 3.1.1 – Application of EN 1993-1-1 – General rules and rules for buildings

General

General recommendation

Article 1 See Table 2.1 of SS-EN 1993-1-10 for selection of steel grade dependent on ambient temperature and material thickness. (BFS 2015:6).

Execution inspection of welds

General recommendation

Article 1a If the execution inspection of the first 10 % of the welds, to the extent specified in SS-EN 1090-2, does not show any deficiencies in execution, the remaining welds can be inspected to half of the extent specified in SS-EN 1090-2. If deficiencies are found in the continued inspection, at a reduced extent as above, the remaining inspection shall resume at the extent specified in EN 1090-2. (BFS 2015:6).

Nationally Determined Parameters

Article 2 Overview of national choices

<table>
<thead>
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<td>7.2.3(1)B</td>
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<tr>
<td>C2.2(4)</td>
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</tbody>
</table>

(BFS 2015:6).
Paragraph 3.1(2)

*General recommendation*

**Article 3** Steel grades in accordance with Table E-1 can also be used.

![Table E-1: Steel grades](image)

Additional steel grades are given in SS-EN 1993-1-12.

*General recommendation*

**Article 4** The following shall be added to Table 4.1 in SS-EN 1993-1-8.

![Table E-2: Correlation factor $\beta_w$ for fillet welds](image)

Paragraph 3.2.1(1)

**Article 5** Alternative $a$ shall be used.

Paragraph 3.2.2(1)

**Article 6** The following values shall be used:

\[
\frac{f_u}{f_y} \geq 1,10 \\
\varepsilon_u \geq 15 \varepsilon_y
\]

Paragraph 3.2.3(1)P

*General recommendation*

**Article 7** For other buildings, the lowest service temperature can be calculated with the aid of SS-EN 1991-1-5:2003 and the associated national annex, or alternatively, a lowest service temperature for outdoor structures.
Paragraph 3.2.4(1)

*General recommendation*

**Article 8** Följande val av riktvärden för $Z_{Ed}$ enligt 3.2(2) i SS-EN 1993-1-10 för respektive kvalitetsklass i SS-EN 10164 bör användas. *(BFS 2015:6).*

**Table E-3**  

<table>
<thead>
<tr>
<th>Quality class according to SS-EN 10164</th>
<th>The required value of $Z_{Ed}$ expressed as $Z$-values according to SS-EN 1993-1-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Z_{Ed} \leq 10$</td>
<td>no requirements</td>
</tr>
<tr>
<td>$Z_{Ed} &gt; 10$</td>
<td>$Z_{35}$</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

Paragraph 5.2.2(8)

*General recommendation*

**Article 9** Plastic hinge method of structural analysis should only be used for single storey frames. When the method is used, joints and attachments should be designed taking into account second order effects. *(BFS 2015:6).*

Paragraph 5.3.2(11)

*General recommendation*

**Article 10** The method may be used provided that elastic analysis is used.

Paragraph 6.1(1) Note 1 and Note 2B

**Article 11** Note 1 and Note 2B: For buildings and structures that are not covered by SS-EN 1993 Parts 2 to 6, the following partial factors shall be used

- $\gamma_{M0}=1,0$
- $\gamma_{M1}=1,0$
- $\gamma_{M2}=0,9 \frac{f_{u}}{f_{y}}$ but not more than 1,1

*(BFS 2015:6).*

Paragraph 6.3.2.3(1)

*General recommendation*

**Article 12** The following values may be used for all rolled or welded beams

\[ \lambda_{LT,0} = 0,4 \]

\[ \beta = 0,75 \]

Paragraph 6.3.2.4(1)B Note 2B

*General recommendation*

**Article 13** The following values should be used $\lambda_{c,0} = 0,5$ for beams in class 1 or 2 cross sections and $\lambda_{c,0} = 0,4$ for class 3 and 4 cross sections.

Paragraph 6.3.3(5) Note 2

*General recommendation*

**Article 14** Method 1 should be used.
Paragraph 6.3.4(1)

General recommendation

Article 15  The method may be used, in which case interpolation between $\chi$ and $\chi_{LT}$ should be done as follows:

$$\bar{\chi} = \frac{nX + mX_{LT}}{m + n}$$

where

$$n = \frac{N_{Ed}}{N_{Rk}}$$

and

$$m = \frac{M_{y,Ed}}{M_{y,Rk}}$$

(BFS 2015:6).

Paragraph 7.2.1(1)B

General recommendation

Article 16  For thin gauge steel structures in walls, the deformation in the serviceability limit states should not exceed l/200 in the combination frequent combination of actions, reversible limit states.

Paragraph 7.2.2(1)B

General recommendation

Article 17  For thin gauge steel structures in roofs, the deformation in the serviceability limit states should not exceed l/200 in the combination frequent combination of actions, reversible limit states.

Paragraph 7.2.3(1)B

General recommendation

Article 18  For criteria for vibrations in lightweight steel floors, see Consolidated results from European development projects relating to lightweight construction using steel, Swedish Institute of Steel Construction Report 259:1.

Paragraph C.2.2(3)

General recommendation

Article 19  Selection of execution class should be based on consequence class according to Table C.1, as well as on the relevant reliability class. (BFS 2015:6).

Paragraph C.2.2(4)

General recommendation

Article 20  The restrictions on EXC1 under points a) – d) need not be followed. (BFS 2015:6).
Chapter 3.1.2 – Application of SS-EN 1993-1-2 – Structural fire design

Nationally Determined Parameters

Article 1  Overview of national choices

<table>
<thead>
<tr>
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</table>

(BFS 2015:6).

Paragraph 2.3(1), 2.3(2)

Article 2  The following value shall be used.

\[ \gamma_{M,fi} = 1,0 \]

Paragraph 4.1 (2)

General recommendation

Article 3  Advanced calculation methods can be used.

Paragraph 4.2.3.6(1) Note 2

General recommendation

Article 4  \( \theta_{crit} = 350 \) °C is a conservative value.
Calculation in accordance with Annex E can be used.
Chapter 3.1.3 – Application of EN 1993-1-3 – Cold-formed members and sheeting

Nationally Determined Parameters

Article 1 Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
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<tr>
<td>Annex E</td>
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</tr>
</tbody>
</table>

\[(BFS 2015:6)\].

**Paragraph 2(3)P**

Article 2 The partial factors $\gamma_{M0}$, $\gamma_{M1}$ and $\gamma_{M2}$ shall be chosen in accordance with the following

- $\gamma_{M0} = 1,0$
- $\gamma_{M1} = 1,0$
- $\gamma_{M2} = 1,2$

**Paragraph 2(5)**

Article 3 The following value shall be used.

- $\gamma_{M,ser} = 1,0$

**Paragraph 3.1(3) Note 1**

Article 4 The recommended values shall be used unless it can be shown that the values in Table 3.1a can be achieved both in the rolling direction and at right angles to the rolling direction.

**Paragraph 3.1(3) Note 2**

Article 5 Steel in accordance with Table 3.1b may be used. For steel in accordance with SS-EN 10327, the following additional requirements shall apply.

When steel in accordance with SS-EN 10327 is used, the design shall be based on the 0,2 limit and the ultimate strength, whichever is lowest. These values shall be verified by means of material certificates taken from the product in question.
The values shall be complied with in the directions in which the steel is employed.

SS-EN 1993-1-3 may also be used for the following steels:
- Steel in accordance with SS-EN 10025-5.
- Steel in accordance with SS-EN 10025-6, provided that the restrictions pursuant to SS-EN 1993-1-3 and SS-EN 1993-1-12 are observed.
- Steel S550GD+Z in accordance with SS-EN 10326-5.
(BFS 2015:6).

**Paragraph 3.2.4(1)**

*General recommendation*

**Article 6** No limits for thickness are given. These may be governed by functional requirements, for example its ability to be walked on. For joints, the validity of the formulae in 8.1(2) is given in the standard.

**Paragraph 8.3(5)**

**Article 7** Recommended value $\gamma_{M2} = 1.25$ shall be used.

**Paragraph 8.3(13) Table 8.1**

**Article 8** The characteristic shear resistance $F_{v,Rk}$ for blind rivets may be chosen in accordance with Table E-4. The design value for tensile resistance $F_{t,Rd}$ and for shear resistance $F_{v,Rd}$ is determined according to

$$F_{t,Rd} = F_{v,Rd} = \frac{F_{v,Rk}}{\gamma_{M2}}$$

Higher values can be used after testing in accordance with Annex D of SS-EN 1990. For small sample size testing rules in Section B, Chapter 0, Article 11 apply when characteristic strength values are determined.

**Table E-4** Characteristic shear resistance for blind rivets $F_{v,Rk}$ (N/rivet)

<table>
<thead>
<tr>
<th>Rivet diameter (mm)</th>
<th>Rivet material 1)</th>
<th>Steel</th>
<th>Stainless steel</th>
<th>Monel 2)</th>
<th>Aluminium</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>1600</td>
<td>2800</td>
<td>2400</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>4.8</td>
<td>2400</td>
<td>4200</td>
<td>3500</td>
<td>1100</td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td>2600</td>
<td>4600</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>6.4</td>
<td>4400</td>
<td>-</td>
<td>6200</td>
<td>2000</td>
<td></td>
</tr>
</tbody>
</table>

1) In accordance with applicable standard or with assessed characteristics.
2) Nickel-copper alloy of two parts nickel and one part copper.

(BFS 2015:6).

**Paragraph 8.3(13) Table 8.2**

**Article 9** The characteristic shear resistance $F_{v,Rk}$ for self-tapping screws may be chosen in accordance with Table E-5. The design values for tensile resistance $F_{t,Rd}$ and shear resistance $F_{v,Rd}$ are determined according to

$$F_{t,Rd} = 1.25 F_{v,Rd} = \frac{1.25 F_{v,Rk}}{\gamma_{M2}}$$

Higher values can be used after testing in accordance with Annex D of SS-EN 1990. For small sample size testing rules in Section B, Chapter 0, Article 11 apply when characteristic strength values are determined.
Table E-5  
Characteristic shear resistance for self-tapping screws $F_{v,Rk}$ (N/screw)

<table>
<thead>
<tr>
<th>Screw diameter (outer diameter of the thread) (mm)</th>
<th>Screw material</th>
<th>Hardened steel</th>
<th>Stainless steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.8</td>
<td></td>
<td>5,200</td>
<td>4,600</td>
</tr>
<tr>
<td>5.5</td>
<td></td>
<td>7,200</td>
<td>6,500</td>
</tr>
<tr>
<td>6.3</td>
<td></td>
<td>9,800</td>
<td>8,500</td>
</tr>
<tr>
<td>8.0</td>
<td></td>
<td>16,300</td>
<td>14,300</td>
</tr>
</tbody>
</table>

1 In accordance with applicable standard or with assessed characteristics. (BFS 2013:10).

(BFS 2015:6).

Paragraph 8.3(13) Table 8.3
Article 10 The shear resistance, tension resistance and pull-out resistance of cartridge-fired pins shall be stated by an assessment. (BFS 2013:10).

Paragraph 8.4(5)
Article 11 Recommended value $\gamma_{M2} = 1,25$ shall be used.

Paragraph 8.5.1(4)
Article 12 Recommended value $\gamma_{M2} = 1,25$ shall be used.

Paragraph A.1(1) Note 2
Article 12a When designing according to testing the characteristic values of section forces and moments shall be calculated in the same way as for small sample size testing from an infinite population according to Section B, Chapter 0, Article 12. The 95 % fractile with 75 % confidence level shall be chosen as the characteristic value. (BFS 2015:6).

Paragraph A.1(1) Note 3
General recommendation
Article 13 The conversion factors may be set equal to 1,00.

Paragraph A.6.4(4)
Article 14 The partial factor $\gamma_M$ shall be determined by testing in accordance with Annex D in SS-EN 1990. For small sample size testing rules in Section B, Chapter 0, Article 11 apply when characteristic strength values are determined. If the intent of testing is only to determine the design value irrespective of any calculation model, the recommended value shall be used.

Application of informative annexes.
Article 15 Annex E must not be applied.
Chapter 3.1.4 – Application of EN 1993-1-4 – Stainless steel

Nationally Determined Parameters

<table>
<thead>
<tr>
<th>Article</th>
<th>Overview of national choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paragraph in the standard</td>
<td>Comments</td>
</tr>
<tr>
<td>5.1(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>Annexe C</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

Paragraph 5.1(2)

Article 2  The following partial factors shall be used
- \( \gamma_{M0} = 1,0 \)
- \( \gamma_{M1} = 1,0 \)
- \( \gamma_{M2} = 1,2 \)

Application of informative annexes

General recommendation

Article 3  Annex C should be used in connection with design using FEM.
Chapter 3.1.5 – Application of EN 1993-1-5 – Plate girders

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>10(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>Annex D</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(*BFS 2015:6*).

