Boverket´s mandatory provisions and general recommendations, BBR

BFS 2011:6 with amendments up to BFS 2018:4

The following translation is strictly for informative purposes.
The legally binding text is found in the Code of Statutes of the Swedish National Board of Housing, Building and Planning (Boverket).

1 Introduction

1:1 General

This Statute contains the mandatory provisions and general recommendations pursuant to the following Act and Ordinance (main statutes):

- Planning and Building Act (2010:900), PBA,
- Planning and Building Ordinance (2011:338), PBO,

General recommendation
Mandatory provisions and general recommendations on load-bearing capacity, stability and durability of load-bearing structures are given in Boverket´s mandatory provisions and general recommendations (2011:10) on the application of European construction standards (Eurocodes), EKS.

Further regulations for lifts, escalators, passenger conveyors and motorised gates and some devices for waste are given in the Boverket´s mandatory provisions and general recommendations on lifts and certain other motorised devices (BFS 2011:12), H.

Further regulations regarding boilers are given in Boverket's mandatory provisions and general recommendations (2011:11) regarding procedures for the assessment of agreement for new boilers fuelled with liquid or gaseous fuel, EVP.

Regulations regarding performance inspection of ventilation systems are given in PBO, in the Boverket´s mandatory provisions and general recommendations (2011:16) on performance inspection of ventilation systems and certification of expert performance inspectors, OVK, and in the Boverket's general recommendations (2012:7) on performance inspection of ventilation systems, OVKAR.

Regulations regarding type approval, etc. are contained in the Boverket´s mandatory provisions and general recommendations (2011:19) on type approval and production control, TYP.

Regulations regarding broadband access are given in Boverket's general recommendations (2017:1) regarding broadband access, BRE. *(BFS 2017:5).*

1:2 Mandatory provisions

The mandatory provisions apply to

- the erection of new buildings,
- ground and demolition works, and
- undeveloped sites to be provided with one or more buildings.

When erecting other constructions than buildings on lots, the mandatory provisions in section 8.9 apply.

When changing buildings provisions shall be followed to that extent that is permitted by section 1:22. *(BFS 2017:5).*

General recommendation
Chapter 1, Section 4 PBA states that reconstruction and extensions are also included in the concept of alterations to buildings.

Mandatory provisions on building design, etc. are also issued by authorities other than the Boverket. For example, the Swedish Work Environment Authority issues provisions on workplaces and the Swedish Board of Agriculture issues provisions on the design of livestock buildings. *(BFS 2017:5).*

1:21 Minor deviations from the mandatory provisions in these statutes

The Building Committee may in specific cases allow minor deviations from the mandatory provisions in this statute on the following conditions. That there are special reasons, that the construction project is still assumed to be technically satisfactory and that there is no significant inconvenience from any other point of view. *(BFS 2011:26).*

General recommendation
The Building committee examines if minor deviations from the design requirements are acceptable in the building permit. Regarding the technical characteristics requirements the Building Committee can clarify if minor deviations are acceptable in the starting clearance. *(BFS 2014:3).*

1:22 Requirements for alterations to buildings

When altering buildings, the rules in Sections 1 and 2 apply where appropriate as well as parts of Sections 3–9, which are under the headings: "Requirements for alterations to buildings."

The parts of Sections 3–9 under the headings: "Definitions" and "Scope" also apply to alterations of buildings. *(BFS 2011:26).*

General recommendation
The requirements for new constructions are never directly applicable to alterations. However, some guidance can often be given from these for assessing the implications of the requirements for the alterations. For alterations, however, the requirements are often met through other solutions than for the construction of new buildings. *(BFS 2016:6).*

1:221 Requirements for caution and prohibition of distortion

1:2211 Caution

General recommendation
For a measure to be considered cautious it should respect the character of the building regarding
- proportions, shape and volume,
- choice of material and design,
- colour scheme, and
- attention to detail and level of detail.

It should also preserve details that are essential to the building's character. *(BFS 2016:6).*

1:2212 Prohibition of distortion

General recommendation
When examining if a measure results in a distortion, it should be clarified if the measure alters the building's character or damages any of the properties that combined form the cultural values of the building or the area. *(BFS 2016:6).*

1:2213 Particularly valuable building

General recommendation

A building can be such a particularly valuable building referred to in Chapter 8, Section 13, PBA, either because it has such values itself or because it is an essential part of a particularly valuable built environment. What is stated here about buildings also apply for areas of built environment.

A building can be particularly valuable if it clarifies earlier societal conditions. Examples of this are

– buildings that represent an earlier common building category or structure that has now become rare.

– buildings that illustrate earlier dwelling conditions, social and economic conditions, working conditions, different groups' living conditions, urban building ideals or architectural ideals and values and thought patterns, and

– buildings that have represented functions or activities important to the local community.

A building can also be particularly valuable if it clarifies the societal progress. Examples of this are

– Buildings that e.g. illustrate the emergence of social movements, the breakthrough of mass car ownership, immigration or emigration,

– buildings that have served as role models or in other ways been acclaimed in its time, and

– buildings that are characterized by a strong architectural idea.

A building can also be particularly valuable if it in itself is a source of knowledge about older materials and construction techniques.

A building can be particularly valuable from an artistic point of view if it shows special aesthetic qualities or has a high level of ambition regarding architectural design or in construction and material choice or in artistic design and decoration.

A building can also be particularly valuable if it is highly valued in a local context. Examples of this can be buildings that have had a great importance in the town's social life or for the town's identity or in local traditions.

The concept particularly valuable means that the building particularly well shall illustrate a certain condition or in its context have few counterparts that can illustrate the same condition.

Buildings from the time before the built environment expansion of the 1920s, that have its main character preserved, currently represents such a limited part of the building stock that most of them can be assumed to fulfill some of the criteria for particularly valuable building. *(BFS 2016:6)*.

1:222 has been repealed by (BFS 2016:6).

1:223 The conditions of the building and the scope of the alteration

Under the condition that the building is still assumed to have acceptable properties, the amendment to requirement levels specified in Sections 3–9 as regards the construction of a building may be made if

– with respect to technical or economic reasons, or the scope of the alteration, it is unwarranted to implement a particular measure, or if

– you can thereby maintain the building's cultural values or other essential residential or user qualities.

However, the alteration must never result in an unacceptable risk to human health or safety. *(BFS 2011:26).*

General recommendation

The developer should report the reasons for amending the levels of technical characteristics requirements no later than at the technical consultation. It should also state how the requirement for care in Chapter 8, Section 17 of PBA and the prohibition of distortion in Chapter 8, Section 13 of PBA have been satisfied. This should be documented appropriately in the minutes of the consultation.

How the requirement for consideration to the scope of the alteration shall apply at reconstruction is specified in section 1:2243. *(BFS 2016:6).*

1:2231 Conditions of the building

General recommendation
Examples of technical reasons could be
- that there is no space to take a certain measure or
- that it is not possible to meet a design requirement or a technical property requirement

without resulting in that another requirement cannot be met at an acceptable level.

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.

The quality of the dwelling may well be of a practical nature, such as the availability of sufficient storage spaces, or of an experiential nature, such as spatial context and line of sight. *(BFS 2016:6).*

1:2232 Scope of the alteration

General recommendation
The assessment of the scope of the alteration may be based on how much of the building is affected and on the consequences of the design requirements and the technical characteristics requirements and the building's cultural values. A penetration in a wall can often be regarded as a minor alteration, 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 alterations, 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 to major extensions, for the extended part.

Normally, higher requirements should be imposed when all or part of the building is assigned a new use compared to when the alteration does not entail any change of use. If the alteration is made to give a historically valuable building a new use, there may be more reason to amend the level of requirements. 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 characteristics requirements.

Examples of when the scope of the alteration can lead to a lower level of requirement is when the alteration affects such a small part of a building that the application of the requirements for this part do not mean that the building will have significantly improved properties. *(BFS 2016:6).*

1:2233 Special consideration regarding extent of the alteration for altered use

For altered use, the design requirements and the technical characteristics requirements that are relevant for the new use shall be taken into consideration. *(BFS 2016:6).*

General recommendation
The extent of the alteration should be assessed based on if the altered use results in that the building needs to be supplied with new properties to meet the technical characteristics requirements and design requirements.

Examples of when the new use results in that the building need to be supplied with new or improved properties are if the altered use results in
- significantly increased loads,
- increased number of people that result in a need for an altered fire protection
- increased number of people that result in a need for increased outdoor air flow, or
- that an earlier unheated space is taken into a use with other requirements for thermal

comfort.

The scope of the alteration should be considered limited if the new use does not result in that the building needs to be supplied with new or improved properties. *(BFS 2016:6).*

1:2234 Special consideration regarding extent of the alteration for extension of a building

The extended part shall meet the requirements applicable for new buildings if an extension from a technical and functional point of view constitutes a separate unit relative to the existing building.

An extension cannot mean that the building, in its design before the extension, deteriorate with respect to its ability to meet the design requirements and the technical characteristics requirements, unless there are exceptional reasons. *(BFS 2016:6)*

General recommendation
An example of when an extension constitutes a separate unit relative to the existing building from a technical and functional point of view is when a multi-dwelling house is extended with a new stairway with surrounding dwellings and the extended part is given a technical supply that is not interconnected with the existing building.

If the extension only entails a smaller supplement to the existing building, there are often reasons to adjust the requirements. For example, it is not reasonable to require that a smaller room shall have another type of ventilation than adjacent rooms.

If an extension leads to altered conditions for the existing building, e.g. regarding load-bearing capacity or the risk for spread of fire, requirements can be made for the existing building.

Exceptional reasons can be if the deterioration is negligible in context. *(BFS 2016:6).*

1:2235 Requirement levels following alteration

General recommendation
Chapter 8, Section 7 of PBA and Chapter 3, Section 23 of PBO states that for any alteration of buildings, adaptations and deviations from the design requirements and the technical characteristics requirements may be made with reference to the scope of the alteration, the building's conditions and with consideration taken to the requirement for caution and prohibition of distortion in Chapter 8, Section 17 and 13 of PBA. However, the extent for the potential for modification of the requirements varies. To provide guidance when considering the room for modification that is available for each requirement, three concepts are used in this provision, in the parts that apply to the modification of buildings. The following table is intended to provide guidance for the interpretation of the terms used.

shall	In principle there is no room for deviation from the prescribed requirement level or performance.
Shall ... unless there are exceptional reasons	Some room for modification is available if the building is still likely to have acceptable properties and it is not possible to satisfy the requirement in full, without high costs or significant adverse impact on other technical characteristics requirements or the building's cultural values. Exceptional reasons may be further defined by examples in the general recommendation.
Shall be pursued	The requirements shall be met if this can be done at a reasonable cost in the context and without prejudicing the other design requirements or technical characteristics requirements, the building's cultural values or other residential or user qualities. If the building already has the required properties, there is no room for compromise unless there are exceptional reasons.

(BFS 2016:6).

1:224 Reconstruction

1:2241 Significant and definable part

Definable part refers to a functional unit of the building’s volume.

Significant and definable part refers to one or several functional units that together constitute a significant part of the building’s volume. *(BFS 2016:6).*

General recommendation
Functional unit refers to e.g. one dwelling or one non-residential premises.

Example of a significant and definable part can be
- a stairway with surrounding apartments,
- all apartments on a floor
- an entire attic

A measure that only affects a limited part of a building normally don't include a functional unit of the building's volume. Example of such measures are
- replacement of a technical system, e.g. the ventilation system,
- replacement of a structural element, e.g. the building envelope, or
- a measure that only includes one space or a function in all apartments, e.g. the sanitary rooms.

(BFS 2016:6).

1:2242 Significant renewal

For an alteration of a building to be considered to result in a significant renewal, the measure shall
- require a building permit or notification
- result in a large economical investment, and
- have such a character and scope that the building is significantly renewed.

(BFS 2016:6).

General recommendation
What is meant by a large economical investment should be assessed in relation to what it would cost to erect a building of corresponding size and character, not the building's market value. The investment must also be large in absolute numbers, this should be considered if the building has a very limited value.

When assessing if a measure is of such a character and scope that is required for the measure to be considered a significant renewal, an overall assessment of the entire project is required. Multiple different criteria often need to be considered together. Criteria that need to be considered in such an assessment are
- larger alterations in layout of existing dwellings or non-dwelling premises,
- the building is claimed or furnished for a significantly different purpose,
- extensive work on the building's frame,
- replacement of most of the technical systems.

For a maintenance measure to be considered as significant renewal, it should contain such extensive measures in both the building envelope, technical systems and interior surface finishes that the building can be considered as a building with only a construction frame.

If an extension results in larger changes in existing dwellings' or non-dwelling premises' layout, then it is a reason that the measure can be considered to have such a character and scope that the building is significantly renewed.

However, if the extension in both technical and functional respects works as a separate unit in relation to the original building, that could be a reason that the existing part of the building should not be considered to be significantly renewed. (*BFS 2016:6).*

1:2243 Special considerations regarding the scope of the alteration for reconstruction

For reconstruction, requirements are made for the functional units of the building subjected to the planned measures. In addition, requirements are made for
- such common functions or technical systems where it is technically and economically appropriate to perform the measures at the same time, and
- significant deficiencies regarding health and safety to be fixed. *(BFS 2016:6).*

General recommendations
Functional unit refers to e.g. a dwelling or a non-dwelling premises.

Example of a common function can be a lift. If one storey needs to be made accessible by lift, the lift should reach the storeys above and below so that these can become accessible and usable.

Example of technical systems can be ventilation systems. If measures are made in one part of the ventilation system, the entire system should be fixed.

Example of significant deficiencies regarding health and safety can be if the building does not comply with today's requirements regarding

- design of the tap water system regarding the risk for microbial growth,
- fire compartmentation in the attic, or
- load bearing capacity regarding snow loads.

(BFS 2016:6).

1:23 has been repealed by (BFS 2014:3).

1:3 General recommendations

The general recommendations regarding the application of the mandatory provisions in this statute and in the main statutes indicate how someone can or should act in order to comply with the requirements of the mandatory provisions.

The general recommendations may also contain particular information for the purpose of clarification or of an editorial nature.

The general recommendations are preceded by the words "General recommendations" and are printed using smaller, indented text next to the provision it refers to.

1:4 Construction products with assessed properties

In this statute, construction products with assessed properties refer to construction products that are

a) CE marked,

b) type-approved and/or production controlled under the provisions of Chapter 8, Articles 22–23 of the Planning and Building Act,

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[1], 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 properties, when alternatives c) and d) above are used, verification shall be of sufficient scope and quality as to ensure that the reported material and product properties are consistent with the actual properties. The verification shall at least correspond to what is decided for the CE marking for similar products. *(BFS 2013:14).*

General recommendation

If a construction product's properties are assessed under options a), c) or d), this does not mean that the product corresponds to Swedish requirements for buildings in this statute. Such assessments mean that the developer shall have confidence in the accompanying product´s declaration of performance. On the basis of the product's declaration of performance, the developer can determine if the construction product is appropriate for the actual use.

For construction products with assessed properties, the developer does not need to perform any own testing of these properties. *(BFS 2013:14).*

Where this statute refers to general guidance or manuals in which the terms *type approved or in-process inspected material and products* are used, these shall be replaced by the term *construction products with assessed properties* in accordance with this section. *(BFS 2013:14).*

[1] OJ L 218, 13.8.2008, p. 30 Celex 2008R0765.

1:41 Coexistence period

Harmonized standards and their coexistence periods are published in the Official Journal of the European Union. Until the end of the coexistence period, other assessments than according to alternative a) in Section 1:4 also apply. Thereafter only assessment according to alternative a) in Section 1:4 apply, as well as in those cases that an ETA[2] for the construction product has been issued. *(BFS 2016:6).*

1:42 Mutual recognition

As assessment in accordance with alternative c) or d) in Section 1:4, an assessment issued by another body within the European Union or European Economic Area or in Turkey is also acceptable if the body in other way than accreditation for the task according to Regulation (EC) No 765/2008, provide similar guarantees concerning technical and professional competence and guarantees of independence. *(BFS 2014:3).*

1:5 *has been repealed by (BFS 2013:14).*

1:6 Terminologies

Terms not specifically defined in the main statutes or in these mandatory provisions and general recommendations have their meaning set out in the publication TNC 95, *Planning and Building Terms 1994*, issued by the Swedish Centre of Technical Terminology.

When *design* is used in these mandatory provisions and general recommendations, this covers designed and built, i.e. the building's final design.

When *public building* is used in these mandatory provisions and general recommendations, this means buildings to which the general public have access.

When *circulation space* is used in these mandatory provisions and general recommendations, this means space in the building used primarily for movement.

When *cultural values* is used in these mandatory provisions and general recommendations, this means the building's technical, historical, cultural, environmental, artistic and architectural values.

When *student dwelling* is used in these mandatory provisions and general recommendations, this means dwellings intended for students at university or equivalent.

Floor in these mandatory provisions and general recommendations refers to floor, basement floor or attic floor.

Storey refers to the floor level in a storey.

Basement floor refers to floor level in each part of a basement which is separated by building floors and exterior walls.

Attic floor refers to the floor level in an attic.

Basement floor or attic floor can also be a storey. *(BFS 2014:3).*

> *General recommendation*
> Examples of circulation spaces are corridors, halls, passages, ramps, stairs and communication areas in rooms.
> Rooms in buildings or separable parts of rooms are classified as follows
> – rooms or separable parts of rooms intended for the accommodation of people, other than on a temporary basis are, for example, spaces for everyday social contact, cooking, sleeping and rest, and
> – rooms or separable parts of rooms intended for the accommodation of people on a temporary basis, such as rooms for food storage in homes, rooms for personal hygiene, utility rooms, garages, circulation spaces, housing storage rooms and culverts. *(BFS 2013:14)*

[2] For information about current ETAs, see the EOTA website http://www.eota.be about Valid ETAs.

1:7 References

When the mandatory provisions and general recommendations refer to standards, regulations and other texts, it is also, where appropriate, stated to which version of e.g. a standard the reference pertains. If no version is stated, the latest version applies. SS-EN refers to the latest version with amendments. *(BFS 2018:4).*

2 General rules

This section contains the mandatory provisions and general recommendations for Chapter 10, Article, 5 of PBA, and Chapter 3, Articles 8 and 9 of PBO. This section also contains general recommendations for the further application of PBA and PBO.

General recommendation
Mandatory provisions and general recommendations on the design of load-bearing structures are included in The Swedish National Board of Housing, Building and Planning´s mandatory provisions and general recommendations (2011:10) on the application of European construction standards (Eurocodes), EKS.

2:1 Material and products

Materials and products used in construction shall have known properties in matters relevant to the building's capacity to meet the requirements in these mandatory provisions and general recommendations.

General recommendation
The relevant requirements are specified in Sections 3–9. The properties should be documented.