**Article 2** – has been repealed by (*BFS 2015:6*).

**Paragraph 10(1)**

*General recommendation*

**Article 3** The method should not be used.

**Application of informative annexes.**

*General recommendation*

**Article 4** Annex D should be applied.
Chapter 3.1.6 – Application of EN 1993-1-6 – Shell structures

Nationally Determined Parameters

<table>
<thead>
<tr>
<th>Article</th>
<th>Overview of national choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paragraph in the standard</td>
<td>Comments</td>
</tr>
<tr>
<td>6.3(5)</td>
<td>National choice made</td>
</tr>
<tr>
<td>8.4.3(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>8.5.2(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>9.2.1(2)P</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

**Paragraph 6.3(5)**

*General recommendation*

**Article 2** The value should be set to \( \varepsilon_{\text{mps}} = 0.05E_{\text{f,ed}} \) i.e. \( \sigma_{\text{mps}} = 0.05 \).

**Paragraph 8.4.3(2)**

*General recommendation*

**Article 3** Absolute figures should not be used. The relative values in Table 8.3 should be used.

**Paragraph 8.5.2(2)**

**Article 4** The partial factor \( \gamma_{\text{M1}} = 1.0 \) shall be used. (BFS 2015:5).

**Paragraph 9.2.1(2)P**

**Article 5** The partial factor \( \gamma_{\text{Mf}} \) shall be selected in accordance with Chapter 3.1.9, Article 2. (BFS 2015:6).
Chapter 3.1.7 – Application of EN 1993-1-7 – Plated structures subject to out of plane loading

Nationally Determined Parameters

**Article 1** Översikt över nationella val

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).
Chapter 3.1.8 - Application of EN 1993-1-8 – Design of joints

General

§ 1 Bolts, nuts, and washers shall come from the same manufacturer and shall have been sold as a unit, unless otherwise specified in the respective product standard. Bolts, nuts and washers from different units may not be mixed together. (BFS 2015:6).

General recommendation

SS-EN 14399-1 specifies that preloaded joints shall use CE marked bolt kits. SS-EN 15048-1 specifies that joints without preloading shall use CE marked bolt kits.

It should be clear from the construction documents that bolt kits may not be mixed and that they shall be CE marked. (BFS 2015:6).

Nationally Determined Parameters

Article 2 Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.6</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.2(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.1.1(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.4.2(1)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

Paragraph 1.2.6

General recommendation

Article 3 Rivets should comply with the requirements in SS 39 and SS 318. Material for rivets in accordance with SS-EN 10263-2 may be used.

Paragraph 2.2(2)

Article 4 Partial factors in accordance with Table E-6 shall be applied.

Table E-6 Partial factors

<table>
<thead>
<tr>
<th>Partial factors for</th>
<th>Partial factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance of cross sections</td>
<td>Före $\gamma_{M0}$, $\gamma_{M1}$ och $\gamma_{M2}$ (tvärsnittet) se 11 § i Kap. 3.1.1</td>
</tr>
<tr>
<td>Bolts</td>
<td>$\gamma_{M2} = 1.2$</td>
</tr>
<tr>
<td>Rivets</td>
<td>$\gamma_{M1} = 1.2$</td>
</tr>
<tr>
<td>Pins</td>
<td>$\gamma_{M5,ser} = 1.0$</td>
</tr>
<tr>
<td>Welds</td>
<td>$\gamma_{M5} = 1.0$</td>
</tr>
<tr>
<td>Plates in bearing</td>
<td>$\gamma_{M5} = 1.0$</td>
</tr>
<tr>
<td>Slip resistance</td>
<td>$\gamma_{M6} = 1.0$</td>
</tr>
<tr>
<td>– in ultimate limit state (Category C)</td>
<td>$\gamma_{M5} = 1.0$</td>
</tr>
<tr>
<td>– in serviceability limit states (Category B)</td>
<td>$\gamma_{M5,ser} = 1.0$</td>
</tr>
<tr>
<td>Injection bolts</td>
<td></td>
</tr>
<tr>
<td>Joints in hollow section lattice girder</td>
<td>$\gamma_{M7} = 1.0$</td>
</tr>
<tr>
<td>Pins in serviceability limit state</td>
<td>$\gamma_{M8,ser} = 1.0$</td>
</tr>
<tr>
<td>Preload of high strength bolts</td>
<td>$\gamma_{M7} = 1.0$</td>
</tr>
<tr>
<td>Concrete</td>
<td>$\gamma$, se SS-EN 1992</td>
</tr>
</tbody>
</table>
Paragraph 3.1.1(3)

*General recommendation*

**Article 5** Only bolt classes 8.8 and 10.9 should be used, except for bolted connections in Category A for which bolt class 4.6 may also be used.

For bolted connections in Categories B, C, and E, bolts, nuts and washers in accordance with SS-EN 14399 should be used. (BFS 2015:6).

Paragraph 3.4.2(1)

*General recommendation*

**Article 6** Preloading force should be $0.7 f_{ub} A_v$.

**Article 7** has been repealed by (BFS 2015:6).
Chapter 3.1.9 – Application of EN 1993-1-9 – Fatigue

Nationally Determined Parameters

Article 1  Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3(7)</td>
<td>National choice made</td>
</tr>
<tr>
<td>5(2)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

Paragraph 3(7)

Article 2  The following partial factors shall be used.
For damage tolerant method:
- In reliability classes 1 and 2
  - $\gamma_{Mf} = 1,0$.
- In reliability class 3
  - $\gamma_{Mf} = 1,15$.

For safe-life method:
- In reliability classes 1 and 2
  - $\gamma_{Mf} = 1,15$.
- In reliability class 3
  - $\gamma_{Mf} = 1,35$.

(BFS 2013:10).

Article 3  has been repealed by (BFS 2015:6).

Paragraph 5(2)

General recommendation

Article 4  For class 4 cross sections, stresses should be calculated for the gross cross section with a reduction for the effect of shear deformations in wide flanges.
Chapter 3.1.10 – Application of EN 1993-1-10 – Material toughness and through-thickness properties

Nationally Determined Parameters

<table>
<thead>
<tr>
<th>Article 1</th>
<th>Overview of national choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paragraph in the standard</td>
<td>Comments</td>
</tr>
<tr>
<td>2.2(5) Note 3</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.2(5) Note 4</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

Paragraph 2.2(5) Note 3

General recommendation

Article 2  No restriction is provided for the difference between $T_{Ed}$ and test temperature.

Allowable stress, $\sigma_{Ed}$, according to Table 2.1 of SS-EN 1993-1-10, should be followed when the temperature is the leading action.

When the temperature is the leading action, design values for ultimate limit shall be selected according to Section B, Chapter 0, Table B-3. (BFS 2015:6).

Paragraph 2.2(5) Note 4

General recommendation

Article 3  Table 2.1 in SS-EN 1993-1-10 may be applied without restrictions. (BFS 2015:6).
Chapter 3.1.11 – Application of EN 1993-1-11 – Design of structures with tension components

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4(2)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

**Paragraph 4.4(2)**

*General recommendation*

**Article 2** With regard to corrosion, stainless steel for wire should be chosen in accordance with Table A.1 in SS-EN 1993-1-4. *(BFS 2015:6).*
Chapter 3.1.12 – Application of EN 1993-1-12 – Additional rules for steel grades up to S 700

**Nationally Determined Parameters**

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>No National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*
Chapter 3.2 – has been repealed by (BFS 2015:6).
Chapter 3.3.1 Application of SS-EN 1993-3-1 – Towers and masts

Nationally Determined Parameters

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
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<tbody>
<tr>
<td>2.1.1(3)P</td>
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</tr>
<tr>
<td>2.6.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.3.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.4.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>9.5(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.2(1)P Note 2</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

*General recommendation*

Paragraph 2.1.1(3)P

*General recommendation*

Article 2 Guy rapture should be taken into account in accordance with Annex E. *(BFS 2015:6).*

Paragraph 2.6(1)

*General recommendation*

Article 3 Normally, a design life of 50 years is recommended for construction works that are accessible for inspection and maintenance. In the case of masts and towers with a design life of less than 50 years, the chosen design life should be stated in the construction documents. *(BFS 2015:6).*

Paragraph 6.1(1)

Article 4 The following values for the partial safety factors $\gamma_M$ shall be used:

- $\gamma_{M0} = 1.00$
- $\gamma_{M1} = 1.00$
- $\gamma_{M2} = 0.9f_u/f_y$ though not more than 1.1 (concerns Expression (6.7) in SS-EN 1993-1-1)
- $\gamma_{M3} = 2.00$
- $\gamma_{M4} = 2.50$

*(BFS 2015:6).*

Paragraph 6.3.1(1)

*General recommendation*

Article 5 The method in Annexes G and H should be used. *(BFS 2015:6).*

Paragraph 6.4.1(1)

Article 6 The partial factors for connections in masts and towers are given in Section E, Chapter 3.1.8, Article 4. *(BFS 2015:6).*
**Paragraph 9.5.1(1)**

**Article 7**  The following value shall be used.

\[ \gamma_{Ff} = 1.00 \]

The value for \( \gamma_{Mw} \) is selected according to Section E, Chapter 3.1.9, Article 2. *(BFS 2015:6).*

**Paragraph A.2(1)P Note 2**

**Article 8**  Load cases according to Tables B-2 and B-3 in Section B, Chapter 0 shall be used for ultimate limit state. Partial factors according to SS-EN 1990 are used for exceptional design situations. *(BFS 2015:6).*
Chapter 3.3.2 Application of SS-EN 1993-3-2 – Chimneys

Nationally Determined Parameters

Article 1  Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3.3.5(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.6.(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>5.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.1(1)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.4.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>9.5(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.2(1) Note 2</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

Paragraph 2.3.3.5(1)

*General recommendation*

Article 2  Chimneys do normally not need to be designed for ice load. *(BFS 2015:6).*

Paragraph 2.6(1)

*General recommendation*

Article 3  Normally, a design life of 50 years is recommended for construction works that are accessible for inspection and maintenance. In the case of chimneys with a design life of less than 50 years, the chosen design life should be stated in the construction documents. *(BFS 2015:6).*

Paragraph 5.1(1)

*General recommendation*

Article 4  The value for mechanical damping, $\delta_m$, should be selected by taking into account, among other things, the foundation work and the amount of damping installations and secondary parts. Recommended values expressed as logarithmic decrement are provided as ranges in the following table.

<table>
<thead>
<tr>
<th>Type of structure</th>
<th>$\delta_m$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel chimneys without installations or secondary parts besides the mantle</td>
<td>0.015–0.02</td>
</tr>
<tr>
<td>Steel chimneys with installations or secondary parts besides the mantle</td>
<td>0.02–0.03</td>
</tr>
<tr>
<td>Lattice masts with welded joints or friction joints</td>
<td>0.015</td>
</tr>
<tr>
<td>Lattice masts with bolted joints</td>
<td>0.02–0.06</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

Paragraph 6.1(1)P

Article 5  The following values for the partial safety factors $\gamma_M$ shall be used:

- $\gamma_{M0} = 1.00$
- $\gamma_{M1} = 1.00$
- $\gamma_{M2} = 0.9 f_u / f_y$ though not more than 1.1 (concerns Expression (6.7) in SS-EN 1993-1-1)

*(BFS 2015:6).*
Paragraph 6.4.1(1)

Article 6 The partial factors for joints in chimneys are selected according to Section E, Chapter 3.1.8, Article 4. (BFS 2015:6).

Paragraph 9.5(1)

Article 7 The following value shall be used.

- $\gamma_f = 1.00$

The value for $\gamma_{Mf}$ is selected according to Section E, Chapter 3.1.9, Article 2. (BFS 2015:6).

Paragraph A.2(1) Note 2

Article 8 Load cases according to Tables B-2 and B-3 in Section B, Chapter 0 shall be used for ultimate limit state. Partial factors according to Table A1.3 in SS-EN 1990 are used for exceptional design situations. (BFS 2015:6).
Chaper 3.4.1 Application of SS-EN 1993-4-1 - Silos

Nationally Determined Parameters

**Article 1** Summary of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2(3)</td>
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<tr>
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</tr>
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<td>5.3.2.3(3)</td>
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</tr>
<tr>
<td>6.1.2(4)</td>
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<tr>
<td>9.8.2(1)</td>
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<tr>
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<td>National choice made</td>
</tr>
<tr>
<td>A.2(1)</td>
<td>National choice made</td>
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<tr>
<td>A.3.2.1(6)</td>
<td>National choice made</td>
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<tr>
<td>A.3.2.2(6)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.3.2.3(2)</td>
<td>National choice made</td>
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<tr>
<td>A.3.3(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.3.3(3)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

**General recommendations**

Rules on silos are also issued by the Arbetsmiljöverket (Eng: Swedish Work Environment Authority). *(BFS 2013:10).*

**Paragraph 2.2(3)**

**Article 2** Reliability classes shall be used in the differentiation of the reliability of construction works; see Section B, § 2 (on SS-EN 1990). *(BFS 2015:6).*

**General recommendations**

**Article 2** Table 2.1 in SS-EN 1993-4-1 can be used as supplementary guidance for the selection of reliability class with consequence classes equated with reliability classes. *(BFS 2015:6).*

**Paragraph 2.9.2.2(3)P**

**Article 3** The following values shall be used:

\[
\begin{align*}
\gamma_{M0} &= 1.0 \\
\gamma_{M1} &= 1.0 \\
\gamma_{M2} &= 0.9 \frac{f_u}{f_y} \text{ though maximum 1.1 (for the net cross-section)} \\
\gamma_{M4} &= 1.0 \\
\gamma_{M5} &= 1.2 \\
\gamma_{M6} &= 1.1
\end{align*}
\]

*(BFS 2013:10).*

**Paragraph 5.3.2.3(3)**

**General recommendations**

**Article 4** The recommended values may be used provided that the fillet weld is designed to be equally strong like the thinner goods if \( j_1 = 1.0 \) is used. *(BFS 2013:10).* *(BFS 2013:10).*

**Paragraph 6.1.2(4)**

**General recommendations**

**Article 5** \( \gamma_{M0g} \) should be set to 1.2. *(BFS 2013:10).*
Paragraph 9.8.2(1) and (2)

General recommendations
Article 6 Any deflection restrictions shall be decided by the client/owner. (BFS 2013:10).

Paragraph A.2(1)

General recommendations
Article 7 $k_M = 1.0$ should be used. (BFS 2013:10).

Paragraph A.3.2.1(6)

General recommendations
Article 8 The recommended values may be used provided that the fillet weld is designed to be equally strong like the thinner goods if $j_1 = 1.0$ is used. (BFS 2013:10).

Paragraph A.3.2.2(6)

General recommendations
Article 9 $\gamma_{M1} = 1.0$ should be used. (BFS 2013:10).

Paragraph A.3.2.3(2)

General recommendations
Article 10 $\alpha_n = 0.5$ and $\gamma_{M1} = 1.0$ should be used. (BFS 2013:10).

Paragraph A.3.3(1)

General recommendations
Article 11 $\gamma_{M0g}$ should be set to 1.2. (BFS 2013:10).

Paragraph A.3.3(3)

General recommendations
Article 12 $k_r = 0.9$ (as recommended) and $\gamma_{M2}$ according to 2.9.2.2(3) should be used. (BFS 2013:10).
Chapter 3.4.2 Application of SS-EN 1993-4-2 – Tanks

General recommendations

Article 1  Rules on tanks are also issued by the Arbetsmiljöverket (Eng: Swedish Work Environment Authority). (BFS 2015:6).

Nationally Determined Parameters

Article 2  Summary of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.9.2.1(1)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.9.2.1(2)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.9.2.2(3)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

Paragraph 2.2(3)

Article 3  Reliability classes shall be used in the differentiation of the reliability of construction works; see Section B, § 2 (on SS-EN 1990). (BFS 2015:6).

General recommendations

The recommended classification can be used as supplementary information with the addition that the size limit for consequence class 3 is a volume greater than or equal to 50 m³. (BFS 2015:6).

Paragraph 2.9.2.1(1)P

Article 4  When applying the expressions 6.10a and b in SS-EN 1990, the following values shall be used:

$$\gamma_{G,\text{sup}} = 1.35$$

$$\gamma_{G,\text{inf}} = 1.00$$

$$\gamma_Q = 1.4$$ for variable loads from fluids ($$\gamma_Q$$ is designated as $$\gamma_F$$ in SS-EN 1993-4-2)

$$\psi_{0,1} = 1.0$$

$$\xi = 0.89$$

(BFS 2015:6).

Paragraph 2.9.2.1(2)P

Article 5  When applying the expression 6.11b in SS-EN 1990, the following value shall be used:

$$\psi_{1,1} = 1.0$$ for variable loads from liquids

(BFS 2015:6).

Paragraph 2.9.2.2(3)P

Article 6  The following values shall be used:

$$\gamma_{M0} = 1.0$$

$$\gamma_{M1} = 1.0$$

$$\gamma_{M2} = 0.9 f_u/f_y$$ though maximum 1.1

$$\gamma_{M4} = 1.0$$

$$\gamma_{M5} = 1.2$$

$$\gamma_{M6} = 1.1$$
The condition above concerns $\gamma_{M2}$ in the expressions (6.7) and (6.16) in SS-EN 1993-1-1. For $\gamma_{M2}$ when designing joints, see Chapter 3.1.8, Article 4, Table E-6. *(BFS 2015:6).*
Chapter 3.5 Application of SS-EN 1993-5 – Piling

Nationally Determined Parameters

<table>
<thead>
<tr>
<th>Article</th>
<th>Summary of national choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paragraph in the standard</td>
<td>Comments</td>
</tr>
<tr>
<td>3.9(1)P</td>
<td>National choice made</td>
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<tr>
<td>5.1.1(4)</td>
<td>National choice made</td>
</tr>
<tr>
<td>7.1(4)</td>
<td>National choice made</td>
</tr>
<tr>
<td>7.2.3(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.3.1(3)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

Paragraph 3.9(1)P

_General recommendation_

**Article 2** Minimum operating temperature can be calculated with the help of SS-EN 1991-1-5:2003 and associated national annex. Alternatively, a minimum operating temperature of –30 °C can be assumed. (BFS 2015:6).

Paragraph 5.1.1(4)

**Article 3** The following values for the partial safety factors \( \gamma_M, \gamma_{M1} \) and \( \gamma_{M2} \) shall be used:
\[
\gamma_M = 1.0 \\
\gamma_{M1} = 1.0 \\
\gamma_{M2} = 0.9 \frac{f_u}{f_y}, \text{ though not more than 1.1 (concerns Expression (6.7) in SS-EN 1993-1-1).}
\]
(BFS 2015:6).

Paragraph 7.1(4)

**Article 4** The following values for the partial safety factors \( \gamma_{M2} \) and \( \gamma_{M3,ser} \) shall be used:
\[
\gamma_{M2} = 1.2 \\
\gamma_{M3,ser} = 1.0
\]
(BFS 2015:6).

Paragraph 7.2.3(2)

_General recommendation_

**Article 5** If no special consideration has been given to load effects that can cause bending of the hinged joint, the factor \( k_t \) can be set to 0.75. If the hinged joint’s connection to the sheet pile is designed such that bending of the hinged joint can be avoided, the factor \( k_t \) can be set to 0.9.
(BFS 2015:6).

Paragraph A.3.1(3)

**Article 6** The following values shall be used:
\[
\frac{f_u}{f_y} \geq 1.10 \\
\text{Elongation at fracture } > 14 \% \\
\epsilon_u \geq 15 \epsilon_y
\]
(BFS 2015:6).
Chapter 3.6. Application of SS-EN 1993-6 – Crane supporting structures

Nationally Determined Parameters

Article 1 Summary of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>2.1.3.2(1)P</td>
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</tr>
<tr>
<td>3.2.3(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.2.4(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.3.2.3(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>8.2(4)</td>
<td>National choice made</td>
</tr>
<tr>
<td>9.3.3(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>9.4.2(5)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6)

Paragraph 2.1.3.2(1)P

Article 2 Provided that the service life, is at least 25 years, unless special circumstances warrant otherwise. (BFS 2013:10).

Paragraph 3.2.3(1)

General recommendations

Article 3 The lowest service temperature for the selection of ductility class should be assumed to be 10°C for heated premises and -40°C for unheated premises or outdoors. (BFS 2015:6).

Paragraph 3.2.4(1)

General recommendations

Article 4 For relationship between the target value \(Z_{Ed}\) according to 3.2(3) in SS-EN 1993-1-10 and the quality class in SS-EN 10164, Table E-3 in Chapter 3.1.1, Article 8 should be applied. (BFS 2015:6).

Paragraph 6.1(1)

Article 5 The values as per Table E-8 shall be used:

Tabell E-8 Partial factors for resistance

<table>
<thead>
<tr>
<th>Resistance of cross-sections or elements</th>
<th>Resistance of joints</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\gamma_{M0} = 1,0)</td>
<td>(\gamma_{M2} = 1,2)</td>
</tr>
<tr>
<td>(\gamma_{M1} = 1,0)</td>
<td>(\gamma_{M3} = 1,2)</td>
</tr>
<tr>
<td>(\gamma_{M2} = 0,9 \frac{f_u}{f_y})</td>
<td>(\gamma_{M3,ser} = 1,0)</td>
</tr>
<tr>
<td></td>
<td>(\gamma_{M4} = 1,0)</td>
</tr>
<tr>
<td></td>
<td>(\gamma_{M5} = 1,0)</td>
</tr>
<tr>
<td></td>
<td>(\gamma_{M6,ser} = 1,0)</td>
</tr>
<tr>
<td></td>
<td>(\gamma_{M7} = 1,0)</td>
</tr>
</tbody>
</table>

(BFS 2013:10).
Paragraph 6.3.2.3(1)

General recommendations

Article 6  Annex A may be used for simply supported beams. As an alternative, the following method may be used for all beams with rails mounted without elastomeric bearing pads.

The flanges are considered as rods with an area equal to the flange area plus one third of the compression zone area (different for upper and lower flanges). The force in the rod is calculated as the moment divided by the distance between the flanges' centre of gravity. Critical force for the rod should be calculated taking into account the force’s variation along the rod. The top flange is assumed to take up the horizontal load by bending sideways. No horizontal load is assumed for the lower flange. The mechanical resistance is verified according to SS-EN 1993-1-1. *(BFS 2015:6).*

Paragraph 8.2 (4)

General recommendations

Article 7  In this context, no crane classes are regarded as "high fatigue". Transverse web stiffeners should be used only at the supports and these should be welded to the top flange if they transfer horizontal support reaction. *(BFS 2013:10).*

Paragraph 9.3.3(1)

General recommendations

Article 8  Bending stresses in the web can be disregarded for all crane classes. *(BFS 2013:10).*

Paragraph 9.4.2(5)

General recommendations

Article 9  Rules for the combined effect of two cranes are set out in Section C, Chapter 1.3, Article 4. If the use of a different calculation model is desired for the combined effect of cranes, \( \lambda_{\text{dup}} \) should be selected two classes lower than the crane that has in the lowest class. In this case, the load combination factor shall be set to 1.0.

More than two cranes do not need to be considered. *(BFS 2015:6).*
Section F – Application of EN 1994 – Design of composite steel and concrete structures

Chapter 4.1.1 – Application of SS-EN 1994-1-1 – General rules and rules for buildings

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
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<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>2.4.1.1(1)</td>
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</tr>
<tr>
<td>2.4.1.2(5)P</td>
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</tr>
<tr>
<td>2.4.1.2(6)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.1.2(7)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.1(4)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.5(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.6.3.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.6.3.1(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.8.2(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.8.2(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>9.6(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>9.7.3(4)</td>
<td>National choice made</td>
</tr>
<tr>
<td>9.7.3(8)</td>
<td>National choice made</td>
</tr>
<tr>
<td>B.2.5(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>B.3.6(5)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6)*

**Paragraph 2.4.1.1(1)**

**Article 2** Recommended value $\gamma_p = 1.0$ shall be used. *(BFS 2013:10).*

**Paragraph 2.4.1.2(5)P**

**Article 3** Recommended value $\gamma_p = 1.25$ shall be used. *(BFS 2013:10).*

**Paragraph 2.4.1.2(6)P**

**Article 4** Following value $\gamma_{VS} = 1.2$ shall be used. *(BFS 2013:10).*

**Paragraph 2.4.1.2(7)P**

**Article 5** Recommended value $\gamma_{Mfs} = 1.0$ shall be used. *(BFS 2013:10).*
Paragraph 3.1(4)  
General recommendation  
Article 6  Values for shrinkage of concrete in Annex C may be applied to buildings.

Paragraph 3.5 (2)  
General recommendation  
Article 7  The minimum nominal sheet thickness should be taken as 0,7 mm, excluding zinc.

Paragraph 6.6.3.1(1)  
Article 8  Values in accordance with Article 3 in this chapter shall be used.

Paragraph 6.6.3.1(3)  
General recommendation  
Article 9  The rules in SS-EN 1994-2 may also be used for buildings.

Paragraph 6.8.2(1)  
Article 10  Values in accordance with Article 5 in this chapter shall be used.

Paragraph 6.8.2(2)  
Article 11  $\gamma_{Ff}$ shall be used.

Paragraph 9.6(2)  
General recommendation  
Article 12  No limit is set, provided that 9.3.2(2) is applied.

Paragraph 9.7.3(4)  
Article 13  Following value $\gamma_{VS} = 1,2$ shall be used. (BFS 2015:6).

Paragraph 9.7.3(8)  
Article 14  Following value $\gamma_{VS} = 1,2$ shall be used. (BFS 2015:6).

Paragraph B.2.5(1)  
Article 15  Recommended value $\gamma_{V} = 1,25$ shall be used. (BFS 2015:6).