2:2 Economically reasonable working life

General recommendation
The developer may select materials and technical solutions, which are economically reasonable and practical to manage, as long as the legal requirements for an economically reasonable working life are met. Working life refers to the period in which a building or a structural element functions as required, with normal maintenance.

Structural elements and installations with a shorter working life than the building's intended service life should be readily accessible and easy to replace and otherwise be easy to maintain, operate and inspect.

Structural elements and installations that are not intended to be replaced during the buildings intended service life should either be durable or be able to be protected, maintained or repaired so that the requirements of these regulations are met. Expected alterations of the properties should be taken into account when selecting materials and technical solutions. When altering the buildings, these materials and technical solutions should be chosen to ensure they work with existing designs. *(BFS 2011:26).*

2:3 General information on construction

Building, demolition or ground work sites shall be arranged in such a way that entry of unauthorised people is prevented and the risk of personal injury is limited. Measures shall be taken to provide protection against the outbreak and spread of fire and against noise and dust.

If buildings or parts of buildings are in use or put into service when building or demolition work is in progress, the necessary measures shall be taken to protect the occupants and users from personal injury resulting from accidents, dangerous noise levels, pollutants in harmful concentrations or similar.

If the regular escape routes cannot be used, temporary escape routes shall be provided. *(BFS 2011:26).*

General recommendation
Particular attention should be paid to measures to limit the risk of accidents to children and microbial growth, e.g. legionella

Cannot an acceptable living environment with regard to noise, dust and hygienic conditions in general be offered during alterations, the possibility to arrange replacement housing should be considered.

Rules for noise from construction sites are published by Naturvårdsverket.

Rules for building and construction works relating to protection against illness and accidents and for the work environment plan are issued by The Swedish Work Environment Authority. *(BFS 2011:26).*

2:31 Design and construction

General recommendation
To ensure that buildings are designed and constructed in accordance with relevant regulations, the developer of the building should at an early stage consider the need for the relevant competency for the respective tasks which together with the conditions for the design and construction are presented to form the basis of the inspection plan.

When calculations are used in designing they should be based on models that to a reasonable extent describe the characteristics of a structural element in relation to the appropriate action or intended use. Calculations should be carried out with input parameters corresponding to the action the structural element or system is expected to be exposed to in operation and the material characteristics the structural element is expected to exhibit during the intended service life. The analytical model should also take into account normal performance tolerances. If there is a high degree of uncertainty in an analytical model, input parameters or available measuring methods, this should be taken into account.

If the design is based on well-established solutions, it should be ensured that the conditions in the relevant case comply with the conditions for the well-established solution, or that it has been established that the consequences of divergence do not have an injurious effect on the functioning of the relevant structural element.

The design should be presented in blue prints and other documents in such a way that the fulfilment of the requirements of these mandatory provisions can be verified.

Deviations from nominal values set out in design documents should not exceed applicable tolerances. Divergences should not be made from design documents nor should measures not specified in any design document be made until it has been established that the function of the structural element has not been compromised. The party responsible for the design documents should be consulted.

When altering a building, where the conditions and designs are not known in advance, it is especially important to have access to the appropriate skilled active labour when following up the execution. The skills that are needed will be determined based on the building's conditions and the nature of the measures. *(BFS 2011:26).*

2:311 Preliminary investigations for alterations to buildings

General recommendation
Alteration work should be preceded by a preliminary investigation in which both the building's cultural values and other qualities that are substandard are clarified. The preliminary investigation should be conducted early enough to ensure the results can serve as a basis for subsequent planning. The extent of the preliminary investigation should be tailored to suit the scale of the measure and the nature of the object.

When working on the frame of the building, the affects this has on the building's load-bearing capacity needs to be clarified. *(BFS 2011:26).*

2:32 Verification

General recommendation
To ensure that the finished building meets the requirements set out in the main statutes and in these mandatory provisions, the developer should ensure that this is verified at an early stage. Verification may be made either at the design and construction stage or in the finished building or any combination thereof. The way in which verification is to be made in the individual case is stipulated in the inspection plan.

Unless otherwise specified, the limit values for the requirements given in this Statute must not be deviated from. The uncertainty of the method should be taken into account with regard to calculation, testing and measuring.

2:321 Verification in the finished building

General recommendation
Verification in the finished building should normally be carried out by testing, measuring or inspection, depending on the property being verified. The method used as well as the results should be documented.

In order to verify that a completed alteration measure meets the requirements for care, the measure must be related to the building design before the alteration. This often requires that the design of the building has been documented before the measure is taken. *(BFS 2011:26).*

2:322 Verification at the design and construction stages

General recommendation
At the design stage it should be verified that the conditions, design methods and calculations are relevant and correctly applied, and that they are accurately recorded in the building documents.

On delivery at the building site the developer of the building should verify that materials and products have the required properties. At this inspection, materials and products should be

- identified,
- reviewed, and
- tested unless they are construction products with assessed properties in accordance with Section 1:4, or that this is obviously unnecessary.

Construction products with assessed properties in accordance with Section 1:4 do not require further testing or inspection of those properties included in the assessment.

However, for construction products with assessed properties other than those type-approved or production controlled in accordance with the provisions in Chapter 8, Articles 22–23 of PBA, it should be ensured that the requirements are met for the intended use.

It should be verified that work is carried out in accordance with the relevant design documents. Issues not verified at the design phase which affect the functioning of the structural elements should be verified at the construction phase.

The result of verifications carried out at the construction phase should be documented, including any divergences from the design documents and measures taken as a result of these divergences, and other information of relevance for the functioning of the finished structural element.*(BFS 2013:14).*

2:4 Ground works

If excavation, filling, piling, blasting or other ground works could affect the nearby buildings, roads and external works, underground pipes or other underground installations in a negative way the risk of damage shall be prevented. *(BFS 2011:26).*

General recommendation
An investigation into groundwater conditions may clarify the risk of damage due to subsidence and temporary or permanent lowering of the groundwater and the associated secondary effects such as water shortage and biodegradation. Monitoring of changes in existing levels can be achieved by balancing the persistent reference points. Chemical, physical and bacterial risks should also be investigated. *(BFS 2011:26).*

For blasting works in areas subject to the provisions of a detailed development plan, a blasting plan and a blasting record, adapted to the type and extent of the work are required.

General recommendation
A blasting plan should describe how blasting work is to be carried out and specify times, risks and safety measures. The plan should include a specification of the explosives used and information on drilling, charges, covering and method of covering, as well as details on cordoning, evacuation and surveillance.

Consultation with the parties concerned should be carried out regarding measures to prevent damage and on vibration measurements.

The blasting plan should be supplemented with the required site plans.

Rules on blasting works and mining works are issued by the Swedish Work Environment Authority.

2:5 Operating and maintenance instructions, etc.

2:51 General

General recommendation

Before buildings or parts of buildings are put into service, written instructions should be available specifying how and when commissioning, testing, maintenance and servicing shall be carried out, in order that the requirements for the building and its installations which result from these mandatory provisions and from the main statutes shall be met during the working life of the building. When changing existing buildings instructions may need to be supplemented or updated. The documentation shall be adapted to the use of the building and to the extent and design of the installations.

The term commissioning refers to the phase and the activities whose aim is to complete the building and to integrate it and its installations into a fully finished and functioning unit. Coordinated performance tests should be carried out to verify that installations meet all applicable requirements.

Requirements for instructions and maintenance directions for ventilation systems to be readily available are detailed in Chapter 5. Article 2 and 3 §§ of PBO.

Requirements for fire protection documentation are contained in Section 5:12.

A plan for periodic maintenance should cover 30 years.

Rules on the maintenance of technical appliances are issued by the Swedish Work Environment Authority.

Further mandatory provisions for maintenance and documentation of certain installations are included in The Swedish National Board of Housing, Building and Planning´s mandatory provisions and general recommendations for lifts and other motorised devices (BFS 2011:12), H. *(BFS 2011:26).*

2:52 Technical fire protection installations and ventilation systems

General recommendation

Buildings or parts of buildings should not be put into service until ventilation systems and technical fire-protection installations are ready for use.

Simple, easy-to-read and permanently displayed user instructions should be available for each device or other part of the installation which is meant to be controlled, operated or cleaned by residents or other users of the building.

When an emergency stop is installed it should be marked to ensure its function is obvious. Emergency stop refers to a device which makes it possible to stop the fans in a building in case of hazardous emissions in the surroundings. The emergency stop can be placed in the stairwell in multi-dwelling blocks or in a central and easily accessible space in buildings containing non-residential premises.

3 Accessibility, dwelling design, room height, and utility rooms

3:1 Accessibility and usability for people with limited mobility or orientation capacity

This section contains the mandatory provisions and general recommendations for Chapter 8, Sections 1, 4 and 9 of PBA and Chapter 3, Sections 4 and 18 of PBO. Section 3:5 also contains mandatory provisions and general recommendations for Chapter 8 Section 7 of PBA and Chapter 3 Section 23 of PBO.

3:11 General

The mandatory provisions in Section 3 Accessibility, dwelling design, room height, and utility rooms do not apply to a holiday home with a maximum of two dwellings. *(BFS 2017:5).*

> *General recommendation*
> That a holiday home with a maximum of two dwellings are exempt from certain rules in Section 3 Accessibility, dwelling design, room height, and utility rooms is already pursuant to the PBA. *(BFS 2017:5).*

3:111 Requirements for lots and design requirements and technical characteristics requirements for buildings

> *General recommendation*
> Section 3:12 contains mandatory provisions and general recommendations for lots.
> Sections 3:13 and 3:14 contain mandatory provisions and general recommendations for either design requirements, the technical characteristics requirements or both.
> Requirements for lots and design requirements for buildings are examined when the building permit is given. The technical characteristics requirements for buildings are handled in conjunction with the technical consultation and starting clearance hearing in the same way as the other technical characteristics requirements. *(BFS 2013:14).*

Scope of application in sections 3:131 and 3:141 applies regardless of whether it is rules that are design requirements or technical characteristics requirements for buildings.

Mandatory provisions and general recommendations for lots are found in section 3:12.

Mandatory provisions and general recommendations for both design requirements and the technical characteristics requirements are found in

a) section 3:132 mandatory provision first paragraph,
b) section 3:142 mandatory provision first paragraph,
c) section 3:1422 mandatory provision first paragraph,
d) section 3:143 mandatory provision third paragraph,
e) section 3:1453 mandatory provision,
f) section 3:147, and
g) section 3:148.

Mandatory provisions and general recommendations only for the design requirements are found in

a) section 3:132 mandatory provision second paragraph, general recommendation first paragraph,
b) section 3:142 mandatory provision second and third paragraph, general recommendation first and second paragraph,
c) section 3:1422 mandatory provision second paragraph, general recommendation first paragraph a-d,
d) section 3:143 mandatory provision first paragraph, general recommendation first and second paragraph,
e) section 3:144 mandatory provision first and fifth paragraph, general recommendation first and second paragraph,
f) section 3:1452,
g) section 3:1453 general recommendation first paragraph and second paragraph a, and
h) section 3:146 mandatory provision first, second and third paragraph, general recommendation first and second paragraph.

Mandatory provisions and general recommendations only for the technical characteristics requirements are found in

a) section 3:132 general recommendation first, third and fourth paragraph,

b) section 3:142 mandatory provision fourth paragraph, general recommendation third, fourth and fifth paragraph,

c) section 3:1421,

d) section 3:1422, general recommendation first paragraph e-f, second, third and fourth paragraph,

e) section 3:1423,

f) section 3:1424,

g) section 3:1425,

h) section 3:143 mandatory provision second paragraph, general recommendation third, fourth, fifth, sixth, seventh eighth, ninth and tenth paragraph,

i) section 3:144 mandatory provision second, third and fourth paragraph, general recommendation third, fourth, fifth and sixth paragraph,

j) section 3:1451,

k) section 3:1453 general recommendation second paragraph b-d, and

l) section 3:146 mandatory provision fourth paragraph, general recommendation third and fourth paragraph.

The definitions in sections 3:112 and 3:113 apply regardless of whether it is rules for lots or rules that are design requirements or technical characteristics requirements for buildings. *(BFS 2016:6).*

3:112 Definitions and terms

When the terms "accessible" and "usable" or "accessibility" and "usability" are used in this section, they mean "accessibility and usability for people with limited mobility or orientation capacity". *(BFS 2013:14)*

General recommendation

Examples of limited mobility are limited movement of the upper limbs, torso and legs and poor balance. People with limited mobility may need to use a wheelchair, walking frame or cane.

Examples of limited orientation capacity are limited vision, hearing or cognitive ability (mental retardation, brain damage). *(BFS 2013:14)*

3:113 Design dimensions for wheelchairs

Where it states in the statute that sites, buildings or parts of buildings shall be accessible and usable, the dimensions for electrically-driven wheelchairs for limited outdoor use (small outdoor wheelchairs) shall be adequately sized with room for manoeuvring. However, the dimensions for manual or small electrically-driven wheelchairs for indoor use (indoor wheelchairs) may be calculated according to individual dwellings. *(BFS 2013:14).*

General recommendation

The calculated turning dimensions that are appropriate for assessing accessibility and usability for a smaller outdoor wheelchair is a circle with a diameter of 150 meters and for an indoor wheelchair a circle with a diameter of 1.30 meters. *(BFS 2013:14)*

3:12 Accessibility and usability on sites

3:121 Scope of application

General recommendation

Chapter 8, Section 9 of PBA states that the rules apply to an undeveloped site that is to be developed if it is not unreasonable in view of the terrain and general conditions.

3:122 Accessible and usable walkways, lay-bys and parking spaces, etc.

There shall be at least one accessible and usable walkway between the accessible entrances to buildings and

- supplementary housing facilities,
- parking spaces,
- lay-bys for cars,
- open spaces, and
- public footpaths adjacent to the site.

Accessible and usable walkways shall where possible be designed without level differences. Where a level difference is unavoidable, this shall be evened out using ramps.

Accessible and usable walkways shall

- be easy to follow,
- be distinguishable from furnished areas, and
- be used as a coherent, tactile and visual guide path.

(BFS 2014:3)

General recommendation

Examples of open spaces are playgrounds, playing fields and common outdoor spaces.

An accessible and usable walkway should

- be as horizontal as possible,
- not slope more than 1:50 laterally,
- have a clear width of 1.5 meters, or at least 1.0 meters and then have turning zones no more than 10 meters apart,
- for openings in fences, hedges and the like, have a minimum clear width of 0.90 meters,
- be free from obstacles, and
- be levelled out with a 0.9 to 1.0 meters wide ramp to 0-level if there are differences in level at the transition between different types of walking surfaces and locations.

Natural guiding surfaces such as grass edges, walls, fences, curbs and façades can be supplemented by artificial guiding surfaces to form a coherent guide path.

Fixed seating with back and arm rests in connection to accessible and usable walkways and entrances will improve accessibility and usability for people with limited mobility.

Mandatory provisions for contrast and markings on sites are contained in Section 3:1223, and rules on accessible and usable entrances are contained in Section 3:132.

A lay-by for cars shall be available and a parking space for the disabled shall be established as needed within 25 meters walking distance from an accessible and usable entrance to public buildings, workplaces and residential buildings. The surfacing of lay-bys of this kind and parking spaces shall be compact, level and slip resistant. *(BFS 2014:3).*

General recommendation

The number of parking spaces for the disabled should be dimensioned with regards to intended use or number of dwellings and long-term needs.

Width measurements for a parking space that will allow that a wheelchair is taken in from the side should be 5.0 meters. Width measurements can reduced if the walking surface next to it can be used or if parking spaces for disabled are located next to each other.

The longitudinal and lateral slope for lay-bys and parking spaces for the disabled should not exceed 1:50.

Parking spaces for disabled should be clearly signposted, even in winter. *(BFS 2014:3)*

3:1221 Walking surfaces on sites

Walking surfaces shall be designed to ensure people with limited mobility or orientation capacity can get around and ensure that wheelchair users can move around without help.

The surfacing of walkways shall be compact, even and slip resistant.

General recommendation

Walking surfaces can, for example, be on walkways, in playgrounds and ramps and in staircases.

Concrete paving flags, plain stone slabs, compact and smooth gravel surfaces and asphalt are all examples of suitable surface materials.

Rules on contrast and warning signs on walking surfaces are contained in Section 3:1223 and Section 8:91.

3:1222 Ramps on sites

Ramps shall be able to be used by people with limited mobility. The maximum slope shall be no more than 1:12.

General recommendation

Ramps should be supplemented by stairs whenever possible.

For people with limited mobility it may be difficult to cope with several ramps in a row with a total height of more than 1.0 meters.

A ramp should

- have at least a 2 meters long landing,
- have a height difference of up to 0.5 meters between landings,
- have a clear width of 1.3 meters,
- be free from obstacles, and
- have run-off protection at least 40 mm high if there are level differences in relation to the surroundings.

A ramp must not slope by more than 1:12 in order to minimise the risk of someone overbalancing. A ramp will be safer to use if it does not slope more than 1:20.

Provisions for stairs and handrails are contained in Section 8:91.

3:1223 Contrasts and markings on sites

Parking spaces, lay-bys for cars and open spaces, as well as walking surfaces, stairs, ramps and artificial guide paths and control devices shall easy to identify.

General recommendation

Contrast to the surroundings can be achieved by using different materials and brightness.

Artificial guide paths can be composed of materials with different structures and brightness that are recessed into the surfacing, such as clearly perceptible slabs in a smooth surface.

A lightness contrast of at least 0.40 NCS (Natural Color System) between the contrast marks and the surrounding area can significantly enhance the ability of the visually limited to perceive the marking.

Rules for contrast marking of stairs are contained in Section 8:91.

3:1224 Lighting for orientation on sites

Lighting along the accessible and usable walkways and at parking spaces, lay-bys for cars and open spaces, shall be designed to ensure that people with limited mobility or orientation capacity can find their way around.

General recommendation

For accessible and usable walkways, the surface area should be sufficiently and evenly illuminated. Permanent lighting should not give off glare.

3:1225 Orientation signs on sites

Orientation signs shall be accessible and usable.

General recommendation

Orientation signs should be easily understood and easy to read, have a light contrast and be positioned at a suitable height to ensure that they can be read/heard by both wheelchair users and

standing people with limited vision. They should be placed where you expect them to be, and that allows you to be right beside them.

The text size should be selected according to reading distance and the surface should not generate reflections. Signs should be supplemented with letters in raised relief and in some cases with Braille and spoken information along with clear, easily understood and easy to recognise picture symbols.

3:13 Accessible and usable entrances to buildings

3:131 Scope of application

General recommendation
Chapter 8, Section 6 of PBA states that the rules do not apply to work premises if it is unjustified due to the nature of the occupancy that the premises are designed for, or for a single-family house if it is unreasonable to meet the requirements when taking the terrain into consideration.