Paragraph B.3.6(5)  
Article 16  Following value $\gamma_{VS} = 1,2$ shall be used. (BFS 2015:6).
Chapter 4.1.2 – Application of SS-EN 1994-1-2 – Structural fire design

Nationally Determined Parameters

Article 1  Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
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</thead>
<tbody>
<tr>
<td>1.1(16)</td>
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<tr>
<td>2.1.3(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.3.2(9)</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.1(1)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.3.5.1(10)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6)

Paragraph 1.1(16)

Article 2  This part may only be used with concrete strength classes equal to or higher than C20/25 and LC20/22, but not higher than C50/60 and LC50/55.

Paragraph 2.1.3(2)

General recommendation

Article 3  $\Delta \theta_1=180$ K and $\Delta \theta_2=220$ K should be used.

Paragraph 3.3.2(9)

General recommendation

Article 4  The function in 3.6b in the standard should be used.

Paragraph 4.1(1)P

Article 5  Advanced calculation methods should be used.

Paragraph 4.3.5.1(10)

General recommendation

Article 6  Buckling length for a column in an intermediate storey is $\lambda_{ei}=0,5$ times the system length and for a column in the top floor, the buckling length is $\lambda_{ei}=0,7$ times the system length.
Chapter 4.2 – has been repealed by (BFS 2015:6).
Section G – Application of EN 1995 – Design of timber structures

Chapter 5.1.1 – Application of SS-EN 1995-1-1 – General rules and rules for buildings

General

Durability

General recommendation

Article 1 Additional rules on durability can be found in Section A.

Article 2 Timber structures shall be designed and constructed so that harmful attacks by rot and wood destroying insects are prevented.

Article 3 Moisture movements in timber structures shall be taken into consideration if they are relevant to mechanical resistance.

Article 4 Steel fasteners shall be protected from harmful corrosion. (BFS 2013:10).

General recommendation

Suitable corrosion protection of steel fasteners should be determined based on Service class, Corrosivity category according to SS-EN ISO 12944-2, working life, as well as the effects of corrosive substances in certain wood species.

The examples given in Table 4.1 in SS-EN 1995-1-1 are not appropriate for the Swedish conditions. That table should therefore be replaced by the examples in Table G-1.

Tabell G-1 Examples of minimum requirements for protection against corrosion for different fasteners

<table>
<thead>
<tr>
<th>Fastener</th>
<th>Service class</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nails, screws, Bolts, washers, nuts, dowels</td>
<td>Untreated1</td>
<td>Zinc-plated(^\text{2}) min 12 μm</td>
<td>Hot-galvanized(^\text{3})</td>
<td></td>
</tr>
<tr>
<td>Staples</td>
<td>Zinc-plated(^\text{2}) min 3μm</td>
<td>Zinc-plated(^\text{2}) min 12μm</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>Glued steel rods</td>
<td>Untreated</td>
<td>Untreated</td>
<td>Hot-galvanized(^\text{3})</td>
<td></td>
</tr>
<tr>
<td>Punched metal plate fasteners</td>
<td>Z275(^\circ)</td>
<td>Z275(^\circ)</td>
<td>Stainless steel</td>
<td></td>
</tr>
<tr>
<td>Steel plates up to 5 mm thickness</td>
<td>Z275(^\circ)</td>
<td>Z275(^\circ)</td>
<td>Z350(^\circ)</td>
<td></td>
</tr>
<tr>
<td>Steel plates over 5 mm thickness</td>
<td>Untreated</td>
<td>Hot-galvanized(^\text{3})</td>
<td>Hot-galvanized(^\text{3})</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Connectors for internal panels shall at least have 5 microns zinc-plating.

\(^2\) Zinc-plated according to SS-EN ISO 2081:2008. If other corrosion protection is selected, it must at least provide an equivalent protection.
3 Hot-galvanized according to SS-EN ISO 1461:2009 (for nails, the least corrosion protection as per Table 3 of the standard should be applied) or another corrosion protection for at least corrosivity category C4 according to SS-EN ISO 12944-2:1998.

4 For structures in corrosivity category C5, stainless steel shall be selected throughout. For exterior wood elements that are not surface treated after installation, stainless steel connections shall be used in accordance with SS-EN 10088-1:2005, e.g. no. 1.4301. Aggressive wood species such as Red Cedar requires connectors of stainless, acid-resistant steel, e.g. no. 1.4401 according to SS-EN 10088-1:2005.

5 Continuous hot-galvanized sheet in accordance with SS-EN 10346:2009. *(BFS 2015:6)*

Preconditions

**General recommendation**

**Article 5** General rules on execution can be found in Section A.

- Finger jointed structural timber can be used in load-bearing structures, provided that such a structure is designed such that a failure of a single finger joint does not cause the collapse of essential parts of the structure in general.
- Finger jointed structural timber should not be used in scaffolding or in other structures exposed to impacts and shock loads.

Material

**Article 5a** CE marking according to method B in SS-EN 14081-1: A1:2011 (so-called package marking) must not be used for structural timber in load-bearing structures. *(BFS 2015:6)*

Nationally Determined Parameters

**Article 6** Overview of national choices

<table>
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<tr>
<th>Paragraph in the standard</th>
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</thead>
<tbody>
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<tr>
<td>2.4.1(1)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.1.7(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>7.2(2)</td>
<td>National choice made</td>
</tr>
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<td>7.3.3(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>8.3.1.2(4)</td>
<td>National choice made</td>
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<tr>
<td>10.9.2(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>10.9.2(4)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6)*

**Paragraph 2.3.1.2(2)P**

**General recommendation**

**Article 7** In Table G-2, a breakdown is given of loads according to duration as is relevant for the Swedish conditions.
Table G-2  Examples of classification of loads according to duration

<table>
<thead>
<tr>
<th>Load-duration class</th>
<th>Examples of loads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent</td>
<td>Self-weight</td>
</tr>
<tr>
<td>Long-term</td>
<td>Imposed load in warehouse</td>
</tr>
<tr>
<td>Medium-term</td>
<td>Imposed load in buildings with the exception of warehouse</td>
</tr>
<tr>
<td></td>
<td>Snow load</td>
</tr>
<tr>
<td>Short-term</td>
<td>Wind load</td>
</tr>
<tr>
<td>Momentary</td>
<td>Gusts</td>
</tr>
<tr>
<td></td>
<td>Accidental load</td>
</tr>
<tr>
<td></td>
<td>Single concentrated load on the roof</td>
</tr>
</tbody>
</table>

(BFS 2013:10).

Paragraph 2.4.1(1)P

General recommendation

**Article 7a** If verification of pressure perpendicular to the grain concerns design situations where the sole consequence is increased deformations that have no significant impact on the system’s stability and mechanical resistance, $\gamma_M = 1.0$ and $k_{mod} = 1.0$ can be used when design strength $f_{c,90,d}$ is calculated. Examples of such cases include the indentation of joists into a cill beam and wailing of low buildings as well as support reaction against beams. For cases where indentation of the wood may be deemed to affect the mechanical resistance (e.g. local pressure in lattice) or where deformations have a significant effect on function (e.g. in tall buildings), the recommended partial factors in Table 2.3 of SS-EN 1995-1-1 should be used. The recommended partial factors in Table 2.3 of SS-EN 1995-1-1 are used for other material values. (BFS 2015:6).

Paragraph 6.1.7(2)

General recommendation

**Article 7b** For Glued laminated timber and solid timber fully or partially exposed to precipitation and solar radiation, $k_{cr} = 0.67$ should be used. For other Glued laminated timber and solid timber

$$
\begin{align*}
t_{cr} = \min \left( \frac{3.0}{f_{v,k}}, 1.0 \right)
\end{align*}
$$

should be used when the effect of cracks is considered. (BFS 2013:10).

Paragraph 7.2(2)

**Article 8** Limits for deflection related to health and safety shall be determined where necessary on a case-by-case basis with regard to the circumstances.

General recommendation

Limits according to e.g. appearance and comfort can be provided by the client/owner.

Paragraph 7.3.3(2)

General recommendation
Article 9  For Swedish conditions, the following values may be applied: \(a = 1,5 \text{ mm/kN} \) and \(b = 100 \text{ m/Ns}^2\).

Paragraph 8.3.1.2(4)

Article 10  Section 8.3.1.2(4) must not be applied. (BFS 2015:6).

Paragraph 10.9.2(3)

General recommendation

Article 11  After erection and adequately securing, \(\alpha_{\text{bow,perm}}\) should not exceed 10 mm. (BFS 2013:10).

Paragraph 10.9.2(4)

General recommendation

Article 12  \(\alpha_{\text{dev,perm}}\) should be the smallest of zero, 0,02\(h\) or 50 mm. \(h\) is the largest height of the truss. (BFS 2013:10).
Chapter 5.1.2 – Application of SS-EN 1995-1-2 – Structural fire design

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.3(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>Annexe E</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6)*

**Paragraph 2.1.3(2)**

*General recommendation*

**Article 2** The values for the average temperature rise and the maximum temperature rise during the cooling phase should be set to
- $\Delta \theta_1 = 180$ K,
- $\Delta \theta_2 = 220$ K.

**Application of informative annexes**

**Article 3** Annex E may only be used for walls lower than 3 m.
Chapter 5.2 – has been repealed by (BFS 2015:6).
Section H – Application of EN 1996 – Design of masonry structures

Chapter 6.1.1 – Application of EN 1996-1-1 – General – Rules for reinforced and unreinforced masonry structures

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4.3(1)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.4(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.2.2(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.6.1.2(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.6.2(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.6.2(4)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.6.2(6)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.6.4(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>3.7.2(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.3.3(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>8.1.2(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>8.5.2.2(2)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6)

**Paragraph 2.4.3(1)P**

**Article 2** Values of $\gamma_M$ for the ultimate limit state as per Table H-1 shall be used.

Table H-1 Values of partial factor $\gamma_M$ for the ultimate limit state

<table>
<thead>
<tr>
<th>Masonry executed using:</th>
<th>Execution class $^e$ (mean value)</th>
<th>Execution class $^e$ (characteristic value)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>II</td>
</tr>
<tr>
<td>Units Category I, designed mortar$^a$</td>
<td>1,9</td>
<td>2,1</td>
</tr>
<tr>
<td>Units Category I, prescribed mortar$^b$</td>
<td>2,1</td>
<td>2,5</td>
</tr>
<tr>
<td>Units Category II, any mortar$^{a, b, d}$</td>
<td>2,6</td>
<td>3,0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Masonry executed using:</th>
<th>Execution class $^e$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Anchorage of reinforcing steel</td>
<td>2,0</td>
</tr>
<tr>
<td>Reinforcing steel and prestressing steel</td>
<td>1,3</td>
</tr>
<tr>
<td>Anchorage of wall ties$^e$</td>
<td>2,5</td>
</tr>
<tr>
<td>Strength of wall ties</td>
<td>1,5</td>
</tr>
</tbody>
</table>

a. Requirements for designed mortar are given in SS-EN 998-2 and SS-EN 1996-2.
b. Requirements for prescribed mortar are given in SS-EN 998-2 and SS-EN 1996-2.
c. Specified partial safety factors shall be applied to declared mean values.
d. Where the coefficient of variation for masonry units Category II does not exceed 25 %
e. Execution class:
Masonry structures shall be subdivided into two execution classes: class I and class II. Masonry of Execution class I relates to masonry work that is led and supervised by a person with special training and experience in the execution of masonry structures. Masonry of Execution class II relates to masonry work that is led and supervised by a person with experience in the execution of masonry structures. Masonry in a building with more than two storeys, and on-site reinforced masonry shall be executed in class I. However, in-situ reinforced masonry in single-dwelling houses with not more than two storeys and masonry that is reinforced for deformation forces only, may be executed in class II.
This type of training may also be provided in countries other than Sweden.

(BFS 2015:6).