3:132 General

The main entrances to public buildings, work premises and residential buildings shall be located and designed to ensure they are accessible and usable. Other entrances to public buildings, work premises and residential buildings shall also be accessible and usable if they need to meet the requirements for accessibility and usability. Accessible entrances shall be easy to identify.

For single-family houses, accessibility to the building is satisfied if it is possible to subsequently arrange a ramp to the entrance on the site using simple measures.

General recommendation
In addition to the main entrance, other entrances might need to be made accessible and usable, for instance in situations where the terrain or location of supplementary housing facilities would make the distance be too long, see also Section 3:23.

In order for an entrance to be easy to identify, it should be
a) contrast marked, see section 3:1223, and
b) well lit, see section 3:1224.

Orientation signs should be designed in accordance with section 3:1225.

Rules on ramps are contained in Section 3:1422. *(BFS 2013:14).*

3:14 Accessibility and usability in buildings

3:141 Scope of application

General recommendation
Chapter 8 Section 6 of PBA states that the rules do not apply to work premises if it is unjustified due to the nature of the occupancy that the premises are designed for.

3:142 Entrances and circulation spaces

Entrances and circulation spaces shall be accessible and usable by people with limited mobility or orientation capacity.

Entrances and circulation spaces shall have enough room to manoeuvre a wheelchair and be designed to ensure that people who use wheelchairs can move around without needing help.

Entrances and circulation spaces shall be designed without any level differences where possible. Where different levels cannot be avoided in the circulation spaces, the differences shall be evened out with ramps, lifts or other lifting devices and staircases.

It shall be possible to carry a person on a stretcher from individual dwellings. *(BFS 2013:14).*

General recommendation
A circulation space should

a) have a clear width of 1.30 meters, although this does not apply to stairs,

b) where there are limited obstructions such as columns, have a clear width of at least 0.80 meters.

For dwellings, appropriate size for the entrance and circulation spaces are included in SS 91 42 21 (normal level).

In public buildings, a circulation space should be separated from furnished areas with e.g. lighting or different materials.

Rules about when transport by stretcher needs to be possible by lift are in Section 3:144.

Rules for the safe transport by stretcher are contained in Section 8:232. *(BFS 2013:14).*

3:1421 Walking surfaces in buildings

Walking surfaces in the entrance and circulation spaces shall be firm and smooth.

General recommendation

Rules for designing accessible and usable walking surfaces and guide paths for people with limited orientation capacity are included in 3:1423–3:1425.

Rules for protection against slipping are contained in Section 8:22.

Rules for protection against falling down stairs are contained in Section 8:232.

3:1422 Ramps in buildings

Ramps shall be able to be used by people with limited mobility. The maximum slope shall be no more than 1:12. *(BFS 2013:14).*

General recommendation

A ramp should

a) have at least a 2 meter long landings,
b) have a height difference of up to 0.5 meters between landings,
c) have a total height difference of at most 1.0 meter,
d) have a clear width of 1.3 meter,
e) be free from obstacles, and
f) have a minimum of 40 mm run-off protection.

A ramp must not slope by more than 1:12 in order to minimise the risk of someone overbalancing. A ramp will be safer to use if it does not slope more than 1:20.

Rules on lifts are contained in Section 3:144.

Provisions for stairs, balustrades and handrails are contained in Section 8:232. *(BFS 2013:14).*

3:1423 Contrasts and markings in buildings

Important destinations in buildings and walkways, stairs and ramps, as well as control devices shall be easy to identify and find even for people with limited orientation capacity.

General recommendation

Examples of important destinations in buildings are entrance doors and lift doors, and, in public buildings, reception counters, toilet doors, doors in and to escape routes, and information points.

In public buildings there should be logical guide paths that guide you between selected destinations. In open spaces in, for example, station buildings (terminals), reception areas and foyers, there should be a coherent, tactile and visual guide path in place. Guide paths in the floor can be arranged with different materials and with a lightness contrast.

Contrast to the surroundings can be achieved by using different materials and brightness. A lightness contrast of at least 0.40 NCS (Natural Color System) between the contrast marks and the surrounding area can significantly enhance the ability of the visually limited to perceive the marking.

A logical colour scheme facilitates the orientation of people with mental retardation or other orientation difficulties.

Rules for contrast marking of stairs are contained in Section 8:232.

Rules for protection against impacts and crushing are contained in Section 8:3.

3:1424 Lighting for orientation in buildings

The lighting of entrances and circulation spaces shall be designed to ensure people with limited mobility or orientation capacity are able to navigate.

General recommendation

Floors in circulation spaces should be adequately and evenly illuminated.

The light source should be shielded and the contrast in brightness between adjacent spaces, and between the outside and inside should not be too great.

Rules for lighting conditions are contained in Section 6:32.

Rules for lighting and glare to protect against falls are contained in Section 8:21.

3:1425 Orientation signs on buildings

Orientation signs shall be accessible and usable.

General recommendation

Orientation signs should be easily understood and easy to read, have a light contrast and be positioned at a suitable height to ensure that they can be read/heard by both wheelchair users and standing people with limited vision. They should be placed where you expect them to be, and that allows you to be right beside them.

The text size should be selected according to reading distance and the surface should not generate reflections. Signs should be supplemented with letters in raised relief and in some cases with Braille and spoken information along with clear, easily understood and easy to recognise picture symbols.

Electronic signage should be designed to ensure people with limited orientation capacity are able to perceive and understand it.

3:143 Doors and gates

Accessible and usable doors and gates shall be designed to ensure they allow passage by wheelchair and ensure that there is sufficient space for opening and closing the door or gate from a wheelchair. Other openings in the passageways shall also be designed to allow passage by wheelchair.
Accessible and usable doors and gates shall be designed to ensure they can be easily opened by people with limited mobility. Handles, control devices and locks shall be located and designed to ensure they can be used both by people with limited mobility and people with limited orientation capacity.

Revolving doors shall be supplemented with a door that can be used by people with limited mobility or orientation capacity. *(BFS 2013:14).*

General recommendation

The clear passage dimension should be at least 0.80 meters, when the door is opened at 90°, for

a) entrance doors,
b) lift doors,
c) corridor doors that are positioned perpendicular to the corridor's longitudinal direction,
d) openings in passageways,
e) doors to sanitary rooms in public buildings that are to be usable for people with limited mobility,
f) doors to places of assembly, and
g) doors to supplementary housing facilities.

For doors in dwellings, there are suitable passage dimensions and appropriate dimensions for service areas in SS 91 42 21 (normal level).

Rules on widths for escape routes are contained in Section 5:334.

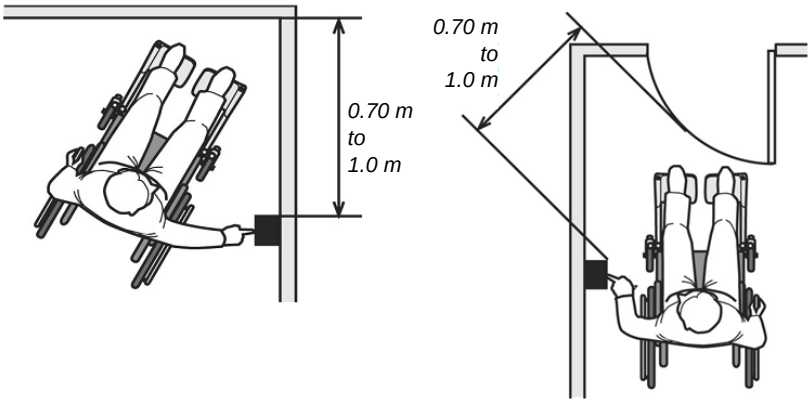
The Swedish Work Environment Authority issues rules on doors in work premises.

Doors that shall be accessible and useful should be fitted with automatic door openers if they have door closers or are heavy.

For doors with automatic door openers, it is important to indicate the space where the door opens, or to fit the doors with security sensors or the like.

Control devices for door openers should be placed with their centre 0.80 meters from the floor or ground and at least 0.70 meters, but preferably 1.0 meters from the corner or the front edge of the door leaf in the most adverse position.

Figure 3:143 Placement of control devices for door openers



Control devices should also be able to be handled by people with reduced strength or reduced grip or precision capability.

Door and gate openings should be designed without any level differences, unless a threshold is required for e.g. moisture or climate reasons. However, any threshold should be as low as possible and bevelled, so it is easy to pass with a wheelchair or walking frame, and so that the risk of tripping is minimized.

Examples of how the doors can be designed in respects other than those that have been addressed in this general recommendation can be found in The Swedish Agency for Participation's *Riv hindren – Riktlinjer för tillgänglighet. (Break the Barriers – Guidelines for accessibility.)*

3:144 Lifts and other lifting devices

When lifts or other lifting devices are required to make dwellings, workplaces and public buildings accessible and usable, at least one of them shall accommodate a person using a wheelchair and a helper.

A lift or other lifting device of this type shall also be designed to ensure that people with limited mobility or orientation capacity are able to use it unaided.

Lifts and other lifting devices shall be designed to ensure that people with limited mobility or orientation capacity can be aware of when the car has stopped at a landing for entering and leaving.

Transport by stretcher in a lift shall be possible in residential buildings with more than four storeys.

An additional passenger lift shall be installed in buildings with more than ten storeys. *(BFS 2013:14).*

General recommendation

The lifts and other lifting devices that are to be accessible and usable are regulated in Chapter 3, Sections 4 and 18 of PBO.

Lifts complying with the requirements are included in SS-EN 81-70. Type 2 (1.1 x 1.4 meters) and 3 (2.0 x 1.4 meters) in SS-EN 81-70 meet the requirements for accessible and usable spaces in lifts.

SS-EN 81-70 also includes appropriate control and signal devices, where Annex G should be used for lifts in public buildings.

Additional requirements for lifts used to transport people with limited mobility or orientation capacity are contained in Boverket´s provisions and general recommendations (2011:12) for lifts and other motorised devices, H, Annex 5:1, Sections 1.2 and 1.6.1.

Lifts complying with space requirements for accommodating a stretcher are contained in SS 763520 (1.1 x 2.1 meters).

There are also harmonized standards for platform lifts, SS-EN 81-40 and SS-EN 81-41. *(BFS 2013:14).*

3:145 Accessibility and usability in public buildings

3:1451 Acoustic environment

In public buildings where people with limited orientation capacity are dependent on the acoustic environment to be able to register significant information, the acoustic environment shall be designed for good audibility, good speech intelligibility and good orientability.

Assembly halls and reception areas shall be equipped with induction loops or other technical solutions to ensure they are accessible and usable by people with limited hearing. *(BFS 2013:14)*

General recommendation

The requirement for good audibility, good speech intelligibility and good orientability applies for public areas in e.g.

- premises for public transport,
- travel terminals,
- premises for healthcare and nursing,
- assembly halls, and
- reception areas.

Examples of places of assembly are auditoriums, theatres, churches and large conference rooms that can accommodate at least 50 people.

A reverberation time of 0.6 seconds should be achieved, with the exception of assembly halls where the reverberation time can be up to 0.8 seconds. If the mandatory provision requirement is ensured in another way, the reverberation time in large premises with room height exceeding 3.50 meters can be up to 2.0 seconds.

The premises should be designed so that the background level equivalent sound level L_{pAeq} from technical installations, lifts or other traffic than its own traffic amounts to a maximum of

- 30 dB in assembly halls,
- 35 dB in reception areas and in premises for healthcare and nursing, and
- 45 dB in other premises according to the first paragraph.

Own traffic refers to the traffic that is generated to achieve the function of the premises, e.g. busses and trains at a travel terminal or a railway station.

If a speaker system is used the speech intelligibility can be verified according to SS-EN 60268-16. Speech transmission index STI should be greater than 0.60 in the entire premises and 0.70 in more than half of the premises.

Induction loops' function can be verified according to IEC 60118-4.

For definition of reverberation time and equivalent sound level, see section 7. *(BFS 2013:14).*

3:1452 Places of assembly

Restricted sections of cinemas, theatres, sports facilities and other similar large places of assembly do not need to be fully accessible and usable for people with limited mobility. However, podiums and stages shall always be accessible and usable.

General recommendation

Permanent locations for people who use wheelchairs should be integrated with other locations and provide the same opportunity to see and hear as other spectators.

3:1453 Accessible and usable toilets

Where there are toilets for the public, at least one toilet shall be accessible and usable.

General recommendation

In public buildings that have more than one storey with toilets for the public, at least one toilet on each such storey should be accessible and usable.

The accessible and usable toilet should have

- minimum dimensions 2.2 x 2.2 meters,
- properly designed and installed fittings and equipment;
- contrast markings, and
- security alarm. (BFS 2011:26).

3:146 Accessibility and usability in individual dwellings on a single storey

Rooms, balconies, terraces and outdoor spaces shall be accessible to and usable by people with limited mobility. For terraces that supplement accessible and usable and well positioned balconies, accessibility and usability are ensured if it is possible to subsequently install a ramp in a simple way.

At least the door to the main entrance and at least one door to each room (including room for cooking and a sanitary room), balcony, terrace and outdoor space shall allow passage by wheelchair. There shall be enough room to open and close doors from a wheelchair.

At least one sanitary room shall be accessible and usable for people with limited mobility and be designed to ensure there is adequate room for a helper.

In the accessible and usable sanitary room it shall also be possible to install a separate shower area if this has not been catered for from the start. *(BFS 2013:14)*

General recommendation

Design dimensions that are appropriate to accessibility and usability of rooms are contained in SS 91 42 21 (normal level).

Student dwellings of maximum 35 m^2 according to section 3:225 can be designed without room for helper on the far side of the bed.

Room for helper and separate shower can be arranged by removing a bathtub, for example.

Rules on the appropriate design of thresholds are contained in Section 3:143. *(BFS 2016:6)*

3:147 Accessibility and usability in individual dwellings on multiple storeys

The requirements in Section 3:146 shall be met for the entire ground storey.

General recommendation

Rules on the design of dwellings on multiple storeys are contained in Section 3:221.

3:148 Accessible and usable supplementary housing facilities

Storage spaces in Section 3:23, mailboxes, laundry rooms, waste storage areas, waste chutes and other supplementary housing facilities shall be accessible and usable.

3:2 The design of dwellings

This section contains mandatory provisions and general recommendations pursuant to Chapter 3, section 1 and 17 of PBO. Section 3:5 also contains mandatory provisions and general recommendations for Chapter 8 section 7 of PBA. *(BFS 2011:26).*

3:21 General

3:211 Design requirements and technical characteristics requirements

General recommendation

Section 3:2 contains mandatory provisions and general recommendations for either the design requirements, the technical characteristics requirements or both.

The design requirements are examined when the building permit is given and the technical performance requirements are handled in conjunction with the technical consultation and starting clearance hearing in the same way as the other technical characteristics requirements. *(BFS 2013:14).*

Mandatory provisions and general recommendations for both design requirements and the technical characteristics requirements are found in

a) section 3:22 mandatory provision second paragraph,
b) section 3:222 mandatory provision,
c) section 3:223 mandatory provision first paragraph,
d) section 3:224 mandatory provision first paragraph, general recommendation third paragraph,

e) section 3:225 mandatory provision first paragraph, general recommendation third and fourth paragraph,
f) section 3:226 mandatory provision third paragraph, general recommendation,
g) section 3:227 seventh paragraph, general recommendation first, second and third paragraph, and
h) section 3:228 fourth paragraph.

Mandatory provisions and general recommendations only for the design requirements are found in

a) section 3:22 mandatory provision first paragraph, third paragraph a, c–e, g–j and fourth paragraph, general recommendation first and third paragraph,
b) section 3:221 mandatory provision,
c) section 3:222 general recommendation,
d) section 3:223 mandatory provision second paragraph, general recommendation,
e) section 3:224 mandatory provision second paragraph, general recommendation first paragraph,
f) section 3:225 mandatory provision second paragraph, general recommendation first paragraph,
g) section 3:226 mandatory provision first paragraph,
h) section 3:227 mandatory provision first, third, fourth, fifth and sixth paragraph,
i) section 3:228 mandatory provision first paragraph, general recommendation, and
j) section 3:23 mandatory provision, general recommendation first and second paragraph.

Mandatory provisions and general recommendations only for the technical characteristics requirements are found in

a) section 3:22 mandatory provision second paragraph and third paragraph b, f and k, general recommendation, fourth, fifth and sixth paragraph,
b) section 3:221 general recommendation,
c) section 3:224 general recommendation second paragraph,
d) section 3:225 general recommendation second paragraph,
e) section 3:226 mandatory provision second paragraph,
f) section 3:227 mandatory provision second paragraph, general recommendation fourth paragraph,
g) section 3:228 mandatory provision second and third paragraph, and
h) section 3:23 general recommendation third and fourth paragraph.

The definition in section 3:212 applies regardless of whether it is the case of design requirements or technical characteristics requirements. *(BFS 2016:6).*

3:212 Definitions

Cooking: Food preparation, cooking and food storage

(BFS 2013:14).

3:22 General on the design of dwellings

Dwellings shall be sized and laid out with consideration taken to their long-term use.

The dwellings shall also be fitted out and equipped with consideration taken to their long-term use.

The dwelling shall include

a) at least one room for personal hygiene,
b) fittings and equipment for personal hygiene,
c) room or a separable part of the room for everyday social contact,
d) room or a separable part of the room for sleep and rest;
e) room or a separable part of the room for cooking,
f) fittings and equipment for cooking,
g) area for dining in or near the room for cooking,
h) space near the entrance with space for outdoor clothes etc.,
i) space for washing and drying laundry in machines if there is no common laundry room,
j) space for storage, and
k) fittings for storage.

A separable part of the room shall have windows facing the open. A separable part of a room shall be designed in such a way that, with its function retained, so it can be separated by walls from the rest of the room. *(BFS 2016:6).*

General recommendation

A balcony, outdoor space or a similar space should be provided adjacent to the dwelling.

The design dimensions and fitting lengths that are suitable for the design of the dwelling are contained in SS 91 42 21.

Space for a combined washer and dryer meets the requirement for washing and drying laundry in machines in the dwelling.

Rules for supplementary housing facilities are contained in Section 3:23.

Rules on waste storage areas in dwellings are contained in Section 3:4.

Rules for ventilation, light and view are contained in Sections 6:253 and 6:3. *(BFS 2016:6).*

3:221 Dwellings on multiple storeys

In dwellings with multiple storeys the entrance storey shall at least accommodate

- a sanitary room according to Section 3:146,
- separable space for a bed (alcove),
- facilities for cooking
- dining space,
- place for a sofa suite and armchairs,
- entrance area,
- space for storage, and
- area for washing and drying laundry in machines if there is no common laundry room. *(BFS 2011:26).*

General recommendation

Rules for accessibility and usability in individual dwellings on multiple storeys are contained in Section 3:147. *(BFS 2011:26).*

3:222 Dwellings larger than 55 m^2

Dwellings with a residential area (BOA)[3] greater than 55 m^2 shall be designed to suit the number of people for which they are intended. *(BFS 2016:6).*

General recommendation

Dwellings with a BOA greater than 55 m^2 should have room for a double bed in at least one room or in a separable part of a room for sleep and rest.