**Paragraph 2.4.4(1)**

**Article 3** The standard’s recommendation of 1.0 for $\gamma_M$ in the serviceability limit states shall be used.

**Paragraph 3.2.2(1)**

*General recommendation*

**Article 4** The following acceptable equivalent mixing proportions for mortar should be used.

**Table H-2** Mixture proportions for masonry

<table>
<thead>
<tr>
<th>Mortar class Binder</th>
<th>Parts by weight</th>
<th>Parts by volume</th>
<th>Mortar class Designation 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mortar class M10 (A)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cement</td>
<td>C 100/450</td>
<td>C 1:4</td>
<td>Mortar class M10 (A)</td>
</tr>
<tr>
<td>Lime, cement</td>
<td>KC 20/80/400</td>
<td>KC 1:3:15</td>
<td>M10-1:0:4C</td>
</tr>
<tr>
<td>Masonry cement</td>
<td>M 100/350</td>
<td>M 1:3</td>
<td>M10-4:1:15CK</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M10-1:3M</td>
</tr>
<tr>
<td><strong>Mortar class M2.5 (B)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lime, cement</td>
<td>KC 35/65/550</td>
<td>KC 1:1:8</td>
<td>Mortar class M2.5 (B)</td>
</tr>
<tr>
<td>Masonry cement</td>
<td>M 100/600</td>
<td>M 1:5</td>
<td>M2.5-1:1:8CK</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M2.5-1:5M</td>
</tr>
<tr>
<td><strong>Mortar class M1 (C)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lime, cement</td>
<td>KC 50/50/650</td>
<td>KC 2:1:12</td>
<td>Mortar class M1 (C)</td>
</tr>
<tr>
<td>Masonry cement</td>
<td>M 100/900</td>
<td>M 1:7</td>
<td>M1-1:2:12CK</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M1-1:7M</td>
</tr>
<tr>
<td><strong>Mortar class M0.5 (D)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lime, cement</td>
<td>KC 50/50/950</td>
<td>KC 2:1:18</td>
<td>Mortar class M0.5 (D)</td>
</tr>
<tr>
<td>Hydraulic lime</td>
<td>Kh 100/850</td>
<td>Kh 1:5</td>
<td>M0.5-1:2:18CK</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M0.5-1:5Kh</td>
</tr>
</tbody>
</table>

1 The designation indicates the mortar class and parts by volume of cement, lime, sand, as well as the binder type.

**Table H-3** Equivalent mixture proportions for mortar

<table>
<thead>
<tr>
<th>Mortar class Term 1</th>
<th>Binder</th>
<th>Parts by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mortar class M10 (A)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>M10-1:0:4C</td>
<td>Cement</td>
<td>100:450</td>
</tr>
<tr>
<td>M10-3:1:15CK</td>
<td>Cement, lime</td>
<td>80:20:400</td>
</tr>
</tbody>
</table>
The designation indicates the mortar class and parts by volume of cement, lime, sand, as well as the binder type (BFS 2015:6).

### Paragraph 3.6.1.2(1)

**General recommendation**

**Article 5** The following characteristic compressive strength of masonry $f_k$ should be used. Unless otherwise specified, group 1 applies according to SS-EN 1996-1-1, 3.1.1. (BFS 2015:6).

**Table H-4** Characteristic values

<table>
<thead>
<tr>
<th>Masonry Unit</th>
<th>Strength class</th>
<th>$f_k$ (MPa)</th>
<th>Mortar class in accordance with EN 998-2</th>
<th>Thin layer mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M10</td>
<td>M2.5</td>
<td>M1</td>
</tr>
<tr>
<td>Clay blocks</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Clay brick</td>
<td>12</td>
<td>5.2</td>
<td>3.6</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>5.8</td>
<td>4.2</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>7.5</td>
<td>6.0</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>8.9</td>
<td>7.5</td>
<td>5.7</td>
</tr>
<tr>
<td></td>
<td>45</td>
<td>10.0</td>
<td>9.0</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>11.1</td>
<td>10.3</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td>65</td>
<td>12.1</td>
<td>11.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Calcium silicate</td>
<td>25</td>
<td>-</td>
<td>6.0</td>
<td>4.5</td>
</tr>
<tr>
<td>Concrete brick</td>
<td>25</td>
<td>7.5</td>
<td>6.0</td>
<td>-</td>
</tr>
<tr>
<td>Hollow concrete block</td>
<td>5</td>
<td>-</td>
<td>2.0</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>2.4</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Solid concrete block</td>
<td>10</td>
<td>3.8</td>
<td>3.6</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>4.7</td>
<td>4.7</td>
<td>3.7</td>
</tr>
<tr>
<td>Autoclaved Aerated Concrete</td>
<td>2.0</td>
<td>-</td>
<td>1.2</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>2.5</td>
<td>-</td>
<td>1.4</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-</td>
<td>1.6</td>
<td>1.2</td>
</tr>
</tbody>
</table>
### Table H-5  Initial shear strength

<table>
<thead>
<tr>
<th>Masonry unit</th>
<th>f&lt;sub&gt;ko&lt;/sub&gt; (MPa)</th>
<th>General purpose mortar of the strength class given</th>
<th>Thin layer mortar (bed joints 0.5–3.0 mm)</th>
<th>Lightweight mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay block</td>
<td>0,30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clay</td>
<td>M10–M20</td>
<td>0,30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>M2,5–M9</td>
<td>0,20</td>
<td>-</td>
<td>0,15</td>
</tr>
<tr>
<td></td>
<td>M1–M2</td>
<td>0,10</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Calcium silicate</td>
<td>M10–M20</td>
<td>0,20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>M2,5–M9</td>
<td>0,15</td>
<td>0,40</td>
<td>0,15</td>
</tr>
</tbody>
</table>

### Paragraph 3.6.2(3)

**General recommendation**

**Article 6** The following values of f<sub>sk</sub> (MPa) should be used:
- Clay blocks and clay bricks = 1,0,
- Calcium silicate bricks, concrete bricks, hollow concrete blocks, solid concrete blocks and autoclaved Aerated concrete blocks = 0,6,
- Thin joint autoclaved aerated concrete blocks = 0,8,
- Lightweight aggregate blocks = 1,1.

### Paragraph 3.6.2(4)

**General recommendation**

**Article 7** f<sub>sk</sub> in accordance with Article 6 should be applied.

### Paragraph 3.6.2(6)

**General recommendation**

**Article 8** The following initial shear strengths f<sub>ko</sub> should be used.
### Table H-6  Characteristic flexural strength

<table>
<thead>
<tr>
<th>Masonry unit</th>
<th>$f_{sk0}$ (MPa)</th>
<th>General purpose mortar of the strength class given</th>
<th>Thin layer mortar (bed joints 0,5–3,0 mm)</th>
<th>Lightweight mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete and lightweight aggregate concrete</td>
<td>M10–M20</td>
<td>0,20</td>
<td>0,30</td>
<td>0,15</td>
</tr>
<tr>
<td>Lightweight aggregate concrete $a$</td>
<td>M1–M2</td>
<td>0,15</td>
<td>0,30</td>
<td>0,15</td>
</tr>
<tr>
<td>Lightweight aggregate concrete</td>
<td>M2,5–M9</td>
<td>0,20</td>
<td>0,30</td>
<td>0,15</td>
</tr>
<tr>
<td>Autoclaved aerated concrete</td>
<td>M2,5–M9</td>
<td>0,15</td>
<td>0,30</td>
<td>0,15</td>
</tr>
<tr>
<td>Manufactured stone and Dimensioned natural stone</td>
<td>M1–M2</td>
<td>0,10</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*a* For dry-rod lightweight aggregate blocks with mesh reinforced plaster, a confirmed value of $f_k$ is used, though no higher than 0.10 MPa.

The characteristic value for the shear strength perpendicular the bed joints, i.e. in a vertical cross section, is set to 0.8 MPa for mortar classes ≥ M1. Butt joints should not be included. *(BFS 2015:6).*

**Paragraph 3.6.3(3)**

*General recommendation*

*Article 9*  The following characteristic flexural strength $f_{sk1}$ and $f_{sk2}$ should be used.

### Table H-6  Characteristic flexural strength

<table>
<thead>
<tr>
<th>Masonry unit</th>
<th>Strengt hclass</th>
<th>$f_{sk1}$ (MPa) M1,0-M2,4</th>
<th>$f_{sk1}$ (MPa) M2,5-M10</th>
<th>$f_{sk1}$ Thin layer mortar</th>
<th>$f_{sk2}$ (MPa) M1,0-M2,4</th>
<th>$f_{sk2}$ (MPa) M2,5-M10</th>
<th>$f_{sk2}$ Thin layer mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clay block</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0,29</td>
<td>-</td>
<td>-</td>
<td>0,12</td>
</tr>
<tr>
<td>Hollow clay brick</td>
<td>15–65</td>
<td>0,12</td>
<td>0,3</td>
<td>--</td>
<td>0,9</td>
<td>1,1</td>
<td>--</td>
</tr>
<tr>
<td>Solid clay brick</td>
<td>15–65</td>
<td>0,12</td>
<td>0,25</td>
<td>--</td>
<td>0,9</td>
<td>1,1</td>
<td>--</td>
</tr>
<tr>
<td>Calcium silicate brick</td>
<td>25</td>
<td>0,05</td>
<td>0,1</td>
<td>0,20</td>
<td>0,7</td>
<td>0,9</td>
<td>0,30</td>
</tr>
<tr>
<td>Concrete brick</td>
<td>25</td>
<td>0,05</td>
<td>0,2</td>
<td>0,20</td>
<td>0,7</td>
<td>0,9</td>
<td>0,30</td>
</tr>
<tr>
<td>Hollow concrete block</td>
<td>5–10</td>
<td>0,05</td>
<td>0,2</td>
<td>0,20</td>
<td>0,30</td>
<td>0,4</td>
<td>0,30</td>
</tr>
<tr>
<td>Solid concrete block</td>
<td>10–15</td>
<td>0,05</td>
<td>0,2</td>
<td>0,20</td>
<td>0,30</td>
<td>0,4</td>
<td>0,30</td>
</tr>
<tr>
<td>Autoclaved aerated concrete</td>
<td>2,0</td>
<td>0,08</td>
<td>0,1</td>
<td>0,15</td>
<td>0,08</td>
<td>0,1</td>
<td>0,30</td>
</tr>
</tbody>
</table>
Paragraph 3.7.2(2)

General recommendation

Article 10  Choice of KE for the module of elasticity.

When the effect of the module of elasticity is very significant it should be determined by testing in accordance with SS-EN 1052-1.

If the module of elasticity \( E \) is not determined by testing, the following values of \( KE \) may be used

\[
\begin{align*}
K_E &= 500 & \text{for solid clay bricks and calcium silicate bricks} & \text{(a)} \\
K_E &= 500 & \text{for hollow clay bricks and thin joint autoclaved aerated concrete blocks} & \text{(b)} \\
K_E &= 1000 & \text{for lightweight aggregate blocks} & \text{(c)} \\
K_E &= 1000 & \text{for concrete bricks, hollow concrete blocks, solid concrete blocks, and autoclaved aerated concrete blocks} & \text{(d)}
\end{align*}
\]

Paragraph 4.3.3(3)

General recommendation

Article 11  The following choices of reinforcing steel with regard to durability should be used.

Table H-7  Durability

<table>
<thead>
<tr>
<th>Materials</th>
<th>Ref. No</th>
<th>Exposure class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MX1</td>
</tr>
<tr>
<td>Austenitic stainless steel, acid resistant steel</td>
<td>R 1</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>R 3</td>
<td>15</td>
</tr>
<tr>
<td>Galvanised steel</td>
<td>R 13</td>
<td>15</td>
</tr>
<tr>
<td>Galvanised, epoxy-coated steel</td>
<td>R 18</td>
<td>15</td>
</tr>
<tr>
<td>Unprotected non-alloy steel</td>
<td>ob</td>
<td>25</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>

* Consult the manufacturer or masonry specialist for recommendation prior to use.

-- Corrosion protection not recommended.
### Table H-8  Material description

<table>
<thead>
<tr>
<th>Ref no.</th>
<th>Material designation</th>
<th>Material description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R 1</td>
<td>SS-EN 10088</td>
<td>Austenitic stainless, acid resistant steel.</td>
</tr>
<tr>
<td>R 3</td>
<td>SS-EN 10088</td>
<td>Austenitic stainless steel.</td>
</tr>
<tr>
<td>R 13</td>
<td>SS-EN 10020</td>
<td>Galvanised steel min. 265 g/m² zinc per side.</td>
</tr>
<tr>
<td></td>
<td>SS-EN 10244 zinc coating</td>
<td></td>
</tr>
<tr>
<td>R 18</td>
<td>SS-EN 10020</td>
<td>Galvanised and epoxy-coated steel min. 60 g/m² zinc per side and min.</td>
</tr>
<tr>
<td></td>
<td>SS-EN 10244 zinc coating</td>
<td></td>
</tr>
<tr>
<td>ob</td>
<td>SS-EN 10245 epoxy</td>
<td>Value 100 g/m² epoxy.</td>
</tr>
<tr>
<td></td>
<td>SS-EN 10020</td>
<td>Unprotected non alloy steel.</td>
</tr>
</tbody>
</table>

### Table H-9  Exposure classes

<table>
<thead>
<tr>
<th>Exposure class</th>
<th>Micro conditions of the masonry</th>
<th>Type of structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>MX1</td>
<td>Dry environment</td>
<td>Interior walls in normal environment, inner shell in double walls, the warm inner side of mobile walls, basement walls with two-stage sealing.</td>
</tr>
<tr>
<td></td>
<td>Insignificantly corrosion aggressive.</td>
<td></td>
</tr>
<tr>
<td>MX2</td>
<td>Damp or wet environment not exposed to frost/thaw cycles.</td>
<td>Interior walls in damp environment, exterior walls not exposed to frost/thaw or aggressive chemical environment, other basement walls.</td>
</tr>
<tr>
<td></td>
<td>Moderately corrosion aggressive.</td>
<td></td>
</tr>
<tr>
<td>MX3</td>
<td>Damp or wet environment exposed to frost/thaw cycles.</td>
<td>Masonry as class MX2 also exposed to frost/thaw cycles.</td>
</tr>
<tr>
<td></td>
<td>Corrosion aggressive.</td>
<td></td>
</tr>
<tr>
<td>MX4</td>
<td>Wet environment also exposed to chlorides, seawater or de-icing salts.</td>
<td>Masonry exposed to salt/thaw cycles, non-plastered walls exposed to pelting rain, construction parts exposed to high moisture load and chlorides.</td>
</tr>
<tr>
<td></td>
<td>Very corrosion aggressive.</td>
<td></td>
</tr>
<tr>
<td>MX5</td>
<td>Aggressive chemical environment</td>
<td>Exterior and interior walls in aggressive industrial atmosphere.</td>
</tr>
<tr>
<td></td>
<td>Particularly corrosion aggressive.</td>
<td></td>
</tr>
</tbody>
</table>

(BFS 2015:6).