Dwellings with a BOA greater than 55 m^2 that are intended for several students can be designed without room for a double bed in any room or in a separable part of a room for sleep and rest. *(BFS 2016:6).*

3:223 Dwellings larger than 35 m^2 and not larger than 55 m^2

Dwellings with a BOA larger than 35 m^2 and not larger than 55 m^2 shall be designed in accordance with their size.

However, in these dwellings it is sufficient that either the room for sleep and rest, or the room with fittings and equipment for cooking is a separable part of a room. Separable part of a room shall have windows facing the open and shall be designed in such a way that, with its function retained, it can be separated by walls from the rest of the room.

General recommendation

Dwellings with a BOA larger than 35 m^2 and not larger than 55 m^2 can be designed without room for a double bed in any room or in a separable part of a room for sleep and rest. *(BFS 2016:16).*

[3] BOA = Residential area. Definition in Swedish Standard SS 02 10 53

3:224 Dwellings not larger than 35 m^2

Dwellings with a BOA not larger than 35 m^2 shall be designed in accordance with their size.

In these dwellings, it is allowed that the spaces for the functions

a) everyday social contact, sleep and rest and cooking are located in the same room without being separable, and

b) everyday social contact and sleep and rest overlap completely or partially.
(BFS 2016:6).

General recommendation

In dwellings with a BOA not larger than 35 m^2

a) the space for the fitting length for cooking should be at least 1.80 meters wide,
b) the space for the fitting length for storage should be at least 1.20 meters wide, and
c) the space for outdoor clothes in coat rack should be at least 0.40 meters wide.

In dwellings with a BOA not larger than 35 m^2

a) the fitting length for cooking should be at least 1.80 meters wide, and
b) the fitting length for storage should be at least 1.20 meters wide.

Rules for dwellings intended for one person with common spaces are contained in section 3:227 *(BFS 2016:6).*

3:225 Student dwellings not larger than 35 m^2

Student dwellings with a BOA not larger than 35 m^2 shall be designed in accordance with their size.

In individual student dwellings with a BOA not larger than 35 m^2 it is allowed that the spaces for the functions

a) everyday social contact, sleep and rest and cooking are located in the same room without being separable, and

b) everyday social contact, sleep and rest, and meals overlap completely or partially. *(BFS 2016:6).*

General recommendation

In individual student dwellings with a BOA not larger than 35 m^2

a) the space for the fitting length for cooking should be at least 1.40 meters wide,
b) the space for the fitting length for storage should be at least 1.20 meters wide, and
c) the space for outdoor clothes in coat rack should be at least 0.40 meters wide.

In individual student dwellings with a BOA not larger than 35 m^2

a) the fitting length for cooking should be at least 1.40 meters wide, and
b) the fitting length for storage should be at least 1.20 meters wide.

Rules about accessibility are contained in section 3:146.

Rules for dwellings intended for one person with common spaces are contained in section 3:227. *(BFS 2016:6).*

3:226 Dwellings with common spaces

For a group of residents, the individual dwellings' rooms for cooking and for everyday social contact and space for meals can partially be grouped into common spaces. The common spaces shall be large enough to ensure they can fully compensate for the limitations in the individual dwellings.

For a group of residents, the individual dwellings' fittings and equipment for cooking can partially be grouped into common spaces. The common spaces shall also be adequately equipped to ensure they can fully compensate for the limitations in the individual dwellings.

Section 3:226 does not apply to dwellings intended for people with disabilities specified in Section 9 Point 9 of the Act (1993:387) for Support and Service for people with Certain Functional Impairments, LSS, and Chapter 5, Section 7 of the Social Services Act (2001:453), SoL. *(BFS 2016:6).*

General recommendation

Rules for special forms of dwellings for the elderly are contained in section 3:228. *(BFS 2016:6).*

3:227 Dwellings intended for one person with common spaces

For a group of residents, in individual dwellings intended for one person, the individual dwellings' rooms for personal hygiene, cooking, everyday social contact, and spaces for meals can completely or partially be grouped into common spaces. The common spaces shall be large enough to ensure that they to a reasonable extent compensate for the limitations in the individual dwellings.

For a group of residents, in individual dwellings intended for one person, the individual dwellings' fittings and equipment for cooking can also completely or partially be grouped into common spaces. The common spaces shall also be adequately equipped to ensure they to a reasonable extent compensate for the limitations in the individual dwellings.

Common parts of the dwelling for personal hygiene shall be located close to and in the same storey as the individual dwellings.

Each room for personal hygiene can be shared by no more than three individual dwellings intended for one person.

Common parts of the dwelling for cooking, everyday social contact and space for meals shall be located close to the individual dwellings.

Common parts of the dwelling with fittings and equipment for cooking that replace corresponding functions in the individual dwellings cannot be shared by more than twelve individual dwellings intended for one person.

Section 3:227 does not apply to dwellings intended for people with disabilities specified in Section 9 Point 9 of the Act (1993:387) for Support and Service for people with Certain Functional Impairments, LSS, and Chapter 5, Section 7 of the Social Services Act (2001:453), SoL. *(BFS 2016:6).*

General recommendation

Rules for dwellings of not more than 35 m^2 are contained in section 3:224.

Rules for student dwellings of not more than 35 m^2 are contained in section 3:225.

Rules for special forms of dwellings for the elderly are contained in section 3:228.

Rules for ventilation, light and view are contained in Sections 6:253 and 6:3. *(BFS 2016:6).*

3:2271 ***has been repealed by (BFS 2016:6).***

3:2272 ***has been repealed by (BFS 2016:6).***

3:2273 ***has been repealed by (BFS 2016:6).***

3:2274 ***has been repealed by (BFS 2016:6).***

3:228 Special forms of dwelling for the elderly

For a small group of residents, in special forms of dwelling for the elderly, the individual dwellings' rooms for cooking and for everyday social contact and space for meals can partially be grouped into common spaces. The common spaces shall be large enough to ensure they can fully compensate for the limitations in the individual dwellings. The common spaces shall be located adjacent to the individual dwellings.

For a small group of residents, in special forms of dwelling for the elderly, the individual dwellings' fittings and equipment for cooking can partially be grouped into common spaces. The common spaces shall also be adequately equipped to ensure they can fully compensate for the limitations in the individual dwellings.

Group dwellings intended for senile people, do need not to be equipped with fittings and equipment for cooking in the individual dwelling. In such cases, however, provision shall be made for the necessary installations for this purpose.

Individual dwellings of not more than 35 m^2, in special forms of dwelling for the elderly, shall be designed according to 3:223. *(BFS 2016:6)*

General recommendation
The term special forms of dwelling for the elderly refers to dwellings in accordance with Chapter 5, Section 5, second paragraph of the Social Services Act (2001:453), SoL.

Special forms of dwelling for the elderly are often also workplaces. The Swedish Work Environment Authority issues rules on workplace design. *(BFS 2016:6).*

3:23 Supplementary housing facilities

In the vicinity of dwellings there shall be a common laundry room with the option of washing and drying by machine, if there is no room to wash and dry by machine in the individual dwelling (see Section 3:22).

In the dwelling or in its vicinity there shall be a lockable space for storage of seasonal equipment and the like.

In the vicinity of the dwelling, there shall be a room for the storage of prams, bicycles, outdoor wheelchairs, walking frames and the like, as well as space for post boxes.

General recommendation
Storage space and common laundry rooms should be within 25 meters walking distance from an entrance of this type as referred to in Section 3:132.

SS 91 42 21 contains suitable dimensions for storage.

Rules for accessible and usable supplementary housing facilities are contained in Section 3:148.

Rules on waste storage areas are contained in Section 3:4.

3:3 Room height

This Section contains mandatory provisions and general recommendations pursuant to Chapter 3, Section 9 of PBO. Section 3:5 also contains mandatory provisions and general recommendations for Chapter 8, Section 7 of PBA.

3:31 General

The height of rooms in buildings shall be sufficient to avoid problems to human health.

General recommendation
Rules for ventilation are contained in Section 6:25.

Rules on clear height are contained in Section 8:34.

3:311 Rooms intended for accommodation other than on temporary basis

3:3111 Dwellings

The room height of dwellings shall be not less than 2.40 meters. In one or two family houses, however, the room height in attics, semi-basements and basements must be no lower than 2.30 meters. In restricted sections of rooms, these room heights may be lower. In sections of the room where standing height is needed, the room height must not be less than 2.10 meters under horizontal sections of roofs or 1.90 meters under sloping roofs.

General recommendation
Examples of rooms or separable parts of rooms intended for the accommodation of people other than occasionally are contained in Section 1:6.

3:3112 Public premises

The ceiling height in public premises shall be at least 2.70 meters. In rooms designed for a small number of people, this room height may be lower. However, the room height must not be less than 2.40 meters.

General recommendation
Examples of rooms designed for a small number of people are rooms with space for 16 people at the most.

3:3113 Work premises

The room height of workrooms shall be not less than 2.40 meters. In restricted sections of rooms, these room heights may be lower. In sections of the room where standing height is needed, the room height must not be less than 2.10 meters under horizontal sections of roofs or 1.90 meters under sloping roofs.

In educational premises and other premises intended for a large number of people, the room height shall be not less than 2.70 meters.

General recommendation

The Swedish Work Environment Authority also issues rules on room heights in work premises.

3:312 Rooms intended for accommodation on a temporary basis

In rooms or separable parts of rooms in dwellings and public premises for people to accommodate on a temporary basis, the room height shall be not less than 2.10 meters.

General recommendation

Section 1:6 contains examples of rooms or separable parts of rooms intended for the accommodation of people on a temporary basis.

The Swedish Work Environment Authority issues rules on ceiling heights in work premises.

3:4 Utility rooms

This section contains mandatory provisions and general recommendations for Chapter 8, Section 4 first paragraph 9 and Section 9 of PBA and Chapter 3, Section 9 and 10 of PBO. Section 3:5 also contains regulations and general recommendations to Chapter 8, Section 7 PBA. (BFS 2011:26).

3:41 General

3:411 Definitions

Utility rooms:	Rooms used primarily for the operation and maintenance of buildings, such as rooms for fans, cleaning equipment, lift machines, waste storage areas, substations and boiler rooms.
Waste handling installations:	Fixed facilities for management of waste, such as vacuum systems and lifting container (recessed or placed on the surface).

3:42 Layout of engineering and utility service rooms

Utility rooms shall be located and designed to ensure that the risk for accidents during usage, inspection and maintenance of the rooms and their installations are limited. Utility rooms and their installations shall also be located and designed to limit any risk to hygiene or health of users or neighbours is limited.

In the room there shall be adequate space for materials and equipment and for operation and maintenance work.

General recommendation

In utility rooms, there should be lighting and electrical outlets, and where appropriate waterproof flooring, hot water installation, floor gulley with evaporation protection, emergency lighting and permanent devices for handling of heavy installations.

If there is any risk of personal injuries, utility rooms should be lockable.

Doors to fan rooms should be hung to ensure they can be opened in the event of any excess pressure, i.e. at excess pressure in to the room and the under-pressure out from the room.

Rules for water and drainage installations are contained in Section 6:6.

Rules on areas requiring waterproof or water-repellent layers are contained in Section 6:533.

Rules on the design of lift areas and lift installations are also included in Boverket´s mandatory provisions and general recommendations (2011:12) on lifts and other motorised devices, H.

Rules on the design of utility rooms are also issued by The Swedish Work Environment Authority

Examples of how the utility rooms can be designed are included in the Swedish Association of Plumbing and HVAC Contractor's guidelines *Rätt arbetsmiljö för montörer och driftpersonal*

Rules for manual handling and ergonomics are issued by The Swedish Work Environment Authority. *(BFS 2013:14).*

3:421 Access routes to utility rooms

Utility rooms shall be located and designed in such a way that limits the risk of accidents is limited when accessing and transporting. Access routes shall be designed with sufficient room for the transportation of large and heavy parts and equipment. Access routes via a residential unit may only occur to installations intended for the particular residence only.

General recommendation

Access to utility rooms via ladders, external staircases and over roofs should be avoided.

Rules on access routes to roofs are contained in Section 8:2421.

The Swedish Work Environment Authority also issues regulations on transport routes and manual handling.

3:422 Waste storage areas and waste handling installations

In, or adjacent to a building, there shall be spaces or installations for the handling of waste that can be used by all users of the building. For single-family houses separate waste containers may be used. The spaces shall be designed and dimensioned to enable the recycling of waste, in addition to what is specified in Section 3:42.

General recommendation

Household waste, such as food waste, that for reasons of hygiene needs to be taken out frequently, should be as close to the dwelling as possible. The distance between the building's entrances and spaces or installations for handling of waste should not exceed 50 meters for multi-dwelling blocks.

Section 3:1 states that waste storage areas and waste handling installations shall be accessible and usable.

Rules for the design of engineering and utility service rooms are also issued by the Swedish Work Environment Authority.

Rules for manual handling and load ergonomics are issued by the Swedish Work Environment Authority.

Spaces or installations for handling of waste shall be adapted according to

- pick-up frequency and amount of waste,
- the type and composition of waste,
- the need for cleaning,
- the need to be used in a way that ensures the risk of accidents is limited, and
- local rules for waste disposal on how the waste is sorted, stored and picked up.

General recommendation

For larger quantities of food waste, such as waste from supermarkets, there should be a refrigerated waste room, if, from a hygienic point of view, this cannot be arranged in any other way.

The refuse chute should have a circular cross section and a larger internal diameter than the largest lateral dimension of the waste inlet opening. An inlet opening with a cross section larger than 0.3 meters should be fitted with a safety device. The pipe inside the inlet should be designed to ensure the waste does not jam.

Rules for local waste disposal are contained in the municipal sanitation regulations.

Bulky waste shall be disposed separately.

It shall be possible for waste inlets and pneumatic tube conveyors to be locked from the associated collection spaces.

Spaces or installations for the handling of waste must not be placed

– so that the transport of waste must take place through spaces where people are present other than occasionally or where food is stored, and

– so that food waste has to be transported through circulation spaces adjacent to rooms where people are present other than occasionally, or where food is stored.

3:5 Requirements for accessibility, dwelling design, ceiling height, and utility rooms for alterations of buildings

3:51 Accessibility and usability for people with limited mobility or orientation capacity

For the application of section 3:51, the corresponding division in design requirements and technical characteristics requirements stated in section 3:111 applies. *(BFS 2013:14).*

General Recommendation
From Chapter 8, Article 7 PBO follows that deviations from the requirements for accessibility and usability for people with limited mobility or orientation capacity are always allowed if the alteration means that an attic is converted into dwellings of not more than 35 m^2. *(BFS 2014:3).*

3:511 Accessibility and usability in buildings

Buildings shall, following alteration, comply with the accessibility and usability requirements in Section 3:1. The requirements may be satisfied in a way other than that specified where the corresponding level of accessibility and usability is still achieved.

However, deviations from the level may be made if there are exceptional reasons relating to the scope of the alteration and the building's conditions. Rules on this are contained in this section and in Section 1:22.

Rules on requirements for alterations of lifts are contained in Section 3:513. *(BFS 2011:26).*

General recommendation
That one of the requirements in Section 3:1 cannot be met in full cannot be taken as a way of waiving other requirements in Section 3:1.

The entrances to multi-dwelling blocks, work premises and facilities to which the general public has access that have different levels inside the main entrance door, a ramp, lift or other lifting device should be installed. A precondition is that there is enough space and that the installation is performed to ensure the building's cultural values can be retained.

Level differences between sanitary rooms and the area outside the door should be evened out. The accessibility to sanitary rooms cannot be compromised by e.g. that the floor level is raised, unless there are exceptional reasons. One example of exceptional reasons is if it is necessary to get a slope towards the floor gulley.

Important destinations in buildings such as walkways, stairs and ramps, as well as control devices should be easy to identify and navigate for people with limited orientation capacity. This may involve contrast marking, for example.

Doors that shall be accessible and usable, and that do not meet the requirements in Section 3:143, should be made wider if there are no exceptional reasons to deviate from this requirement.

If a public building has one or more toilets for the general public, at least one toilet should be accessible and usable.

The requirements for acoustic environment according to 3:1451 should be met unless there are exceptional reasons for deviations. If the requirements cannot be met in the entire premises, e.g. due to lack of space for sufficient area of absorbents, they should at least be met in parts of the premises.

Places of assembly and reception areas should be fitted with induction loops, infra-red systems or another technical solution to ensure they are accessible and usable by people with limited hearing.

Sanitary rooms in dwellings should be made as accessible and usable as possible. If it is not possible to move the walls, you should at least place the toilet, sink, shower and bathtub in relation to each other as specified in Annex A in SS 91 42 21 (normal level).

Waste storage areas should be accessible and usable.

Exceptional reasons to deviate from this could, for example, be that

– the measure could lead to an alteration of a particularly historic building in accordance with Chapter 8, Article 13 of PBA,

– the floor needs to be raised locally in a sanitary room to ensure a slope to the floor gulley, and

– there is no room to widen the doors in dwellings.

Additional rules on accessibility and usability are contained in The Swedish National Board of Housing, Building and Planning´s provisions and general recommendations (2011:13) on the removal of easily remedied obstacles, to which and in premises where the public has access and in public places, HIN. *(BFS 2016:6).*

3:5111 Accessibility and usability at the extension of one- and two dwelling houses

An extension shall not result in that the dwelling, in its design before the extension, is compromised regarding accessibility and usability.

An extension in the ground floor shall, for the extended part, aim at the same level of accessibility and usability applicable for the erection of new buildings. If there are reasons to allow deviations form that requirement the alteration shall be designed and built in such a way that the extended part without difficulties can be made accessible from within the dwelling afterwards, unless there are exceptional reasons. *(BFS 2016:6).*

General recommendation

Reasons to allow deviations from the requirements that the extension shall be accessible and usable can be if it, with regards to the building's cultural values, living qualities or the city- and landscape image is inappropriate to place the extension at the same level as the main building. Another reason to allow deviations can be if it would result in unreasonably high additional costs to place the extension at the same level as the main building. The requirement for possibilities to make the extension accessible afterwards is met if there is room and other conditions to install ramp, lift or other lifting device. *(BFS 2016:6).*

3:512 Accessible and usable entrances to buildings

Differences in level to the main entrances shall be bridged if there are exceptional reasons to deviate.

However, for single-family houses, the requirement for accessibility and usability is satisfied if it is possible to subsequently arrange a ramp for the entrance to the site in a simple way. *(BFS 2011:26).*

General recommendation

Differences in level at the main entrances can be bridged, for example, with ground build-up, ramps, lifts or other lifting devices.