**Paragraph 8.1.2(2)**

*General recommendation*

**Article 12**  Masonry should have a minimum nominal thickness, $t_{\text{min}}$, according to Table H-10.

Walls higher than four storeys and their bearing surfaces should be designed in ultimate limit state and for stability.
<table>
<thead>
<tr>
<th>Height of masonry</th>
<th>Minimum nominal wall thicknesses (mm)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Load-bearing wall</td>
<td>Veneer wall</td>
</tr>
<tr>
<td>Not more than 2</td>
<td>85</td>
<td>55</td>
</tr>
<tr>
<td>storeys, ≤ 6 metres</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 2 storeys, &gt; 6 metres</td>
<td>100</td>
<td>85</td>
</tr>
</tbody>
</table>

*(BFS 2015:6)*

**Paragraph 8.5.2.2(2)**

*General recommendation*

**Article 13** The veneer walls should use at least 3 ties per m² and used for cavity walls, at least 4 ties per m² should be used.
Chapter 6.1.2 – Application of EN 1996-1-2 – Structural fire design

**Nationally Determined Parameters**

**Article 1**  Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.3(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.2(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>Annex B(5) Note 1</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

**Paragraph 2.1.3(2)**

*General recommendation*

**Article 2**  The values for the mean temperature increase and maximum temperature increase during the decay stage should be set to:
- $\Delta \theta_1 = 180 \text{ K}$
- $\Delta \theta_2 = 220 \text{ K}$

*(BFS 2015:6).*

**Paragraph 2.2(2)**

*General recommendation*

**Article 3**  $\epsilon_m = 0.8$ can be used if no other value is demonstrably more accurate. (BFS 2015:6).

**Annex B(5) Note 1**

**Article 4**  Section C, Chapter 1.1.2, Table C-7 shall be used for fire resistance classes. *(BFS 2015:6).*
Chapter 6.2 – Application of EN 1996-2 – Design considerations, selection of materials and execution of masonry

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3.4.2(2)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

**Paragraph 2.3.4.2(2)**

*General recommendation*

**Article 2** The recommended spacing between the vertical movement joints of brick veneer walls can be a maximum of five times the veneer wall height if the veneer wall is erected with a slip membrane at the interface with the immobile bearing surface.

To avoid constraint cracks in the masonry corners, however, spacing between the movement joints should not exceed 24 metres. In addition, ties should not be within 1 metre of corners. *(BFS 2015:6).*
Chapter 6.3 – Application of EN 1996-3 – Simplified calculation methods for unreinforced masonry structures

Nationally Determined Parameters

<table>
<thead>
<tr>
<th>Article</th>
<th>Overview of national choices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paragraph in the standard</strong></td>
<td><strong>Comments</strong></td>
</tr>
<tr>
<td>2.3(2)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.2.2.3(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>D.1(1)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

**Paragraph 2.3(2)P**

**Article 2** \( \gamma_M \) is chosen according to Chapter 6.1.1, Article 2. *(BFS 2015:6).*

**Paragraph 4.2.2.3(1)**

**Article 3** \( n_{\text{min}} \) is chosen according to Chapter 6.1.1, Article 13. *(BFS 2015:6).*

**Paragraph D.1(1)**

**Article 4** The recommendation may be used on the condition that the strength is reduced to 70 % of the table value for masonry in Group 1 with clay bricks. *(BFS 2015:6).*
Section I – Application of EN 1997 – Design of geo-structures

Chapter 7.1 – Application of SS-EN 1997-1 – General rules

Article 1 In addition to the paragraphs marked with the letter P after the notation number in SS-EN 1997-1, the first sentence of 6.6.1(4) and 7.5.3(1) shall be considered as mandatory provisions.

*General recommendation*
In geotechnical category 2 or 3, settlement should be checked out for spread foundations on non-cohesive soils with very low to medium strength.

When applying 7.6.1.1(3), the failure criteria for piles in compression should be defined as the settlement of the pile top equal to 10% of the pile diameter at the most. The pile’s elastic compression shall be taken into account.

Article 2 Paragraphs 7.5.1(6)P and 7.5.2.3(2)P in SS-EN 1997-1 shall be considered as general recommendations.

*General recommendation*
For load testing of piles in silty soils or when the risk of false pile stop is present, the time between installation and testing should be long enough so that the outcome would, to the greatest extent possible, describes the relevant limit state.

*General recommendation*

Article 3 When the exemption from verification in accordance with 7.8(5) in SS-EN 1997-1 is used, the shear strength should exceed 25 kPa.

*General recommendation*

Article 4 Documentation in accordance with 7.9(4) relating to the measured driving resistance for displacement piles should be specified as the number of blows for the last three series of 10 blows.

Nationally Determined Parameters

Article 5 Summary of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1(8)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.6.1(4)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.6.2(2)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.1(2)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.1(3)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.1(6)</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.2(2)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.3.2(3)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.3.3(2)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.3.4.1(1)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.4(3)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.7.5(2)P</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.8(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.9(1)P</td>
<td>National choice made</td>
</tr>
</tbody>
</table>
Paragraph 2.1(8)P

Article 6  Geotechnical constructions shall be divided into three categories dependent on extent and complexity. Geotechnical category 1 shall include small and simple structures which are executed with negligible risk and with known ground conditions. Geotechnical category 2 shall include conventional types of structures and foundations where there is no exceptional risk of affecting the surrounding and with no special soil or load conditions.

Geotechnical category 3 shall include structures or parts of structures which fall beyond the limitations of geotechnical categories 1 and 2.

Geotechnical category 1 must not be applied to geotechnical constructions in reliability class 3.

General recommendation

The content and extent of the geotechnical study, structural design, execution and inspection are determined by the geotechnical category.
Supporting constructions where the shaft depth is greater than 4 m or where water is of crucial importance should be treated as being a construction in geotechnical category 3 and be designed for example using numerical methods. *(BFS 2015:xx).*

**Paragraph 2.4.6.1(4)**

**Article 7** Partial factors for loads in persistent and transient design situations shall be selected in accordance with Section B, Chapter 0, Articles 6-8 and Article 47, Table I-15 and Article 47, I-15 in this chapter. *(BFS 2015:6).*

**Paragraph 2.4.6.2(2)**

**Article 8** Partial factors for material and mechanical resistance parameters for persistent and transient design situations shall be selected in accordance with Article 37, Table I-5, Article 39, Table I-6, Article 41, Tables I-7–I-9 and Article 46, Table I-14 in this chapter. *(BFS 2015:6).*

**Paragraph 2.4.7.1(2)**

**Article 9** Partial factors for persistent and transient design situations shall be selected in accordance with Articles 36–47 in this chapter.

**Paragraph 2.4.7.1(3)**

**Article 10** Partial factors for material and mechanical resistance parameters for accidental situations are to be set to 1.0 if not otherwise specified in this statute.

*General recommendation*

Accident situations in the form of loss of bracing should be taken into consideration in anchorages.

**Paragraph 2.4.7.1(6)**

*General recommendation*

**Article 11** An examples of a model factor, $\gamma_{RD}$, for piles can be found in Article 23. Use of the factor is shown in SS-EN 1997-1, Section 6.3.5. *(BFS 2015:6).*

**Paragraph 2.4.7.2(2)**

**Article 12** Partial factors for the verification of static equilibrium shall be selected in accordance with Section B, Chapter 0, Article 6 and Article 37, Table I-5 in this chapter. *(BFS 2015:6).*

*General recommendation*

Static equilibrium (EQU) requires normally only to be verified for spread foundation on heavily compacted soil or rock.

**Paragraph 2.4.7.3.2(3)**

**Article 13** For loads, load effects, and material parameters, partial factors for the verification of structural (STR) and geotechnical (GEO) limit states shall be selected in accordance with Section B, Chapter 0, Articles 7-8 and Article 39, Table I-6 in this chapter. *(BFS 2015:6).*

**Paragraph 2.4.7.3.3(2)**

**Article 14** Partial factors for mechanical resistance shall, for the verification of structural (STR) and geotechnical (GEO) limit states, be selected in accordance with Article 41, Tables I-7–I-9. *(BFS 2015:6).*
Paragraph 2.4.7.3.4.1(1)P

Article 15  Design approaches for the different types of geotechnical constructions shall be selected in accordance with Table I-1.

<table>
<thead>
<tr>
<th>Type of geotechnical construction</th>
<th>Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilings, geotechnical mechanical resistance</td>
<td>DA 2</td>
</tr>
<tr>
<td>Pilings, structural mechanical resistance</td>
<td>DA 3</td>
</tr>
<tr>
<td>Support structures</td>
<td>DA 3</td>
</tr>
<tr>
<td>Slopes and embankments a</td>
<td>DA 3</td>
</tr>
<tr>
<td>Plates</td>
<td>DA 3</td>
</tr>
<tr>
<td>Anchorages</td>
<td>DA 3</td>
</tr>
</tbody>
</table>

*a  Does not relate to natural slopes. (BFS 2015:6).

Paragraph 2.4.7.4(3)P

Article 16  Partial factors for the verification of risk of uplift (UPL) shall be selected in accordance with Article 46, Table I-14 in this chapter. (BFS 2015:6).

Paragraph 2.4.7.5(2)P

Article 17  Partial factors for the verification of risk of heave (HYD) due to seepage of water shall be selected in accordance with Article 47, Table I-15 in this chapter.

Paragraph 2.4.8(2)

General recommendation

Article 18  Refer to SS-EN 1990, section 6.5.4(1) for partial factors for material parameters for the serviceability limit state. (BFS 2015:6).

Paragraph 2.4.9(1)P

Article 19  Limit value for the movements of foundations are to be set by the client/owner.

Paragraph 2.5(1)

General recommendation

Article 20  For spread foundations in geotechnical category 1, a simplified verification based on soil pressure values in accordance with Table I-2 shall be used.

Table I-2  Design values of soil pressure for spread foundations in geotechnical category 1

<table>
<thead>
<tr>
<th>Materials</th>
<th>$f_a$ (kPa)</th>
<th>Materials</th>
<th>$f_d$ (kPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain (unweathered)</td>
<td>400</td>
<td>Sand</td>
<td>100</td>
</tr>
<tr>
<td>Moraine</td>
<td>200</td>
<td>Silt</td>
<td>50</td>
</tr>
<tr>
<td>Gravel</td>
<td>150</td>
<td>Solid clay</td>
<td>100</td>
</tr>
</tbody>
</table>

1 Characteristic shear strength > 50 kPa under undrained conditions.
2 For sand and silt, $f_d$ shall be limited to half the table value if the water table is higher than a foundation width below the foundation level.
3 If there are layers of different soils within a depth of twice the foundation width, measured from the foundation level, the design values of soil pressure shall be chosen on the basis of the worst material present.
Paragraph 7.6.2.2(8)P
Article 21  Correlation factors for the determination of characteristic geotechnical mechanical resistance of piles, based on results from static pile load tests, shall be selected in accordance with Article 42, Table I-10 in this chapter.

Paragraph 7.6.2.2(14)P
Article 22  Partial factors for the verification of geotechnical mechanical resistance of piles, through the use of static pile load tests, shall be selected in accordance with Article 41, Tables I-7–I-9 in this chapter.

Paragraph 7.6.2.3(4)P
Article 23  Partial factors for the verification of geotechnical mechanical resistance of piles, based on the results from geotechnical surveys combined with documented experience of pile load tests under similar conditions, shall be selected in accordance with Article 41, Tables I-7–I-9 in this chapter.

General recommendation
Table I-3 provides examples of model factors for the verification of geotechnical mechanical resistance of friction piles.

<table>
<thead>
<tr>
<th>Method</th>
<th>( \gamma_{Rd} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geostatic method (based on friction angle)</td>
<td>1.6</td>
</tr>
<tr>
<td>Results from CPT types of sounding</td>
<td>1.4</td>
</tr>
<tr>
<td>Results from other types of sounding, for example HfA, SPT, and Tr, with sampling for verification of soil type.</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Table I-4 specifies an example of model factors for the verification of geotechnical mechanical resistance of friction piles.