Exceptional reasons to deviate from this could, for example, be that

– soil conditions do not permit this, for example, because the site cannot accommodate a ramp, lift or other lifting device,

– the measure could lead to an alteration of a particularly historic building in accordance with Chapter 8, Article 13 of PBA,

– accessibility and usability, despite the measures, still cannot be improved, for example, if there is a difference immediately inside the entrance that cannot be bridged,

– a building already has an equivalent accessible and usable entrance, and

– the measure could reduce accessibility in general, for example, if a ramp to an entrance obstructs accessibility to and usability of a pavement. *(BFS 2011:26).*

3:513 Accessible and usable lift or other lifting device

For substantial alterations to multi-dwelling blocks with more than two storeys, work premises and public buildings shall have an accessible and usable lift or other lifting device installed, if there is none. Where there is a housing or main part of housing in the attic, the attic is equivalent to a storey. Deviations from this provision may only be made if there are exceptional reasons for doing so. *(BFS 2011:26).*

General recommendation

Extensive alterations to multi-dwelling blocks may involve major work in stairways, major changes to floor layouts or significant changes to the building's frame.

One way of satisfying the requirement for lifts may be to install a lift in an extension adjacent to the stairwell.

When an attic is converted into new dwellings in multi-dwelling blocks with more than two floors, a lift or other lifting device should be installed if there is none. If there is a lift, you must assess in each case if the lift needs to be run up to the new dwellings.

Exceptional reasons to deviate from this could, for example, be that

– the measure leads to a particularly valuable building as specified in Chapter 8, Article 13 of PBA being distorted,

– it is not possible to produce adequate space for both the lift and safe evacuation via the stairway and space for carrying stretchers down the stairs if the lift does not accommodate a stretcher,

– a lift installation in itself would entail changes to the building frame, in addition to the alterations needed for the actual lift installation, and

– essential living qualities would be lost, such as the essential qualities of living contained in Section 1:2231.

Requirements for the design of accessible and usable lifts and other lifting devices are contained in Section 3:144 and in The Swedish National Board of Housing, Building and Planning´s provisions and recommendations on lifts and other motorised devices (BFS 2011:12) Chapter 2. *(BFS 2011:26).*

3:514 Accessibility and usability on sites

General recommendation

Chapter 8, Article 11 of PBA states that when alterations are made to a building that require planning permission or that requires notification to the authorities, the site shall be organised to ensure it meets the requirements in Article 9 to the extent that is reasonable considering the cost of the work and the special characteristics of the site.

To be more usable, the following should be ensured on the site

– level differences at the transition between different types of walking surfaces and locations, such as at pedestrian crossings, should be evened out to 0-level with a 0.9 to 1.0 meters wide surface that has an incline of no more than 1:12,

– the surfacing on the walking surfaces should normally be firm, smooth and non-slip,

– parking spaces, lay-bys for cars, open spaces, walkways, stairs and ramps have markings and contrasts in relation to their surroundings, and

– the requirement levels for sites specified in Section 3:12 are otherwise pursued. *(BFS 2011:26).*

3:52 The design of dwellings

For the application of section 3:52, the corresponding division in design requirements and technical characteristics requirements stated in section 3:111 applies.

Dwellings shall be designed, utilised, fitted out and equipped, with consideration taken to their long-term use. The requirement levels specified in Section 3:2 shall be pursued. Rules for alterations of buildings are also given in Section 1:22. *(BFS 2013:14).*

General recommendation
When all or parts of buildings gain a new function, higher requirements should normally be met compared to when retaining the existing function.

The requirements in section 3:2 should be applied when e.g. attics, offices, schools or health care facilities are converted into dwellings. The same applies when dwellings in Sections 3:225–3:228 or other special dwellings are converted into regular dwellings.

Despite the second paragraph in the general recommendation there may be reasons to compromise in the requirements in section 3:2 when larger buildings with a large depth or load-bearing partition walls are reconstructed to student dwellings or dwellings intended for one person with common spaces according to section 3:227. The same is applicable if alteration is made so that a historically valuable building can have a new function.

Floor plans and interiors in existing dwellings should not be altered simply because they do not fully meet all the requirements for construction of new housing, unless they apply to the availability and usability of the sanitary rooms, see Section 3:511 ninth paragraph in the general recommendation. *(BFS 2016:6).*

3:53 Ceiling height

Ceilings in buildings shall be sufficiently high to avoid problems to human health. Rules for alterations of buildings are also given in Section 1:22. *(BFS 2011:26).*

General recommendation
The ceiling height of existing dwellings can usually be accepted even if it is lower than the ceiling heights specified in Section 3:3, and should be retained if it is higher.

For example, when attics, offices, schools and health care facilities are converted into dwellings, the ceiling heights in Section 3:3 should be applied.

Rules on clear height are contained in Section 8:34.

The Swedish Work Environment Authority issues rules on ceiling heights in work premises. *(BFS 2011:26).*

3:54 Waste storage areas and waste handling installations

In, or adjacent to a building, there shall be spaces or installations for the handling of waste that can be used by all users of the building. The corresponding requirement levels specified in Sections 3:422–3:423 shall be pursued. Rules for alterations of buildings are also given in Section 1:22. *(BFS 2011:26).*

General recommendation
Household waste, such as food waste, that for reasons of hygiene needs to be taken out frequently, should be as close to the dwelling as possible. The distance between the building's entrances and spaces and installations for handling of waste should not exceed 50 meters for multi-dwelling blocks.

Requirements for accessibility and usability are contained in Section 3:51.

Rules for local waste disposal are contained in the municipal sanitation regulations.

Rules on the design of engineering and utility service rooms are also issued by The Swedish Work Environment Authority.

Rules for manual handling and load ergonomics are issued by The Swedish Work Environment Authority. *(BFS 2011:26).*

4 has been repealed by (BFS 2013:14).

5 Safety in case of fire

This section contains the mandatory provisions and general recommendations for Chapter 8, Section 9 of PBA, and Chapter 3, Section 8 of PBO. The section also includes general recommendations to Chapter 10, Section 6 of PBA. Section 5:8 also contains mandatory provisions and general recommendations for Chapter 8 Section 7 of PBA. *(BFS 2011:26).*

General recommendation
For rules on analytical design, see Boverket´s general recommendations (2011:27) on the analytical design of the buildings fire protection, BBRAD.

Rules for the building's load-bearing capacity in case of fire are given in Section C, Chapter 1.1.2 in Boverket´s mandatory provisions and general recommendations (2011:10) on the application of European construction standards (Eurocodes), EKS. *(BFS 2011:26).*

5:1 General conditions

Buildings shall be designed with a fire protection that ensures that fire safety is satisfactory. The design of the fire protection shall be based on the assumption that a fire could occur.

A buildings fire protection shall be designed with adequate robustness to ensure all or large parts of the protection is not knocked out by individual events or stresses. *(BFS 2011:26).*

General recommendation
Examples of events and stresses referred to in the provision's second paragraph are malfunctions that could affect multiple protective systems or failure of individual protection systems that are important to fire protection. *(BFS 2011:26).*

5:11 Design

The fire protection of buildings shall be designed, developed and verified through simplified or analytical design. *(BFS 2011:26).*

General recommendation
General recommendations on verification are given in Section 2:32. *(BFS 2011:26).*

5:111 Prescriptive design

Prescriptive design means that the builder meets the requirements through the solutions and methods specified in the general recommendations in Sections 5:2-5:7. *(BFS 2011:26).*

General recommendation
The control plan should include a check to ensure only the methods and solutions for simplified design are applied. *(BFS 2011:26).*

Prescriptive design cannot be applied if an automatic fire suppression system is used to meet the requirements

a) in more than two mandatory provisions, or

b) in more than one mandatory provision, where an automatic fire suppression system is required.

The mandatory provisions referred to are sections 5:331, 5:336, 5:527, 5:531, 5:5332, 5:534, 5:536, 5:542, 5:548, 5:551, 5:561 and 5:732, and in Section C, Chapter 1.1.2, Section 6 of Boverket´s mandatory provisions and general recommendations (2010:10) on the application of European construction standards (Eurocodes), EKS. *(BFS 2014:3).*

5:112 Analytical design

Analytical design means that the developer meets one or more of the provisions in this section through a way other than simplified design.

Verification of the building's fire protection shall be performed through

– qualitative assessment,

– scenario analysis,
– quantitative risk analysis,

or equivalent methods. The methods can also be combined.

The verification method shall be chosen for the specific object in view of the complexity of the fire protection.

A qualitative assessment may be used as a verification method if the deviations from the simplified design are limited. The same applies if the impact of the design on fire safety is well known and if the design satisfies the provisions with a large safety margin.

Fire protection in buildings in building class Br0 shall be verified with analytical design. *(BFS 2011:26).*

General recommendation
Verification should be performed in the manner shown in Boverket's general recommendations (2011:27) on the analytical design of a building's fire protection. *(BFS 2011:26).*

5:12 Documentation

A fire protection documentation shall be prepared. This shall include information about the pre-conditions for the fire protection and how the constructed building's fire protection is designed, along with verification that the fire protection complies with the requirements in this Section and in Section C of Boverket´s mandatory provisions and general recommendations (2011:10) on the application of European construction standards (Eurocodes), EKS.

The requirement for fire protection documentation does not apply to accessory buildings with a building area not exceeding15 m^2. *(BFS 2011:26).*

General recommendation
The documentation should show the building and the design of its components with respect to fire protection in Section 5, load-bearing capacity in case of fire in Section C of Boverket´s mandatory provisions and general recommendations (2011:10) on the application of European construction standards (Eurocodes), EKS, as well as a plan for operation and maintenance in accordance with Section 2:5.

If fire protection strategy is based on the capabilities of the rescue services in 5:13, this should be indicated.

The documentation should also describe the type of preconditions that may include restrictions on how the building is used. These preconditions, for example, are the number of people that the facilities are designed for and the fire load the fire protection is designed for. What is referred to on fire load in this section is clarified in the Boverket's general recommendations (2013:11) on fire load, BBRBE.

Rules for systematic fire protection work are issued by the Swedish Civil Contingencies Agency. *(BFS 2013:14).*

5:13 Importance of responses from the rescue services

If the rescue services have a sufficiently fast response time and sufficient capacity, evacuation through windows with the help of rescue services in 5:323 may be applied. *(BFS 2011:26).*

General recommendation
Response time means the time from when the alarm is received by the rescue services until the rescue work has begun.

The assessment of the rescue services response time and response capability can be based on the municipal plan of action established in Chapter 3, Section 8 in the Act (2003:778) on protection against accidents. *(BFS 2011:26).*

5:14 has been repealed by (BFS 2011:26).

5:2 Fire resistance classes and other conditions

5:21 Occupancy classes

Spaces in buildings shall, on the basis of the intended occupancy, be divided into occupancy classes (Vk). *(BFS 2011:26).*

General recommendation
The classification depends on
– the extent to which people are knowledgeable about the building and its evacuation procedures,
– if people can mainly evacuate on their own,
– if people can be expected to be awake, and
– if there is an increased risk of fire occurring or where a fire can spread quickly and extensively.

The same building can be divided into several occupancy classes. *(BFS 2011:26).*

5:211 Occupancy class 1 – Industrial, offices, etc.

The occupancy class includes spaces where residents are likely to have good local knowledge and have the ability evacuate without assistance and are likely to be awake. *(BFS 2011:26).*

General recommendation
Examples of premises covered by the provision are industrial buildings, warehouses and offices. *(BFS 2011:26).*

5:212 Occupancy class 2 – Places of assembly etc.

The occupancy class includes places of assembly and other premises where residents are likely to have good local knowledge and have the ability to evacuate without assistance and are likely to be awake. A place of assembly means any premises or group of premises within a fire compartment designed for a large number of people.

Spaces shall be divided into occupancy classes 2A, 2B or 2C.

Occupancy class 2A refers to premises for up to 150 people.

Occupancy class 2B refers to a place of assembly for more than 150 people.

Occupancy class 2C refers to a place of assembly that is designed for more than 150 people and where alcohol is served to a significant extent. *(BFS 2011:26).*

General recommendation
Examples of premises that may be included in occupancy classes 2A or 2B are schools, shops, health centres, conference centres, auditoriums, cinemas, lecture halls, restaurants, travel terminals, sports halls, warehouses, retail facilities, and halls for theatres, concerts, dance, study and leisure activities. Examples of places of assembly that may be included in occupancy class 2C are discos, larger pubs and nightclubs *(BFS 2011:26).*

5:213 Occupancy class 3 – Dwellings

The occupancy class includes dwellings where residents are likely to have good local knowledge and have the ability to evacuate without assistance and cannot assume to be awake.

Occupancy class 3A includes dwellings referred to in the first paragraph not included in occupancy class 3B. *(BFS 2014:3).*

General recommendation
Examples of spaces included in occupancy class 3 are ordinary dwellings such as dwellings in multi-dwelling blocks and single-family houses, sheltered housing, nursing homes, day care centres for families and second homes and similar. *(BFS 2014:13).*

Occupancy class 3B includes shared lodging. *(BFS 2014:3).*

General recommendation
Examples of shared lodging are residential care homes (HVB), homes for children seeking asylum without a parent and similar. Occupancy class 3B can also be applied for e.g. dwellings intended for one person with common spaces referred to in section 3:227. *(BFS 2016:6).*

5:214 Occupancy class 4 – Hotels etc.

The occupancy class includes spaces where residents are not likely to have good local knowledge, but have the ability to make themselves safe and cannot be assumed to be awake. *(BFS 2011:26).*

General recommendation
Occupancies covered by the provision are hotels, hostels, bed and breakfasts, and other types of temporary housing.
Rules for fire protection in hotels, guest houses, hostels and similar facilities are also issued by Swedish Civil Contingencies Agency. *(BFS 2014:3).*

5:215 Occupancy class 5 – Healthcare environments etc.

The occupancy class includes areas where residents have limited or no ability to evacuate without assistance.

The spaces shall be divided into occupancy classes 5A, 5B, 5C or 5D.

Occupancy class 5A includes spaces intended for activities conducted during day time and that satisfy the provision's first paragraph. The occupancy class also includes similar activities conducted during night time. *(BFS 2016:6).*

General recommendation
Examples of spaces included in occupancy class 5A are pre-schools or daily activities as specified in the Social Services Act (2001:453), SoL. Examples of similar activities are pre-schools conducted during night time *(BFS 2016:6).*

Occupancy class 5B includes means-tested special accommodation for people
- with physical or mental illness,
- with disabilities,
- with mental retardation,
- with dementia or
- who otherwise have a limited ability to place themselves in safety. *(BFS 2011:26).*

General recommendation
Means-testing can be made in relation to legislation such as the Social Services Act, SoL, or the Act for Support and Service for Persons with Certain Functional Impairments, LSS. Occupancy class 5B also includes open departments with needs testing in accordance with the act on the care of drug users in certain cases (1988:870), LVM, the Care of Young Persons Act (1990:52), LVU, or the Act on the Enforcement of Institutional Care of Young people (1988:603), LSU. *(BFS 2011:26).*

Occupancy class 5C includes premises for healthcare and nursing. *(BFS 2011:26).*

General recommendation
Examples of premises referred to in the provision are hospitals. *(BFS 2011:26).*

Occupancy class 5D includes premises for people who are kept under lock and key. *(BFS 2011:26).*

General recommendation
Examples of premises covered by the provision are detention centres, prisons, jail facilities or activities in which people could be denied freedom in accordance with the Communicable Diseases Act (2004:168), Act (1991:1129) on Forensic Psychiatric Care, or the Act (1991:1128)

on Compulsory Psychiatric Treatment. Occupancy class 5D also includes closed departments with needs testing in accordance with the law on the care of drug users in certain cases (1988:870) (LVM), the Care of Young Persons Act (1990:52) (LVU), or the Act on the Enforcement of Institutional Care of Young Persons (1988:603) (LSU). *(BFS 2011:26).*

5:216 Occupancy class 6

Occupancy class 6 includes premises with an increased probability of the occurrence of fire or where a fire can progress very rapidly and substantially. *(BFS 2011:26).*

General recommendation
Premises covered by the provision are mainly those where highly flammable materials are produced and processed to more than a minor extent or where combustible dust could accumulate. Examples of such premises are mills, paper factories, textile factories, production buildings for agricultural and facilities for professional woodworking. *(BFS 2011:26).*

Rules for the handling of flammable and explosive goods are issued by The Swedish Civil Contingencies Agency. *(BFS 2011:26).*

5:22 Building classes

Buildings shall be divided into classes, Br, based on the need for protection.
- Buildings with a very high need for protection shall be designed in building class Br0.
- Buildings with a high need for protection shall be designed in building class Br1.
- Buildings with a moderate need for protection shall be designed in building class Br2.
- Buildings with a low need for protection shall be designed in building class Br3.

In assessing the need for protection account shall be taken to a probable fire progress, potential consequences of a fire and the complexity of the building. *(BFS 2011:26).*

General recommendation
The classification should take into account factors that are related to evacuation and the consequences of a building collapse.

Buildings with more than 16 storeys, large buildings with occupancy class 5C, buildings with occupancy class 5D and buildings with certain types of places of assembly should be designed in building class Br0.

Certain types of places of assembly refer to:
- Places of assembly in occupancy class 2B that are not on the ground floor and that are intended for more than 1,000 people.
- Places of assembly in occupancy class 2C that are on the ground floor and that are intended for more than 600 people.
- Places of assembly in occupancy class 2C that are not on the ground floor and that are intended for more than 300 people.

Buildings with three or more storeys should be designed in building class Br1. However, single-family houses with up to three storeys can be designed at a minimum of building class Br2.

The following buildings with two storeys should be designed in building class Br1:
- Buildings designed for occupancy classes 4, 5A, 5B or 5C.
- Buildings with places of assembly in occupancy classes 2B or 2C on the second storey.

The following buildings with two storeys should be designed in building class Br2:
- Buildings intended for more than two dwellings and in which habitable rooms or workrooms are situated on the attic floor.
- Buildings and places of assembly in occupancy classes 2B or 2C on the ground floor.
- Buildings which have a building area greater than 200 m^2 and that are not divided into fire compartments not exceeding this size by compartment walls in the fire resistance class specified in 5:562.

Buildings in one storey should be designed in building class Br2 if they contain:
- places of assembly in occupancy classes 2B or 2C on or under the ground floor,
- dwellings and premises in occupancy classes, 5B or 5C.

Other buildings may be designed in building class Br3.

For the classification of buildings, a mezzanine floor in a building should be considered as a separate storey if the area of the mezzanine floor represents more than 50 % of the floor area of the underlying floor. The area should not exceed 100 m^2 for buildings in building class Br1 and Br2, or 200 m^2 for buildings in building class Br3. However, for warehouses or factories in occupancy class 1 in buildings in building class Br3, an area of up to 500 m^2 is acceptable. *(BFS 2011:26).*

5:221 has been repealed by (BFS 2011:26).

5:222 has been repealed by (BFS 2011:26).

5:23 Structural elements, classes, and definitions

5:231 Classes

Depending on their function, structural elements are assigned to the following classes:

- R load-bearing capacity,
- RE load-bearing capacity and integrity (airtightness),
- REI load-bearing capacity, integrity and insulation,
- E integrity,
- EI integrity and insulation,
- EI_1 or EI_2 integrity and insulation for fire separating windows (which can be opened only with tools, keys or similar) or for fire doors,
- EW integrity and limited radiation,

The classes are accompanied by a time requirement: 15, 30, 45, 60, 90, 120, 180, 240 or 360 minutes. The classes may be combined with additional subclasses

- M mechanical impact
- S_a or S_{200} smoke leakage for doors.
- C doors with door closers in one of classes C1–C5.

(BFS 2018:4).

General recommendation

Fire classes are further described in SS-EN 13501 parts 1–6.

Examples of classes are: R 120, RE 60, REI 30, EI_1 30,$EI_2$15/EW 30, EI 30, EI 60-C, E 15 and REI 60-M.

Rules on building products with assessed properties are defined in Section 1:4. *(BFS 2014:3).*

The following classes are used for material, claddings and surface finishes where designations with index L refer to materials for pipes.

- A1, A2, B, C, D, E
- $A1_L$, $A2_L$, B_L, C_L, D_L, E_L

Fire resistance class A1 has the highest requirement and cannot be combined with any of the supplementary classes. Classes A2, B, C, and D are always combined with one of the following supplementary classes:

- s1 the structural element may only emit a very limited amount of smoke.
- s2 the structural element may emit a limited amount of smoke
- s3 no requirement on limitation of smoke
- d0 burning drops or particles may not be emitted from the structural element
- d1 burning drops or particles may be emitted in a limited amount
- d2 no requirement regarding restrictions on burning drops or particles.

Fire resistance class E is the lowest class and is combined with the supplementary class d2 if burning drop requirements are not met. *(BFS 2011:26).*

General recommendation
Examples of class designations are: A1, A2-s1,d0, B-s1,d0, D-s2,d0, D_L-s3,d0. *(BFS 2011:26).*

Floor covering $A1_{fl}$, $A2_{fl}$, B_{fl}, C_{fl}, D_{fl}, E_{fl}.

Class $A1_{fl}$ has the highest requirement and cannot be combined with any of the supplementary classes. Classes $A2_{fl}$, B_{fl}, C_{fl}, D_{fl} are always combined with one of the following supplementary classes:

– s1 floor coverings may emit a limited amount of smoke.
– s2 no requirement on limitation of smoke.

Class Efl is the lowest class and is not combined with any of the supplementary classes. *(BFS 2011:26).*

General recommendation
Examples of class designations are: $A1_{fl}$, C_{fl}-s1, D_{fl}-s1. *(BFS 2011:26).*

– Cables A_{ca}, $B1_{ca}$, $B2_{ca}$, C_{ca}, D_{ca}, E_{ca}.

Class A_{ca} has the highest requirement and cannot be combined with any of the supplementary classes. Classes $B1_{ca}$, $B2_{ca}$, C_{ca}, D_{ca} are always combined with one of the following supplementary classes:

– s1 the cable may only emit a very limited amount of smoke.
– s2 the cable may emit a limited amount of smoke
– s3 no requirement on limitation of smoke
– d0 burning drops or particles may not be emitted from the cable
– d1 burning drops or particles may be emitted in a limited amount.
– d2 no requirement regarding restrictions on burning drops or particles.

Classes $B1_{ca}$, $B2_{ca}$, C_{ca}, D_{ca} can also be combined with one of the following supplementary classes:

– a1 the cable may only emit a very limited amount of acidic and corrosive smoke
– a2 the cable may emit a limited amount of acidic and corrosive smoke
– a3 no requirement on limitation of acidic and corrosive smoke

The class E_{ca} is the lowest class and cannot be combined with any of the supplementary classes. *(BFS 2014:3).*

General recommendation
Examples of class designations are: A_{ca}, C_{ca}-s1,d1, D_{ca}-s2,d2,a3, E_{ca}. *(BFS 2014:3).*

– Roof covering class B_{ROOF} (t2).
– Cladding fire resistance class $K_2$10/B-s1, d0.
– Soot fire resistance, class G.

Classes and the applicable supplementary classes shall at least meet the requirements set out in this statute to comply with and be allowed in the specified application. *(BFS 2013:14).*

5:2311 Doors

General recommendation
Doors with requirements for fire resistance class EI XX can be designed in class EI2 15/EW XX according to SS-EN 13501-2 and where XX represents the time in minutes that the fire resistance corresponds to.

For doors in class A2-s1,d0, the requirement for insulation, I, is satisfied if the temperature rise on the reverse side of the fire is at most 280 ˚C on average and at most 330 ˚C at isolated points.

For lift doors, fire resistance can be up to 120 minutes in class E or EI, which is verified with SS-EN 81–58. *(BFS 2011:26).*

5:232 Separating constructions

Separating construction refers to separation by means of floors and walls - including penetrations and junctions to adjoining building elements - that is resistant to fire during all or a part of a fire

progression. Separating construction shall comply with relevant requirements for integrity and insulation.
The requirement that the separating construction shall restrict the spread of fire and smoke shall be applied with the regard to probable fire progression and the need for protection of the building. *(BFS 2011:26).*

General recommendations
Separating construction should be classified by the classes (E or EI) as specified in Section 5:231. *(BFS 2011:26)*

5:233 Fire load

Fire load means energy per floor area (MJ/m^2) within a defined space. Fire load is determined for the total amount of energy that can be burned for full fire progress in relation to the floor area for the space in question.

The design value for the fire load shall be the value included in 80 % of the observed values in representative statistical material. *(BFS 2011:26).*

General recommendation
The fire load should be calculated according to Boverket's general recommendations (2013:11) on fire load, BBRBE. The defined space should correspond to a fire compartment. *(BFS 2013:14).*

5:234 has been repealed by (BFS 2011:26).

5:24 General definitions

5:241 Lobbies and protected lobbies

Lobbies connect rooms that have special requirements for protection against the spread of fire and smoke. A lobby shall be large enough that it is not necessary for more than one door at a time to be opened by people passing through. If the lobby forms part of the boundary between fire compartments, the door that is subject to fire resistance classification shall be self-closing.

Protected lobbies connect spaces with particularly high requirements for protection against the spread of fire and smoke. The protected lobby shall be designed as a separate fire compartment. The protected lobby shall be large enough that it is not necessary for more than one door at a time to be opened by people passing through. *(BFS 2011:26).*

General recommendation
The smoke leakage characteristic of doors in a fire compartment boundary in lobbies and protected lobbies should meet fire resistance class S_{200}.

The protected lobby should be separated from adjacent spaces by class El 60 as a minimum. The protected lobby should have doors in a minimum class of EI 60-S_{200}C. *(BFS 2018:4).*

5:242 Fire compartment

The term fire compartment refers to a part of a building separated from other parts of the building in which a fire, during all or part of a fire progression, can develop without spreading to other parts of the building or other buildings. The fire compartment shall be separated from the rest of the building, by enclosing walls and building floors to ensure that escape from the building is secured and to ensure that people in adjoining fire compartments or buildings are protected during a fire or parts of a fire progress. *(BFS 2011:26).*

5:243 Fire section

The term fire section refers to a part of a building separated from other parts of the building in which a fire can develop without spreading to other parts of the building or other buildings. The fire section

shall be separated from the rest of the building by firewalls and building floors or equivalent to ensure that fire spread is restricted within and between buildings. *(BFS 2011:26).*

5:244 Firewall

Firewalls shall, with sufficient reliability, be able to contain a fire without input from rescue personnel.

The wall shall withstand the mechanical impacts that are likely to occur in case of fire and be designed to ensure it can be easily located by the rescue service.

Structural elements, installations and connections that are placed on, near or in a firewall shall be designed so as not to impair the function of the firewall.

The firewall between buildings shall have sufficient stability and load-bearing capacity that it is possible for buildings on either side to collapse without an appreciable reduction in the properties of the firewall.

Firewalls may be common in adjoining buildings. In adjoining buildings of different building classes, the firewall shall be constructed to the same fire resistance class as that applicable for the building in the higher building class. *(BFS 2011:26).*

General recommendation

A firewall should be designed in fire resistance class REI XX-M, where XX follows from the relevant requirements in Section 5:5. The firewall can, for example, be located by the connection to the roof being clearly marked. *(BFS 2011:26).*

5:245 Stairway Tr1

Stairway Tr1 shall be designed with a separate structure to ensure that the spread of fire and smoke to the stairway is limited. *(BFS 2011:26).*

General recommendation

The separating structure should be designed in a minimum of fire resistance class EI 60.

The stairway should only be connected to other spaces through a protected lobby which is open to the outside. However, the lift shaft can be placed in a stairway as part of the same fire compartment as the stairway. Neither the stairway, lift shaft or protected lobby should be connected to a floor that is situated below the floor used for escape to the outside.

Doors between the stairway and the protected lobby should be designed in a minimum of fire resistance class E 30-S_{200}C. Doors between a dwelling or premises and the protected lobby should be designed in a minimum of fire resistance class El 60-S_{200}C. If the protected lobby is adjacent to a connection, corridor or similar space in its own fire compartment, doors can be designed in a minimum of fire resistance class EI 30-S_{200}C. *(BFS 2018:4).*

5:246 Stairway Tr2

Stairway Tr2 shall be designed with a separate structure to ensure that the spread of fire and smoke to the stairway is limited. *(BFS 2011:26).*

General recommendation

The separating structure should be designed in a minimum of fire resistance class EI 60.

Doors to stairway Tr2 should be designed in a minimum of class E 60-S200C. If the stairway serves a building with up to eight storeys, EI 30-S200C is adequate. The stairway should only have a connection through a space in its own fire compartment with dwellings in occupancy class 3, offices in occupancy class 1 and spaces comparable therewith where people are present other than occasionally. Spaces other than dwellings in occupancy class 3, offices in occupancy class 1 and spaces comparable therewith, where people are present other than occasionally, should only have a connection to the stairway through a protected lobby. Such spaces should have access to at least one more access route for rescue services.

The lift shaft can be placed in the stairway as part of the same fire compartment.

A stairway Tr2 which constitutes the only escape route should not be connected with the basement floor in accordance with the requirements in 5:722. This also applies to lift shafts that are part of the same fire compartment as the stairway.

Attic spaces, where people are present only occasionally, can be in direct connection with stairway Tr2 through doors in a minimum of class EI 60-S_{200}C. *(BFS 2018:4).*

5:247 Escape route and secure location

An escape route shall be an exit to a secure location. An escape route may also be a space in a building which leads from a fire compartment to such an exit. *(BFS 2011:26).*

General recommendation
A secure location refers to a space in the open where fire and smoke cannot affect evacuated people. A secure location could be, for example, a street in the open or terrace, courtyard or similar provided that a public street is accessible from the secure location.

An escape route may include doors and elements such as corridors or staircases in their own fire compartments, access balconies or similar areas outside. *(BFS 2011:26).*

5:248 Evacuation place

Evacuation place refers to a space in an adjacent fire compartment which is located adjacent to an escape route where people with limited mobility or orientation capacity can await further evacuation instructions. The evacuation place may also be part of the escape route if the evacuation site is located adjacent to the spaces served by the escape route.

The evacuation place shall accommodate people with limited mobility or orientation capacity. The evacuation place shall be usable and accessible to people listed in Section 3:1, and be accessible without a key or equivalent.

The evacuation place shall be located on the same floor as the space it serves. There shall be means of two-way communication from the evacuation site. It shall be possible to maintain the functionality of the communication system in the event of a power outage, as well as protection against power outages due to fire. *(BFS 2011:26).*

General recommendation
The design of the communication system should at least meet the requirements for power outages and error signals such as automatic fire alarms in accordance with Section 5:2511. Equipment for communication from the evacuation site should be located with the centre 0.8 meters from the floor.

Communication to the evacuation site should be in connection to the alarm system's central equipment, firefighting panel or equivalent.

Doors to evacuation sites should be fitted with door closers. *(BFS 2011:26).*

5:249 Separate boiler room

Separate boiler room refers to boiler rooms that are specifically designed with protection against the development and spread of fire and smoke. *(BFS 2011:26).*

General recommendation:
Separate boiler rooms and fuel magazines in direct connection to a separate boiler room should be designed in individual fire compartments. *(BFS 2011:26).*

5:25 Fire safety installations

5:251 Alarm systems

5:2511 Automatic fire alarm

Automatic fire alarms shall be installed where this is necessary for the fire protection's design. The system shall be designed with the necessary properties that have the ability to detect fire reliably and give signals to the functions that depend on the alarm. The system shall be designed with sufficient coverage and shall activate quickly enough to ensure proper function. The system shall be designed to

ensure that corrosion, thermal effects or other factors in the building's environment do not affect the reliability.

The function of the installation shall be maintained following power outages and shall be provided with protection against power outages due to fire in the spaces not covered by the automatic fire alarm.

If the automatic fire alarm is a precondition for fire protection in all or parts of a building, the detection system shall cover these areas. *(BFS 2011:26).*

General recommendation

The reliability and capacity of automatic fire alarms can where applicable be verified in accordance with Sections 6-7 and 15-16 in the Swedish Fire Protection Association's publication *Rules for fire alarms, SBF 110:8*. The components in an automatic fire alarm can be verified in accordance with the standard series SS-EN 54 with characteristics adapted to the intended use. Components in fire alarms pursuant to SS-EN 54-21 should be designed as type 1.

Examples of properties of the type that are referred to in the provision are the ability to detect different types of fire, the design of the detection system, the location of the detectors depending on coverage, as well as how the detection system is enabled. Examples of functions that may be dependent on the alarm are door closers, dampers or fans in HVAC systems the buildings HVAC system, evacuation alarms and smoke ventilation.

Where it is possible, detection should be by means of smoke detectors.

The automatic fire alarm should automatically deliver fault signals when there are faults in the mains network or power supply. Fault signals should be designed to ensure they can be detected by people in the building or elsewhere. *(BFS 2018:4).*

5:2512 Evacuation alarm

Evacuation alarms shall be installed where this is necessary for the fire protection's design. The evacuation alarm shall be tailored to suit the needs for information to ensure that people present in the building can be reached with information on appropriate measures to take for their escape.

Spaces in public buildings where people with limited hearing may be present without any direct contact with other people shall be provided with additional alarm devices to ensure that the hearing limited and deaf people can also be reached by warning signals in case of fire or other danger.

The audibility of an acoustic alarm shall be such that the signals or announcements can be understood in the affected parts of the building.

It shall be possible to maintain the function of the installation in the event of a power outage, and have protection against power outages due to fire. *(BFS 2011:26).*

General recommendation

The evacuation alarm can be activated manually or by automatic fire alarm. The evacuation alarm should signal immediately both through activation by a manual call point or automatic fire alarm.

The evacuation alarm should be designed in line with the need for information as specified in Section 5:35, for example, with respect to when spoken announcements or simple signals can be applied.

Examples of spaces in public buildings that should be fitted with supplementary alarm devices are sanitary rooms. Additional alarms refers to optical devices etc.

The volume of an evacuation alarm should be designed to suit the ambient noise in the premises. Evacuation alarms used in dwellings in occupancy class 3 or premises and housing for sleeping people in occupancy classes 4 and 5 should be positioned to ensure the sound level at the place of a sleeping person's head is at least 75 dB(A). The sound level for other premises should not fall below 65 dB(A) in places where people are present other than occasionally. The sound level should be at least 10 dB(A) above the ambient normal background level and should not be less than 115 dB(A) at a one meter distance from the alarm device.

The evacuation alarm with spoken announcements can be verified according to SS-EN 54–16 and SS-EN 54–24. Speech intelligibility can be verified according to SS-EN 60268-16. For a spoken announcement a speech transmission index, STI of at least 0.55 should be achieved. The sound pressure level should be at least 70 dB, although at least 15 dB above ambient level. Spoken escape announcements should be preceded by an unmistakable acoustic signal. The announcement should be tailored to suit the relevant premises and the associated occupancy therein. The spoken

announcement should give precise information about the situation and be repeated until the alarm is reset. An announcement could be formulated as follows:

1. Signal character 1 (immediate danger), in accordance with SIS-TR 47, sounds for 5 seconds.
2. "Important notice. We have a fire incident in the building. We must ask everyone to immediately vacate the premises through the nearest exit. Follow staff instructions. Continue out into the open air and please do not block the exits."
3. Signal character 1 (immediate danger), in accordance with SIS-TR 47, sounds for 5 seconds.
4. ”Important message. There is a fire situation in the building. Please leave the building through the nearest exit. Follow the instructions given by the management and proceed to the outside. Don’t block the exits.”
5. The message is repeated from point 1.

Acoustic and optical alarms can be verified using SS-EN 54-3 or 54-23.

The evacuation signal should continue until the alarm is reset. Any alarm devices should be fitted with a sign indicating the significance of the signal and proposals for appropriate actions. Examples of text could be "evacuation alarm – vacate the building immediately when the alarm signal sounds/flashes". The sign should be designed with white text on a red background and be legible from a standing level under, or at, the alarm device.

Evacuation alarms should be capable of emitting evacuation signals for at least 30 minutes after a power outage of 24 hours. The evacuation alarm should automatically emit fault signals when there are faults in the mains network or power supply. Fault signals should be designed to ensure they can be detected by people in the building or elsewhere.

The design of manual call points for activation of the evacuation alarm can be verified in accordance with SS-EN-54 11. Manual call points of this type should be fitted with a protective cover. The manual call points should be placed at most 1.60 meters above the floor. *(BFS 2018:4).*

5:2513 Smoke alarm devices

Smoke alarm devices shall be installed when this is a precondition for the design of the fire protection. Smoke alarm devices shall be designed and located to ensure they detect and warn of fire with high level of reliability. Smoke alarm devices shall also be designed with sufficiently fast reaction time to alert at an early stage.

Smoke alarm devices shall be designed to ensure corrosion, thermal effects or other factors in the building's environment do not affect reliability. *(BFS 2011:26).*

General recommendation

The design of smoke alarm devices can be verified in accordance with SS-EN 14604. Smoke alarm devices should be fitted with alarm indicators.

Examples of properties that are important to reliability are the capability of detecting various types of combustion, that the power supply is guaranteed even during outages, location that ensures a fast enough reaction time and good coverage.