<table>
<thead>
<tr>
<th>Method</th>
<th>Model factor, ( \gamma_{Rd} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undrained analysis (( \alpha )-method)(^1)</td>
<td>1.1</td>
</tr>
<tr>
<td>Drained analysis (( \beta )-method)</td>
<td>1.2</td>
</tr>
</tbody>
</table>

\(^1\) Used for loose clays.

Paragraph 7.6.2.3(8)P
Article 24  Model factor for the correction of partial factors when verifying the geotechnical mechanical resistance of piles, based on the results from geotechnical surveys combined with documented experience of pile load tests under similar conditions, shall for alternative procedure be selected equal to 1.4.

Paragraph 7.6.2.4(4)P
Article 25  Partial factors and correlation factors for the verification of geotechnical mechanical resistance of piles, based on dynamic testing, shall be selected in accordance with Article 41, Table I-7–I-9 and Article 42, Table I-11 in this chapter.
Paragraph 7.6.3.2(2)P
Article 26  Partial factors for the verification of geotechnical mechanical resistance of piles loaded in tension, based on results from pile load tests, shall be selected in accordance with Article 41, Table I-7–I-9 in this chapter.

Paragraph 7.6.3.2(5)
Article 27  Correlation factors for the determination of the characteristic geotechnical mechanical resistance of piles loaded in tension, based on results from static pile load tests, shall be selected in accordance with Article 42, Table I-10 in this chapter.

Paragraph 7.6.3.3(3)P
Article 28  Partial factors for the verification of geotechnical mechanical resistance of piles loaded in tension, based on the results from geotechnical surveys combined with documented experience of pile load tests under similar conditions, shall be selected in accordance with Article 41, Table I-7–I-9 in this chapter.
Paragraph 7.6.3.3(6)P

Article 29 The model factor for correction of partial factors for the verification of geotechnical mechanical resistance of piles loaded in tension, based on the results from geotechnical surveys combined with documented experience of pile load tests under similar conditions, shall for alternative procedure be selected equal to 1.4.

Paragraph 8.5.2(1)P

Article 30 The measured geotechnical mechanical resistance at ultimate limit state shall be determined by test method 1 according to SS-27104.

At least three trials shall be carried out in investigation testing and suitability testing. All anchorages shall be tested in approval testing. (BFS 2015:6).

Paragraph 8.5.2(3)P Note 2

Article 30a Coefficients for verification of the geotechnical mechanical resistance of anchorages that are based on results from testing shall at minimum be given values according to Table I-16.

Suitability testing and investigation testing shall be performed for anchorages which do not have demonstrable, previous, documented experience for the type of stay and geology in question.

In the case of temporary rock stays set in Swedish bedrock of Precambrian origin, investigation testing and suitability testing may be omitted. (BFS 2015:6).

Paragraph 8.6.2(2)P Note 1

Article 31 The partial factor for approval testing at ultimate limit state, \( \gamma_{a;acc;ULS} \), shall be given a value of at least 1.05. The sample load in approval testing shall be counted as failure load for analytical design according to Equation 8.13. (BFS 2015:6).

Paragraph 10.2.3

Article 32 Partial factors for the verification of risk of uplift (UPL) can be found in Article 16. Friction and anchorage forces shall not be treated as loads in expression 2.8.

Paragraph 11.5.1(1)P

Article 33 Partial factors for actions and strengths for the verification of total stability in slopes and banks shall be selected in accordance with Section B, Chapter 0, Articles 7-8 and Article 39, Table I-6 in this chapter. (BFS 2015:6).

Article 34 has been repealed by (BFS 2015:6).

Article 35 has been repealed by (BFS 2015:6).

Paragraph A.2(1)P

Article 36 For the verification of (EQU), the partial factors for actions in accordance with Table A.1 shall be equal to the factors specified in Section B, Chapter 0, Article 6, in Table B-2. (BFS 2015:6).

Paragraph A.2(2)P

Article 37 For the verification of (EQU), the partial factors for soil parameters, \( (\gamma_M) \) shall be selected in accordance with Table I-5.

Table I-5 Partial factors for soil parameters \((\gamma_M)\) when verifying (EQU)

<table>
<thead>
<tr>
<th>Soil parameter</th>
<th>Term</th>
<th>Factor</th>
</tr>
</thead>
</table>

143
Friction angle, $\tan \phi'$  | $\gamma_{\phi}$ | 1.3
---|---|---
Effective cohesion  | $\gamma_c$ | 1.3
Undrained shear strength  | $\gamma_{uu}$ | 1.5
Uniaxial compressive strength  | $\gamma_{qu}$ | 1.5
Weight density  | $\gamma_y$ | 1.0

**Table I-6**: Partial factors for soil parameters ($\gamma_M$) in the verification of (STR/GEO)

<table>
<thead>
<tr>
<th>Soil parameter</th>
<th>Term</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friction angle, $\tan \phi'$</td>
<td>$\gamma_{\phi}$</td>
<td>M2</td>
</tr>
<tr>
<td>Effective cohesion</td>
<td>$\gamma_c$</td>
<td>1.3</td>
</tr>
<tr>
<td>Undrained shear strength</td>
<td>$\gamma_{uu}$</td>
<td>1.5</td>
</tr>
<tr>
<td>Uniaxial compressive strength</td>
<td>$\gamma_{qu}$</td>
<td>1.5</td>
</tr>
<tr>
<td>Weight density</td>
<td>$\gamma_y$</td>
<td>1.0</td>
</tr>
</tbody>
</table>

**Paragraph A.3.1(1)P**

**Article 38** For the verification of (STR/GEO), the partial factors for actions and the effects of actions in accordance with Table A.3 shall to be equal to the factors specified in Section B, Chapter 0, Articles 7–8, Tables B-3 and B-4. *(BFS 2015:6).*

**Paragraph A.3.2(1)P**

**Article 39** For the verification of (STR/GEO), partial factors for soil parameters ($\gamma_M$) are to be selected in accordance with Table I-6.

**Table I-7**: Partial resistance factors ($\gamma_R$) for the verification of foundations using driven piles

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Term</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip</td>
<td>$\gamma_h$</td>
<td>R2</td>
</tr>
<tr>
<td>Mantel (compression)</td>
<td>$\gamma_s$</td>
<td>1.2</td>
</tr>
<tr>
<td>Total/combined (compression)</td>
<td>$\gamma_t$</td>
<td>1.2</td>
</tr>
<tr>
<td>Mantel (driven)</td>
<td>$\gamma_{s;t}$</td>
<td>1.3</td>
</tr>
</tbody>
</table>

*For railway applications, the partial factor in the table may be reduced by 0.1. The reduction is due to different load models.*

For the verification of foundations using bored piles, partial resistance factors ($\gamma_R$) shall be selected in accordance with table I-8.
Table I-8 Partial resistance factors ($\gamma_R$) for the verification of foundations using bored piles

<table>
<thead>
<tr>
<th>Resistance Term</th>
<th>Term</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip</td>
<td>$\gamma_b$</td>
<td>1.3</td>
</tr>
<tr>
<td>Mantel (compression)</td>
<td>$\gamma_s$</td>
<td>1.3</td>
</tr>
<tr>
<td>Total/combined (compression)</td>
<td>$\gamma_t$</td>
<td>1.3</td>
</tr>
<tr>
<td>Mantel (driven)</td>
<td>$\gamma_{s;t}$</td>
<td>1.4</td>
</tr>
</tbody>
</table>

For the verification of foundations using CFA piles, partial resistance factors ($\gamma_R$) shall be selected in accordance with table I-9.

Table I-9 Partial resistance factors ($\gamma_R$) for the verification of foundations using CFA piles

<table>
<thead>
<tr>
<th>Resistance Term</th>
<th>Term</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tip</td>
<td>$\gamma_b$</td>
<td>1.3</td>
</tr>
<tr>
<td>Mantel (compression)</td>
<td>$\gamma_s$</td>
<td>1.3</td>
</tr>
<tr>
<td>Total/combined (compression)</td>
<td>$\gamma_t$</td>
<td>1.3</td>
</tr>
<tr>
<td>Mantel (driven)</td>
<td>$\gamma_{s;t}$</td>
<td>1.4</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

Paragraph A.3.3.3(1)P

Article 42 Correlation factors for the determination of the characteristic geotechnical mechanical resistance of piles, based on the results from static pile load tests, are to be selected in accordance with Table I-10.

Table I-10 Correlation factors, $\xi$, to derive the characteristic values geotechnical mechanical resistance of piles based on the results from static load tests$^1$ ($n$ – number of tested piles)

<table>
<thead>
<tr>
<th>$\xi$ för $n$</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>$\geq 5$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\xi^1$</td>
<td>1.40</td>
<td>1.30</td>
<td>1.20</td>
<td>1.10</td>
<td>1.00</td>
</tr>
<tr>
<td>$\xi^2$</td>
<td>1.40</td>
<td>1.20</td>
<td>1.05</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

$^1$ Applicable only where uniform geotechnical conditions prevail and where the distance between piles within the control object is not more than 25 metres. The control object here refers to a group of piles with a unified method of installation and mode of action in a unified soil volume.

Correlation factors for the determination of characteristic geotechnical mechanical resistance of piles, based on the results from dynamic pile load testing, are to be selected in accordance with Table I-11.
Tabell I

Correlation coefficients, $\zeta$ to derive the characteristic geotechnical mechanical resistance of piles based on the results from dynamic impact tests $^{1,2,3,4,5,6,8}$ ($n$ – number of tested piles)

<table>
<thead>
<tr>
<th>$\zeta$ for $n$</th>
<th>3$^*$</th>
<th>4</th>
<th>$\geq 5$</th>
<th>$\geq 10$</th>
<th>$\geq 15$</th>
<th>$\geq 20$</th>
<th>$\geq 40$</th>
<th>All piles</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\zeta_5$</td>
<td>1.60</td>
<td>1.55</td>
<td>1.50</td>
<td>1.45</td>
<td>1.42</td>
<td>1.40</td>
<td>1.35</td>
<td>1.30</td>
</tr>
<tr>
<td>$\zeta_6$</td>
<td>1.50</td>
<td>1.45</td>
<td>1.35</td>
<td>1.30</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
<td>1.25</td>
</tr>
</tbody>
</table>

$^*$ In the table, the given values of $\zeta$ are valid for dynamic impact tests that are evaluated using the CASE method.

$^1$ In the table, the given $\zeta$ values are multiplied by the model factor of 0.85 when dynamic impact tests with signal matching is carried out or when there is a permanent sinkage $\leq 2\text{ mm}$ per impact or when the evaluated toe rebound is $< D/60$ for toe bearing piles.

$^2$ If a foundation consists of different types of piles, each type is considered separately when selecting the number of test piles, $n$.

$^3$ For the evaluation of tensile resistance from signal matching, a maximum of 70 % of the mantel’s mechanical resistance may be used. The model factor for mechanical resistance for piles in tension shall, when the evaluation is based on signal matching, be selected equal to 1.3.

$^4$ Signal matching shall always be carried out for primarily mantle borne piles.

$^5$ Pile driving formulas must not be combined using these correlation factors.

$^6$ Applicable only where uniform geotechnical conditions prevail and where the distance between piles within the control object is not more than 25 metres. The control object here refers to a group of piles with a unified method of installation and mode of action in a unified soil volume.

$^7$ For construction works with sufficient rigidity and strength to transfer loads from weak to strong piles, the correlation coefficients $\xi_5$ and $\xi_6$ can be divided by 1.1. (BFS 2015:6).

**Article 43** has been repealed by (BFS 2015:6).

**Paragraph A.3.3.5(1)P**

**Article 44** Partial factors for mechanical resistance, ($\gamma_R$), shall be selected according to set $R3$ in Table A.13 in the verification of retaining structures.

Table A.13, which treats partial resistance factors, ($\gamma_R$) for the verification of retaining structures with an associated verification method, must not be used. (BFS 2015:6).

**Paragraph A.3.3.6(1)P**

**Article 45** Partial factors for mechanical resistance, ($\gamma_R$), shall be selected according to set $R3$ in Table A.14 in the verification of slopes and embankments.

Table A.14, which treats partial resistance factors, ($\gamma_R$) for the verification of slopes and embankments with an associated verification method, must not be used. (BFS 2015:6).

**Paragraph A.4(1)P**

**Article 46** For the verification of (UPL), partial factors for soil parameters, ($\gamma_M$) and mechanical resistance, ($\gamma_R$) shall be selected in accordance with Table I-14.
Table I-14  Partial factors for soil parameters, \((\gamma_M)\) and mechanical resistance, \((\gamma_R)\) in verification of (UPL)

<table>
<thead>
<tr>
<th>Soil parameter / resistance</th>
<th>Term</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friction angle, (\tan \varphi')</td>
<td>(\gamma_{\varphi}')</td>
<td>1.3</td>
</tr>
<tr>
<td>Effective cohesion</td>
<td>(\gamma_c)</td>
<td>1.3</td>
</tr>
<tr>
<td>Undrained shear strength</td>
<td>(\gamma_u)</td>
<td>1.5</td>
</tr>
<tr>
<td>mechanical resistance, pile (driven)(^1)</td>
<td>(\gamma_s)</td>
<td>-</td>
</tr>
<tr>
<td>mechanical resistance, anchorage</td>
<td>(\gamma_{a\ ULS})</td>
<td>-</td>
</tr>
</tbody>
</table>

\(^1\) According to Table I-7–I-9. (BFS 2015:6).