To ensure good coverage, at least one fire detector should be placed on each floor containing spaces where people are present other than occasionally. Smoke alarm devices should be placed in, or outside, every room for sleeping people. If stairs are present, smoke alarm devices should also be placed in the space directly above the stairs. *(BFS 2011:26).*

5:252 Automatic fire suppression systems

If an automatic fire suppression system is essential for fire protection, the design shall be such that it has the capability to extinguish or control a fire over the appropriate time with high reliability,. The system shall activate quickly enough and shall be designed with sufficient coverage to ensure proper functionality. The system shall have the properties that are necessary to ensure that activation can occur with high reliability. The system shall be designed to ensure corrosion, thermal effects or other factors in the building's environment do not affect reliability. Systems with extinguishing agent that may have toxic properties shall be designed to ensure adequate personal safety is maintained.

The installation shall have protection against its operation being disturbed due to fire. *(BFS 2011:26).*

General recommendation
Examples of factors that may affect reliability are the type of water source, pressure, water flow, area of operation, type of trigger mechanism, design of valves, maintenance and the number, type and location of sprinkler heads.

An example of what is meant in the second paragraph in the provision may be power outages due to fire.

Rules for water and drainage are contained in Section 6:6. *(BFS 2011:26).*

5:2521 Automatic water sprinkler system

General recommendation
The reliability and capability of automatic water sprinkler systems can be verified in accordance with SS-EN 12845 and the standard series SS-EN 12259. For spaces in occupancy class 5C, the water source should consist of improved, doubled or combined water inlets as specified in 9.6.2–9.6.4 in SS-EN 12845.

The reliability and capacity of the water spray and deluge systems can be verified in accordance with SIS-CEN TS 14816. Other systems can be verified in accordance with SBF 120. *(BFS 2011:26).*

5:2522 Residential sprinklers

General recommendation
The reliability and capacity of residential sprinklers designed for dwellings in occupancy classes 3 and 5B can be verified in accordance with SS 883001 and SS 883002 with sprinkler systems as follows.

1. For buildings with up to two storeys, sprinkler system type 1 should be applied.
2. For buildings with up to eight storeys, sprinkler system type 2 should be applied.
3. For buildings with more than eight storeys and for spaces in occupancy class 5B, sprinkler system type 3 should be applied.

The components of a system for residential sprinklers can be verified in accordance with the standard series SS-EN 12259 with properties tailored to suit their intended use. *(BFS 2011:26).*

5:253 Smoke ventilation

If a system for smoke ventilation is essential for fire protection to function, the system shall be designed to ensure it can control smoke over the appropriate time with high reliability. The system shall have quick enough reaction time and sufficient capacity to ensure that fire protection is adequate. For the design of the smoke ventilation, the snow load and wind load shall be taken into account. Openings and other devices shall be designed to ensure the routes for supply and extract air are ensured based on the conditions that may prevail during a fire. The function of the installation shall be maintained when power is supplied to the building and be protected against power outages due to fire. *(BFS 2011:26).*

General recommendation
The smoke ventilation can be applied, for example, to limit the accumulation of smoke and their temperatures and to improve the ability for search and rescue responses.

Systems for smoke ventilation can be verified in accordance with the standard series SS-EN 12101. *(BFS 2011:26).*

5:254 Door closers

Door closers shall be installed where this is necessary for the fire protection's design. The system shall be designed to ensure that the fire compartment boundaries maintain their functionality with high reliability. *(BFS 2011:26).*

General recommendation
Door closers should at least be designed in class C1. For doors that can be held open, and that are covered by the requirement, door closers should be automatically activated in case of fire.

Rules on doors are given in Section 5:534.

Rules on accessible and usable doors that shall open easily are given in Section 3:143. *(BFS 2011:26).*

5:255 Fire protection in ventilation systems

5:2551 Dampers

If a damper is a precondition for the buildings fire safety design, it shall be designed with high reliability to ensure protection against the spread of fire and smoke in ventilation systems equivalent to the fire compartment boundary class. Dampers shall withstand the temperature at which they are exposed to and shall be activated within the time required for their intended purpose to be achieved.

The dampers shall if necessary be provided with protection against power outages due to fire. *(BFS 2011:26).*

General recommendation
Dampers can be verified in accordance with SS-EN 15650.

The dampers should be activated with smoke detectors that are installed at a suitable place. The smoke detector design can be verified in accordance with SS-EN 54-7. *(BFS 2011:26).*

5:2552 Fans in operation during a fire

Fans in operation during a fire refer to a protection method that means that fans in ventilation systems are used to control smoke or restrict the spread of fire and smoke between fire compartments.

If fans in operation during a fire are essential for the buildings fire protection system, the design shall ensure that they fulfil their intended function with high reliability. The system shall be provided with protection against power outages due to fire. *(BFS 2011:26).*

General recommendation
Cables for power supply should be designed with protection equivalent to the fire requirement for structure in the building. *(BFS 2011:26).*

5:256 Pressurisation of spaces

If pressurisation of spaces is a precondition for the design of the fire protection, the system shall be designed to ensure with high reliability that smoke spread to that space is limited. *(BFS 2014:3).*

General recommendation
Systems for pressurisation can be verified with SS-EN 12101-6. The system should be designed to operate for at least 30 minutes, provided that the power supply to the building is in working order. The system should be designed to withstand the temperature that it is likely to be exposed to during this time. *(BFS 2011:26).*

5:3 Ability to escape in case of fire

5:31 General

Buildings shall be designed to ensure that there is an adequate time for evacuation during a fire. Adequate time for evacuation means that people who evacuate are not exposed to falling structural elements, high temperatures, high levels of heat radiation, toxic gases or reduced visibility that might impede evacuation to a safe location with sufficient certainty. *(BFS 2011:26).*

5:311 has been repealed by (BFS 2011:26).

5:312 has been repealed by (BFS 2011:26).

5:313 has been repealed by (BFS 2011:26).

5:314 has been repealed by (BFS 2011:26)

5:315 have been repealed by (BFS 2011:26).

5:32 Access to escape route

5:321 General

Unless otherwise specified in Section 5:322, spaces where people are present other than occasionally shall be designed with access to at least two independent escape routes.

If the dwelling or premises have more than one floor, at least one escape route shall be provided on each floor. However, a small mezzanine floor may be designed without an exit to an escape route from the mezzanine floor provided that evacuation can still take place in a satisfactory manner. *(BFS 2011:26).*

General recommendation
Escape routes should be placed as far apart that escape can occur even if one escape route is blocked by fire. In order for escape routes to be considered as independent of each other, the distance between them should be at least 5 meters.
Examples of spaces where people are present other than occasionally are

- common spaces such as laundry rooms and hobby rooms in multi-dwelling blocks
- garages larger than 50 m^2
- sanitary rooms in occupancy classes 2 and 5.

Examples of spaces where people are temporarily present or are present other than occasionally are contained in Section 1:6.

One of the escape routes can be accessed through an adjacent fire compartment on the same floor if the escape route is accessible without a key or other implement. However, this does not apply if one of the escape routes consists only of windows or balconies, except for habitable rooms in occupancy class 3B. For places of assembly in occupancy classes 2B or 2C, the adjacent fire compartment should contain the main entrance. For occupancy class 5C, both escape routes can be accessible through a horizontal passage to adjacent premises in occupancy class 5C.

A corridor constructed as afire compartment, an access balcony or equivalent directly connected to the space it serves can – except for in places of assembly in occupancy classes 2B or 2C – represent a common part of the otherwise separate escape routes. Corridors like these should be separated into units of up to 60 meters in length. The separations should be designed in at least fire resistance class E 15 with doors in fire resistance class E 15-C.

When designing escape routes, small mezzanine floor refers to a floor within a fire compartment that forms a small part of the underlying floor that is not divided into smaller rooms, and that is only equipped with balustrades or equivalent. A small mezzanine floor represents up to 50 % of the floor area of the underlying floor, although no more than 25 m^2. Small mezzanine floors should be equipped with smoke alarm devices. *(BFS 2014:3).*

In a building of more than eight but not more than sixteen storeys, each dwelling and premises shall be designed to have access to at least one Tr2 stairway. In a building with more than sixteen storeys, each dwelling and premises shall be designed to have access to at least one Tr1 stairway. *(BFS 2011:26).*

General recommendation:
In buildings with more than sixteen storeys, other stairways should be at least Tr2. *(BFS 2011:26).*

5:322 Access to only one escape route

Doors directly to a secure location may be the only escape route from spaces on the ground floor for

1. spaces in occupancy class 1 if the means to escape may be considered satisfactory and where only a limited number of people are expected to be present.
2. smaller premises and dwellings in occupancy classes 2A, 3 4 and 5B, that are easily surveyable where a limited number of people are expected to be present. *(BFS 2014:3).*

General recommendation

What is meant in point 1 is that the walking distance to an escape route should be a maximum of 30 meters and that the number of people does not exceed 50.

What is meant in point 2 is premises and dwellings with a maximum walking distance of 15 meters to an escape route, where the escape route is visible from the main part of the premises or dwelling, and the number of people does not exceed 30. *(BFS 2014:3).*

If the conditions for satisfactory evacuation are met, a stairway Tr1 may be the only escape route from dwellings in occupancy class 3 and from premises in occupancy class 1.

If the conditions for satisfactory evacuation are in place, stairway Tr2 must be the only escape route in the premises in occupancy class 1 in buildings with a maximum of eight storeys and from dwellings in occupancy class 3 in buildings with a maximum of sixteen storeys. *(BFS 2011:26).*

General recommendation

Evacuation is assumed to be satisfactory if the walking distance to an escape route is not more than 30 meters and the number of people in each fire compartment does not exceed 50.

A stairway Tr1 can be the only escape route in buildings with up to sixteen storeys.

For habitable rooms in occupancy class 3B, the preconditions for satisfactory evacuation are met even if the escape route from the habitable rooms goes through a common space in another fire compartment. *(BFS 2014:3).*

5:3221 Ability to escape from spaces where people are only temporarily present

Spaces where people are only temporarily present shall be designed with access to at least one escape route. *(BFS 2014:3).*

General recommendation

The escape route may be accessible through adjacent fire compartment.

Walking distance to the escape route should not exceed 30 meters.

If there is access to at least two escape routes, walking distance may be calculated according to section 5:331 instead. *(BFS 2014:3).*

5:323 Escape through windows

Windows for escape shall be designed to ensure that the escape can be conducted in a satisfactory manner. *(BFS 2011:26).*

General recommendation

Windows designed for escape should be side-hung or pivoting on a vertical axis and possible to open without a key or similar. Windows that pivot on a horizontal axis can be used if they open outwards and stay in the open position. Windows should have a clear opening of at least 0.50 meters width and at least 0.60 meters high. For windows that pivot on a horizontal axis, the free dimension should be calculated under the lowest part of the window sash. The sum of the width and height should be at least 1.50 meters. The bottom of the windows opening should be no more than 1.2 meters above the floor. If the distance between the floor and the window's bottom edge exceeds 1.2 meters, a platform or similar should be mounted on the inside. *(BFS 2014:3).*

In spaces in occupancy class 1, schools in occupancy class 2A and dwellings in occupancy class 3, one of the escape routes may be replaced by access to a window. The window's lower edge must be

positioned no higher than 2.0 meters above the ground outside and the opportunity to escape must otherwise be provided in a satisfactory manner.

Evacuation from dwellings in occupancy class 3 in buildings Br2 and Br3 may also be in accordance with Section 5:353. *(BFS 2011:26).*

General recommendation
In spaces in occupancy class 1, schools in occupancy class 2A and dwellings in occupancy class 3, adequate evacuation through windows is expected to take place on any premises or dwelling designed for the evacuation of up to 50 people. Each window that is intended for evacuation should be considered as an escape route for up to 30 people. *(BFS 2011:26).*

Escape from windows with the help of the rescue services may be taken into account as one of the escape routes for buildings in occupancy classes 1 or 3, provided that no more than 15 people evacuate this way from the fire compartment. This requires that the rescue services have a sufficiently fast response time and capacity. Parking bays designed for the fire service equipment shall be provided. *(BFS 2011:26).*

General recommendation
The ability to escape from windows with the help of the rescue services should only be used in buildings where the opening's lower edge is located at most 23 meters above ground level.

In assessing the capacity of the rescue services and the design of parking bays, the factors that influence the ability to effectively carry out evacuation should be taken into account.

Rules for parking bays are contained in Section 5:721.

A sufficiently fast response time for the rescue services shall not normally exceed 10 minutes. For detached multi-dwelling blocks in occupancy class 3 with a maximum of three storeys, a sufficiently fast response time can be at most 20 minutes. Sufficient capacity refers to factors like staffing and equipment allowing evacuation to be conducted in a satisfactory manner.

Fire compartments in premises in occupancy class 1 that are expected to be evacuated with the help of the rescue services through windows should be no larger than 200 m^2.

Dwellings in occupancy class 3 in buildings in class Br1 whose upper floor is exclusively designed for escape through windows with the help of the rescue services should be separated from the underlying floor with a minimum of fire resistance class E 30. The separation does not have to be designed as a fire compartment boundaries. *(BFS 2011:26).*

5:33 Design of escape routes

5:331 Walking distance to an escape route

General recommendation
The walking distance to the nearest escape route or to another fire compartment should not exceed the distances in Table 5:331. The distance to an escape route should be measured to reflect the worst case scenario. An escape route is considered to be common as long as it does not have to branch to create separate escape routes.

In spaces, except in occupancy class 3B, that is protected by an automatic extinguishing system, the walking distance may be increased by one third.

In places of assembly in occupancy class 2C that is protected by an automatic water sprinkler system, the walking distance can be calculated in the same way as for places of assembly in occupancy class 2B.

If escape is made through windows, the permitted walking distance to the window should be reduced to one third.

When measuring the walking distance to an escape route the following is taken into account:

– The route should be measured by assuming that changes in direction when moving are at right angles, Figure 5.331a.

– If the path to two independent escape routes overlap or may coincide, the common path is calculated as two times the actual length. However, for dwellings in occupancy class 3, premises in occupancy class 1, and garages, the common section is only calculated as 1.5 times the actual length. These factors do not apply to a single escape route.

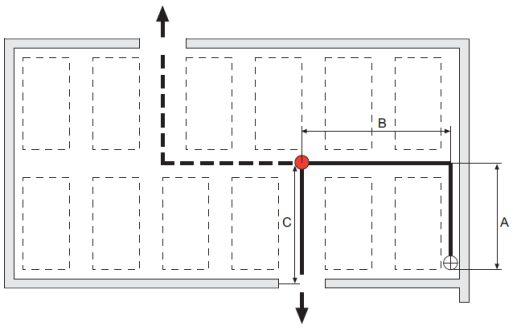
– If a stairway is part of the walkway of an escape route, the stairway is calculated to correspond to a horizontal walking distance that is four times the vertical distance. This does not apply to stairways to bleachers and steps in a place of assembly in occupancy class 2, where the actual walking distance of the stair slope is calculated instead. *(BFS 2013:14).*

Table 5:331 Maximum walking distance to the nearest escape route.

Preconditions	Example	Distance
If accessibility and surveyability are good and the fire load is at most 250 MJ/m^2, while the risk of fire breaking out is low. The occupancy is not associated with any risk of rapid fire spread.	Some premises in occupancy class 1.*	60 m
If the occupant load factor is low while those concerned can be expected for the most part to have good local knowledge.	In garages and certain premises in occupancy class 1 such as offices, warehouses, craftsman and industrial buildings. Dwellings in occupancy classes 3 and 5B.	45 m
If the occupant load is high, or those concerned cannot be expected to evacuate themselves, or cannot be expected to have good local knowledge, or if there is a risk of rapid fire spread.	Premises in occupancy classes 2A and 2B. Some premises in occupancy class 1, such as wood or plastic product factories and high bay storage facilities in industrial applications. Occupancy class 4. Premises in occupancy classes 5A, 5C and 5D.	30 m
If there is a particular risk of fire breaking out, or if a large number of people can be expected to be intoxicated.	Premises in occupancy class 6. Places of assembly in occupancy class 2C.	15 m

** See Boverket's general recommendations (2013:11) on fire load, BBRBE. (BFS 2013:14).*

Figure 5:331 a–b Calculation of walking distances to the nearest escape route.

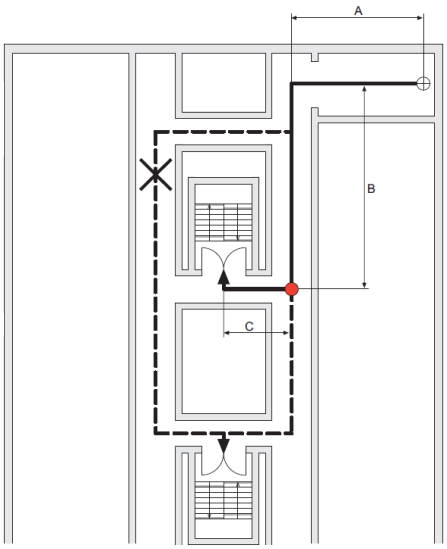


Calculating the walking distance G. if the actual walking distance cannot be determined in advance.

● = place where people must choose an escape route
⊕ = starting point for longest walking distance

G= 2* x (A + B) + C

* 1.5 for Vk1, Vk3 and garage



● = place where people must choose an escape route
⊕ = starting point for longest walking distance

Walking distance G to closest stairway. The calculation is made for the least favourable case = solid line.

G= 2* x (A + B) + C

* 1.5 for Vk1, Vk3 and garage

Examples, estimates of walking distances.

(BFS 2011:26).

5:332 Walking distances in an escape route

Escape routes shall be designed to ensure that the risk of people being trapped by fire and smoke is restricted. *(BFS 2011:26).*

General recommendation

Walking distance in an escape route to,

1. nearest stairway that leads to another floor, or
2. exit leading to a secure location

should not exceed 30 meters.

For escape routes where escape is only possible in one direction, the walking distance should not exceed the distances specified in Table 5:332.

When calculating the walking distance of an escape route, the factor for common walking distance does not need to be taken into account. *(BFS 2011:26).*

Table 5:332 Walking distances within certain escape routes

Occupancy	**Maximum walking distances where the escape option is only in one direction**
In stair lobbies, corridors or the equivalent for occupancy classes 1, 2, 3 or 5B	10 m
In exterior corridors in access balconies for occupancy classes 1, 3 or 5B in access balcony blocks	15 m
In stair lobbies, corridors or the equivalent in occupancy classes 4, 5A or 5C	7 m
All occupancy classes, if you can only move in the right direction, such as when the doors are only placed at each end of a corridor.	30 m

(BFS 2011:26).