**Paragraph A.5(1)P**

**Article 47**  For the verification of (HYD), partial factors for actions, \((\gamma_F)\) shall be selected in accordance with Table I-15.

**Tabell I-15  Partialkoefficienter för laster vid verifiering av (HYD)**

<table>
<thead>
<tr>
<th>Action</th>
<th>Term</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adverse(^1)</td>
<td>(\gamma_{G;dst})</td>
<td>1.0</td>
</tr>
<tr>
<td>Favourable(^2)</td>
<td>(\gamma_{G;stb})</td>
<td>0.9</td>
</tr>
<tr>
<td>Variable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adverse</td>
<td>(\gamma_{Q;dst})</td>
<td>1.5</td>
</tr>
</tbody>
</table>

\(^1\) Destabilising.
\(^2\) Stabilising. (BFS 2015:6).

**Paragraph A.6(3)P**

**Article 48**  Table I-16 shall be used.

**Table I-16  Coefficients for verification of anchorages in testing for permanent and temporary design situations in ultimate and serviceability limit states**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Equation</th>
<th>Test method 1(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\gamma_{ULS})</td>
<td>8.6</td>
<td>1.0(^d)</td>
</tr>
<tr>
<td>(\gamma_{a\ SLS})</td>
<td>8.10</td>
<td>N/A</td>
</tr>
<tr>
<td>(\mu)</td>
<td>8.13</td>
<td>1.05</td>
</tr>
<tr>
<td>(\gamma_{a\ acc;ULS})</td>
<td>8.14</td>
<td>N/A</td>
</tr>
</tbody>
</table>

\(^a\) See SS-27104 for a description of the test method.
\(^b\) The value is applied given that approval testing of each anchorage shows that \(E_{ULS;d} \leq R_{ULS;d}\).
\(^c\) Applies only to investigation testing and suitability testing.
\(^d\) In the case of temporary rock stays set in Swedish bedrock of Precambrian origin, \(n=0\) may be used. (BFS 2015:6)
Paragraph A.6(4)P

§ 49 Table I-17 shall be used.

Table I-17 Criteria for investigation testing, suitability testing and approval testing for permanent and temporary design situations in ultimate and serviceability limit states

<table>
<thead>
<tr>
<th>Test method&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Criteria</th>
<th>Investigation testing and suitability testing</th>
<th>Approval testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ULS (equation 8.5)</td>
<td>ULS (equation 8.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SLS (equation 8.8)</td>
<td>SLS (equation 8.8)</td>
</tr>
<tr>
<td>1</td>
<td>$\alpha_1$</td>
<td>2 mm</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 mm</td>
<td>2 mm</td>
</tr>
</tbody>
</table>

<sup>a</sup> See SS-27104 for a description of the test method. (BFS 2015:xx).

Application of informative annexes

Article 34 Annex D maintains its informative character for national application, under the condition that the impact of foundation level, strength above the foundation level and inclined adjacent ground surface are taken into consideration. (BFS 2015:6).

Article 35 Annex E and F are not to be applied. (BFS 2015:6).
Section J – Application of EN 1999 – design of aluminium structures

Chapter 9.1.1 – Application of SS-EN 1999-1-1 – General rules

General

Execution inspection of welds

*General recommendation*

**Article 1** If the inspection of the first 10% of the welds, to the extent specified in SS-EN 1090-3, does not show any deficiencies in execution, the remaining welds can be inspected to half of the extent specified in SS-EN 1090-3.

If deficiencies are found in the continued inspection, at a reduced extent as above, the remaining inspection shall resume at the extent specified in SS-EN 1090-3. *(BFS 2015:6).*

**Nationally Determined Parameters**

**Article 1a** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1.3(1) Note 1</td>
<td>National choice made</td>
</tr>
<tr>
<td>7.2.3(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>8.1.1(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.2(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.4(3) Note 1</td>
<td>National choice made</td>
</tr>
<tr>
<td>C.3.4.1(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>C.3.4.1(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>C.3.4.1(4)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

**Paragraph 6.1.3(1) Note 1**

**Article 2** The recommended values shall be used

- \( \gamma_{M1} = 1.1 \)
- \( \gamma_{M2} = 1.25 \)

**Paragraph 7.2.3(1)**

*General recommendation*

**Article 3** For criteria for vibrations in lightweight floors, see the Stålbyggnadsinstitutet report *Samlade resultat från europeiska utvecklingsprojekt med stål*, Report 259:1.

**Paragraph 8.1.1(2)**

**Article 4** The recommended values in the table shall be used.

**Paragraph A.2(1)**

*General recommendation*

**Article 4a** See Section B, § 2 for consequence classes and reliability classes. *(BFS 2015:6).*
Paragraph A.4(3) Note 1
Article 4b Execution classes are chosen according to Table A.3. (BFS 2015:6).

Paragraph C.3.4.1(2), C.3.4.1(3), C.3.4.1(4)
Article 5 The recommended partial factors shall be used.
Chapter 9.1.2 – Application of SS-EN 1999-1-2 – Structural fire design

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3(1)</td>
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</tr>
<tr>
<td>2.3(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4.2(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.2.2.1(1)</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.2.2.2(5)</td>
<td>National choice made</td>
</tr>
<tr>
<td>4.2.2.4(5)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

(BFS 2015:6).

**Paragraph 2.3(1)**

**Article 2** Recommended value \( \gamma_{M,fi} = 1.0 \) shall be used.

**Paragraph 2.3(2)**

**Article 3** Recommended value \( \gamma_{M,fi} = 1.0 \) shall be used.

**Paragraph 2.4.2(3)**

**Article 4** The recommended values for \( \gamma_G, \gamma_{Q1}, \psi_{fi}, \text{and} \xi \) in accordance with Section B, Chapter 0 shall be used. The recommendation to use \( \psi_{2.1} \), for \( \psi_{fi} \), shall be followed.

**Paragraph 4.2.2.1(1)**

*General recommendation*

**Article 5** The calculation methods in SS-EN 1999-1-1 should be used. However the modulus of elasticity and the 0.2 limit should be replaced with the values \( E_{al,0} \) and \( f_{o,0} \) at raised temperatures \( \theta_{al} \). In addition \( \gamma_M \) is to be replaced by \( \gamma_{M,al} \).

The reduction factors \( \rho_{o,al} \) and \( \rho_{u,al} \) in the zone affected by heat can be assumed to be the same at elevated temperatures.

To determine the cross section class, the slenderness parameters \( \beta_1, \beta_2 \) and \( \beta_3 \) in Table 6.2 in SS-EN 1999-1-1 are calculated using

\[
\varepsilon = 0.05 \sqrt{\frac{E_{al,0}}{f_{o,0}}} \cdot (BFS 2015:6).
\]

**Paragraph 4.2.2.3(5)**

*General recommendation*

**Article 6** The method in accordance with Note in 4.2.2.1(1) should be used.

**Paragraph 4.2.2.4(5)**

*General recommendation*

**Article 7** The method in accordance with Note in 4.2.2.1(1) should be used. When calculating the buckling load \( N_{cr} \) and the slenderness parameter \( \lambda \), a further reduced modulus of elasticity of \( E_{al} / 1.2 \) should be used, and the buckling curve for buckling class B should be selected.
Nationally Determined Parameters

Article 1  Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4(1) Note 1</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.4(1) Note 2</td>
<td>National choice made</td>
</tr>
<tr>
<td>6.2.1(2)</td>
<td>National choice made</td>
</tr>
<tr>
<td>E(5)</td>
<td>National choice made</td>
</tr>
<tr>
<td>L.4(3) Note 2</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

Paragraph 2.4(1) Note 1

Article 2  Recommended value $\gamma_{Fl} = 1,0$ shall be used.

Paragraph 2.4(1) Note 2

Article 3  The recommended value in accordance with Table 2.1 on $\gamma_{Fl}$ shall be used.

Paragraph 6.2.1(2)

Article 4  Recommended value $\gamma_{Mf} = 1,0$ shall be used.

Article 5  has been repealed by (BFS 2015:6).

Paragraph E(5)

Article 6  Upon application, the recommended value $\gamma_{Mf} = 3,0$ shall be used.

Paragraph L.4(3) nOTE 2

General recommendation

Article 7  See Section B, Chapter 0, § 2 for consequence classes and reliability classes. (BFS 2015:6).
Chapter 9.1.4 – Application of SS-EN 1999-1-4 – Cold-formed structural sheeting

**Nationally Determined Parameters**

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>2(4)</td>
<td>National choice made</td>
</tr>
<tr>
<td>7.3(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.1(1) Note 3</td>
<td>National choice made</td>
</tr>
<tr>
<td>A.3.4(3)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

*(BFS 2015:6).*

**Paragraph 2(3)**

**Article 2** The following values shall be used:
- $\gamma_{M1} = 1,0$
- $\gamma_{M2} = 1,25$
- $\gamma_{M3} = 1,25$

**Paragraph 2(4)**

**Article 3** Recommended value $\gamma_{M,ser} = 1,0$ shall be used. *(BFS 2015:6).*

**Paragraph 7.3(3)**

*General recommendation*

**Article 4** In accordance with SS-EN 1990, deformations in the serviceability limit states are calculated for frequent combination of actions.

If the limit is set with regard to aesthetics, a quasi-permanent combination of actions shall be used in accordance with SS-EN 1990.

Examples of limit values for deflections and deformations that can be used are indicated in the table below.

**Table J-1** Limit values for deflections

<table>
<thead>
<tr>
<th>Structure</th>
<th>Deflection requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor beams</td>
<td>See SS-EN 1993-1-1</td>
</tr>
<tr>
<td>Primary beams in roof constructions</td>
<td>L/300</td>
</tr>
<tr>
<td>rooftops a)</td>
<td>L/200</td>
</tr>
<tr>
<td>Beams in wall constructions b)</td>
<td>L/100</td>
</tr>
<tr>
<td>Profiled sheeting b)</td>
<td></td>
</tr>
<tr>
<td>– in roof constructions</td>
<td>L/200</td>
</tr>
<tr>
<td>– in intermediate floors</td>
<td>See SS-EN 1993-1-1</td>
</tr>
<tr>
<td>– in wall constructions</td>
<td>L/100</td>
</tr>
<tr>
<td>– in cantilevers</td>
<td>L/100</td>
</tr>
</tbody>
</table>

a In general, calculations should use frequent actions (a variable action with $\psi_1$, eventually other variable actions with $\psi_2$) for ordinary insulated and non-insulated metal roofs. In case of vulnerable parts such as eave connections, etc., characteristic loads should be used.

For criteria for vibrations in lightweight steel floors, refer to references in Chapter 3.1.1. *(BFS 2015:6).*
Paragraph A.1(1) Note 3

*General recommendation*

**Article 5** The conversion factors may be set equal to 1.00.

Paragraph A.3.4(3)

**Article 6** The partial factor $\gamma_M$ shall be determined on the basis of testing in accordance with Annex D in SS-EN 1990. For consideration of charges apply rules in Section B, Chapter 0, Article 11, when the characteristic strength values are determined. In addition, the applicable rules of Annex A in SS-EN 1999-1-4 shall be followed. If the intent of testing is only to determine the design value irrespective of any calculation model, the value $\gamma_M = 1.0$ shall be used.

The recommended value $\gamma_{sys} = 1.0$ shall be used. *(BFS 2015:6).*
Chapter 9.1.5 – Application of SS-EN 1999-1-5 – Shell structures

Nationally Determined Parameters

**Article 1** Overview of national choices

<table>
<thead>
<tr>
<th>Paragraph in the standard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1(3)</td>
<td>National choice made</td>
</tr>
<tr>
<td>2.1(4)</td>
<td>National choice made</td>
</tr>
</tbody>
</table>

**Paragraph 2.1(3)**

**Article 2** The following recommended values shall be used:
- $\gamma_{M1} = 1.10$
- $\gamma_{M2} = 1.25$

**Paragraph 2.1(4)**

**Article 3** The following recommended value shall be used:
- $\gamma_{M1, ser} = 1.0$
1. This statute (2015:6) shall enter into force on 1 January 2016.
2. The new provisions apply to construction works which are not railways, metros, tramways, roads or streets or facilities that belong thereto.
3. Older provisions may be applied to work that:
   a) requires planning permission and a building permit application is received by the municipality prior to 1 January 2017,
   b) requires notification and the notification is received by the municipality before 01 January 2017.
   c) does not require either a building permit or notification and the work is commenced before 01 January 2017.

Annex 1 - has been repealed by (BFS 2015:6).

Annex 2 - has been repealed by (BFS 2015:6).