5:333 Occupant load

General recommendation
The design of escape routes and the path to the escape route should be based on the maximum number of people likely to be in the premises. The distribution of people in the premises and how this may vary should be considered. Table 5:333 can be used to determine occupant load factors. *(BFS 2011:26).*

Table 5:333 Design for occupant load factor

Occupancy	Occupant load factor, people/m^2 net area
Occupancy class 1	
Offices	0.1
Occupancy class 2	
Library*	0.1
Dance hall	2.5
Classroom	0.5
Conference room*	0.7
Church	1.0
Shopping centre, department store, retail shop	0.5
Museum, art gallery	0.25
Pub, bar	3.0
Restaurant*	Number of seats or 1.0
Places of assembly for sitting only, but without fixed seats	1.7
Places of assembly for standing and sitting	2.5
Places of assembly with fixed seating	Number of seats

* For these activities, the net area can be determined minus the area for loose fittings.
(BFS 2011:26).

5:334 Design of escape routes

General recommendation
Escape routes should have a clear width of at least 0.90 meters. Handrails and the like may intrude a maximum of 0.10 meters per side of the escape route. Door openings should have a clear width of at least 0.80 meters. Rules for clear height in escape routes are contained in section 8:34.

When two or more escape routes combine into a common section in the building, the escape route from the common section should have a width, or equivalent capacity, that is at least equal to the sum of the widths of the escape routes that combine in the common space. This applies provided that the evacuation from the premises takes place at the same time, and that this requires a higher capacity compared to if evacuation takes place one room at a time.

The distance between a door and staircase or ramp should be at least 0.8 meters.

If any floor represents an individual fire compartment, a staircase that makes up an escape route should be designed for the floor that needs the widest escape route. If several floors simultaneously use the escape route, the width should be adjusted to ensure the staircase can handle the increased number of people.

Escalators should not be included in the way to, or of escape routes.

Spiral staircases should not be used as an escape route from premises in which people have difficulty climbing stairs, such as spaces in occupancy classes 5B and 5C. Spiral staircases should not be used as escape routes from places of assembly in occupancy classes 2B and 2C either.

Staircases with floor gratings should not be used for more than three floors.

Rules for the design of circulation spaces and ramps are contained in Section 3:142. *(BFS 2014:3).*

In premises designed for a large number of people, measures shall be taken to avoid a high occupant load at the exit and long waiting times. *(BFS 2011:26).*

General recommendation
Escape routes serving more than 150 people should have a clear width of at least 1.20 meters. The door leaf at the door width should encroach to a maximum of 0.050 meters. The total clear width of all escape routes should be at least 1.00 meters per 150 people. If one of the escape routes is blocked, the others should have a width whereby 1.00 meters corresponds to 300 people.

Places of assembly in occupancy classes 2B and 2C should have not less than three escape routes if they are intended for more than 600 people, and not less than four escape routes if they are intended for more than 1,000 people. *(BFS 2011:26).*

5:335 Doors

Doors to be used for evacuation shall open outwards in the escape direction and be readily identifiable as exits. Inward opening doors may only be used if queues are not expected to occur in front of the door. Other variations of doors may be used if they can provide an equivalent level of safety as side-hung doors. *(BFS 2011:26).*

General recommendation
The doors should be positioned to ensure when open, they do not prevent the escape of other people.

Queues are not expected to occur in

– dwellings in occupancy class 3 and residential rooms in occupancy class 4,

– premises designed for a maximum of 30 people and where people are aware of the environment such as classrooms in occupancy class 2A, small offices and engineering workshops in occupancy class 1 and entrance doors in residential buildings in occupancy class 3,

– premises for a maximum of 30 people and where people cannot be expected to have knowledge of the environment and where the walking distance to the escape route is no more than 15 meters, such as places of assembly in occupancy classes 1 or 2A, shops, bank premises and restaurant operations in occupancy class 2A.

Automated guided horizontal or vertical sliding doors can be used if they open even during power outages or if you can open them by pushing the door leaves outwards.

A manually operated horizontal sliding door may be used in the same situations as an inward-opening door. For those cases that the door requires some form of mechanical assistance to operate, this function must also be able to operate during a power outage.

Revolving doors can be used if the free passage with the minimum width specified in 5:334 can be achieved through automatic opening if there is a power outage or if it is possible to open the door by pushing the door leaves outwards. *(BFS 2011:26).*

Doors to be used for evacuation shall be easy to open and pass through. Exemptions are allowed for spaces in occupancy class 5D. *(BFS 2011:26).*

General recommendation

It should be possible to open doors with little previous knowledge of how to do this. Where necessary, it should be clear how the door can be opened. Locked doors with delayed opening should not be used.

It should be possible to open doors with a door handle that is pushed down, or by the door being pushed outwards. The opening fixture must be placed in the range between 0.80 to 1.20 meters above the floor. The maximum door opening force should be evaluated based on the type of opening device used.

– For handles, the vertical opening force should be less than 70 N. This applies, for example, to handles designed in accordance with SS-EN 179. The force required to push the door open should be less than 150 N,

– For push plates, the opening force should be less than 150 N. This applies, for example, to push plates designed in accordance with SS-EN 179,

– For larger opening devices, such as a full door leaf or automatic exit device, a greater opening force is accepted, however, no more than 220 N for the opening function and a maximum of 150 N for the continued opening of the door. This applies for example to automatic exit devices designed in accordance with SS-EN 1125.

A knob can be used to unlock an otherwise locked door in a room for up to 50 people. Knobs used to open the door which also operates the handle bolt should be avoided as these are difficult to use. If a cap that covers the knob is used, the cap should be designed to ensure it can be easily forced using one hand.

In some activities, apart from occupancy classes 2B and 2C, buttons with electric opening can be applied. In these cases, the button should be placed next to the door's ordinary handle and be large enough so that it is immediately apparent it is the opening button. The opening button should be located with its centre 0.80 to 1.20 meters above the floor. The button opening should be clearly marked with a sign that is at least 0.10 meters x 0.15 meters, and is illuminated when people are expected to use the door, that is even during evacuation. The sign should have a suitable shape, such as a stylized key, and the text "Emergency opening" or similar. It should be possible to open the door even during power outages.

It should be possible to open sliding doors with more than just electric push buttons.

Locked doors that only open by a signal from an automatic fire alarm should not be installed as evacuation may be necessary for reasons other than fire.

Premises, such as occupancy classes 1 and 2 where doors designed for evacuation are kept locked during certain hours, may have an electrical control ensuring all doors are unlocked during the time people are in the premises. In order that evacuation is conducted satisfactorily, this control should be coordinated with an essential function for operation, such as the main lighting. Power outages or other failures should not put this control out of order.

Doors within escape routes and doors for evacuation through other premises should be fitted with devices to enable people to return after passage. The same applies for doors to escape routes in occupancy classes 4, 5A, 5B and 5C except for guest rooms in occupancy class 4. Doors leading out to a secure location in the open do not need to be fitted with such a device except for in occupancy class 5A.

Rules for protection against slipping and tripping are contained in Section 8:22.

Rules for accessible and usable doors are contained in Section 3:143. *(BFS 2013:14).*

Doors to be used for evacuation that can only be opened with a key, may be used in spaces in occupancy classes 1 and 3 if the doors serve a small number of people likely to have access to the key. *(BFS 2011:26).*

General recommendation
A small number of people is considered to be no more than ten. *(BFS 2011:26).*

5:336 Evacuation place

Public buildings that shall be accessible and usable in accordance with Section 3:1 for people with limited mobility or orientation capacity shall be provided with at least two independent evacuation places. If the premises have more than one floor, at least one evacuation site shall be provided on each floor. If the premises specified in Section 5:322 only have a single escape route, the premises may be designed with only one evacuation site. The evacuation site shall be located in an adjacent fire compartment and be adjacent to, or in, the escape route. An evacuation site shall accommodate at least one small outdoor wheelchair.

An escape route that is accessible and usable, and that leads horizontally to a secure location does not require any evacuation place.

Public buildings that are fitted with an automatic fire suppression system do not require an evacuation place.

Additional requirements are specified in Section 5:352. *(BFS 2014:3).*

General recommendation
A small outdoor wheelchair occupies an area of 1.30 x 0.70 m^2.
The Swedish Work Environment Authority issues rules on evacuation sites. *(BFS 2014:3).*

5:337 Lifts

General recommendation
Rules on lifts and other lifting devices are contained in Section 3:144 and in Boverket´s provisions and recommendations on lifts and other motorised devices (BFS 2011:12), H.

Rules for evacuation lifts are contained in Boverket's general recommendations (2011:27), on the analytical design of a building's fire protection, BBRAD. *(BFS 2011:26).*

5:34 Fire safety installations

5:341 Exit signs

Exit signs refers to signs or similar that in the event of an evacuation provide guidance to ensure the evacuation is not hindered by difficulty navigating the building.

Exit signs shall be installed in areas that are difficult to navigate. Requirements exit signs are also contained in Sections 5:351, 5:352, 5:354 and 5:357. Where there are requirements for exit signs, lighting or backlighting of the exit signs shall have a guaranteed power supply equivalent to the emergency lighting specified in Section 5:343.

For those areas where requirements for exit signs apply, the signs or equivalent shall be fitted adjacent to the doors and windows that are intended for evacuation. Signs shall be designed as green discs with clear white symbols and shall be easily noticed. *(BFS 2011:26).*

General recommendation
Spaces that are difficult to navigate could be larger premises where it is not clear where the escape routes are located, or premises where there is no daylight, e.g. garages larger than 50 m^2 and basements. Examples of when it is not clear where escape routes are located could be an office where the premises are designed with parallel corridors within the fire compartment.

Signs should be located at changes in direction, branches or similar, such as in a staircase that continues past the floor where the evacuation in to the open is to take place. The signs should be placed to ensure that a person only needs to move a short distance to see a sign, see Figure 5:341a–c. Signs should be positioned to ensure it is clear where the escape routes are, for example, over a door opening or suspended from the ceiling.

Signs should be located in premises when evacuation takes place through a different fire compartment.

For signs to be easily noticed, these should consist of green discs with clear white symbols that are illuminated or backlit. Signs should be illuminated or backlit both in normal cases and during any power outages. Signs should be mounted in a fixture with the illumination source.

Signs should be of such a size and luminance that make them clearly visible from the location and lighting conditions in question and have exit signs designed in accordance with the Swedish Board of Occupational Safety and Health's rules for signs.

The path to the evacuation site and accessible and usable escape route that leads to a secure location should be supplemented with exit signs that contain a symbol for people with limited mobility.

The sign height (green field height) can be calculated using the following formula:

Height [m] = Field of view [m]/Constant

It is assumed that the sign width is greater than its height. The constant has the following values:

- Illuminated sign: 100
- Backlit sign: 200

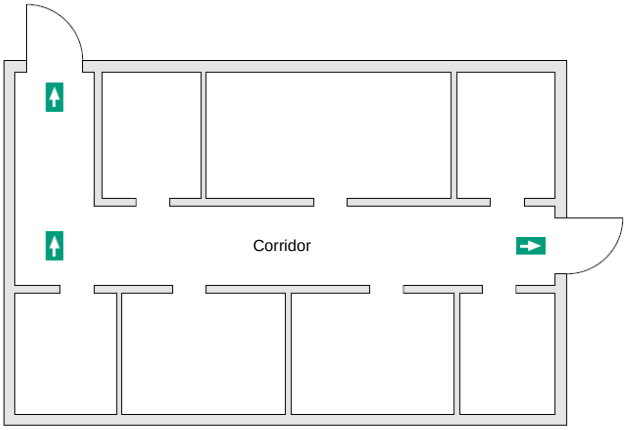
The minimum sign height should be 0.10 meters. In places of assembly in occupancy classes 2B and 2C, such as department stores and larger shops, the minimum sign height should be 0.20 meters.

The luminance of a sign should be adjusted to ensure the sign is clearly visible in the premises it is used in. For backlit signs in premises such as offices and schools, 80 cd/m^2 at the worst lit part of the white surfaces, equivalent to around at least 11 cd/m^2 at the worst lit part of the green surface, may constitute a basis for assessment. The value applies if the lighting intensity in the room is between 500–1 500 lux. A higher luminance may be justified in rooms with daylight where the lighting intensity may be higher. A guideline could be that the contrast between the surroundings and the sign's average luminance may be around 1:20 for well-lit rooms.

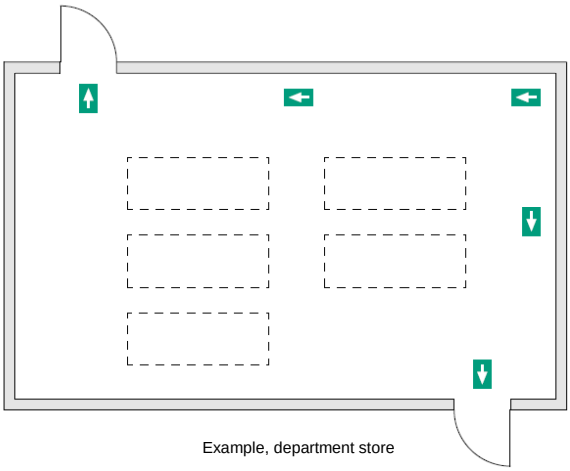
In dark parts of a building, a lower luminance for the sign may still provide the equivalent guidance. The luminance of signs can be suppressed to a minimum of 2 cd/m^2 when the lighting in the room is low, for example in a theatre or cinema during a performance. The limit value of 2 cd/m^2 applies to the worst lit part of the sign, usually on the green surface. The lighting intensity should return to the normal level upon activation of the evacuation alarm and when the lighting in the premises turns on. The signs should otherwise follow the recommendation in SS-EN 1838 for evacuation signs.

Rules on the design of signs in the workplace are available from the Swedish Work Environment Authority. (BFS 2011:26).

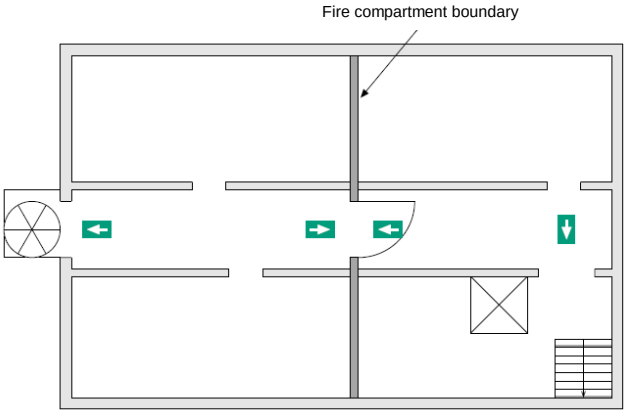
Figure 5:341a–c Examples of the placement of exit signs in offices and department stores.



Example, hotel



Example, department store



Example, evacuation across another fire compartment

(BFS 2011:26).

5:342 General lighting

Escape routes shall be provided with general lighting that work with satisfactory functionality. *(BFS 2011:26).*

General recommendation

In buildings with more than two storeys, two successive points of light in stairways and corridors should not be extinguished as a result of the same fault. This can be remedied, for example, by connecting them to different group fuses and residual current devices.

The lighting intensity should on average not be less than 100 lux in the escape route.

Electric cables for lighting in Tr1 or Tr2 stairways, and associated corridors and similar spaces, should be protected from the direct action of fire for not less than 30 minutes in those parts of the building which are served by the stairway. *(BFS 2011:26).*

5:343 Emergency lighting

The building or part of the building where emergency lighting is stipulated, the lighting shall enable evacuation even in the event of power outages.

In case of fire, the emergency lighting shall fulfil its role in the parts of the building that are not in the immediate vicinity of the fire. In the event of power outages the emergency lighting shall provide the intended illumination for not less than 60 minutes.

Emergency lighting shall also be provided in all stairways which are used as escape routes in buildings of more than eight storeys.

Requirements for emergency lighting are also contained in Sections 5:352, 5:353, 5:354, 5:355 5:356 and 5:357. *(BFS 2016:6).*

General recommendation

Power outages also include those caused by fire. Emergency lighting can be designed in accordance with the recommendation for lighting in escape routes in SS-EN 1838.

The lighting intensity should not be less than 1 lux along the centre line of the escape route. To reduce the risk of falls, the lighting intensity on stairs should be at least 5 lux along the walking line.

The emergency lighting should reach 50 % of the required lighting intensity within 5 seconds and the lighting level required within 60 seconds.

Electric cables for emergency lighting should be run in a separate construction to fire resistance class EI 30 or should have the corresponding fire resistance. Emergency lighting should not go out in parts of the building other than the fire compartment where the fire is located if the cables are affected by the fire. *(BFS 2011:26).*

5:35 Specific requirements for the various occupancy classes

5:351 Occupancy class 2A

Premises in occupancy class 2A shall be provided with exit signs. Smaller premises that are easily surveyable may be designed without the need for exit signs. *(BFS 2011:26).*

General recommendation

Premises can be designed without exit signs if the walking distance to the escape route is not more than 15 meters and the escape routes are visible from the main part of the premises. *(BFS 2011:26).*

5:352 Occupancy classes 2B and 2C

Escape routes from places of assembly shall be designed for the maximum number of people who are permitted to be present in the premises. *(BFS 2011:26).*

General recommendation
In places of assembly or in the anterooms of these there should be signs stating the maximum number of people who are permitted to be in the premises at the same time.

The design of evacuation places should be at least 1 % of the maximum number of people in the premises. Evacuation places should accommodate the same number of small outdoor wheelchairs as the number of people expected to be in need of the evacuation place. Evacuation places should be designed to ensure that together they can accommodate those who are in need of evacuation sites given that one of the evacuation sites may be blocked by fire.

Rules for accessible and usable doors are contained in Section 3:143.

Seating in a place of assembly should be arranged in one or more rows with connected seats, to ensure evacuation can be conducted easily.

Seat rows should be no wider than 40 seats if the evacuation can take place in two directions, otherwise no wider than 10 seats. The clear passage dimension in front of a row to the next row, should be at least 0.45 meters. Chairs in an auditorium, theatre, cinema or equivalent should be attached to the floor. *(BFS 2014:3).*

It shall be possible to open doors in, or to, the escape route by pushing the door or using an easily operated handle. *(BFS 2011:26).*

General recommendation
It shall be possible to open doors for evacuation of places of assembly by pushing outwards, or by pressing down a door handle. This manoeuvre should be possible by hand. The manoeuvre should also open both door leaves double leafed doors are used. If both door leaves cannot be opened by such a manoeuvre, the passive door half should be provided with fittings in accordance with SS-EN 1125.

Doors for evacuation should be designed with simple handles such as the fittings specified in SS-EN 179. Doors in places of assembly intended for more than 1,000 people should be designed with fittings in accordance with SS-EN 1125. *(BFS 2011:26).*

Places of assembly shall be provided with devices for warning in case of fire and where necessary devices for early detection of fire. *(BFS 2011:26).*

General recommendation
Places of assembly should be fitted with evacuation alarms. Evacuation alarms in places of assembly in occupancy class 2C should be activated with automatic fire alarms and also be possible to activate manually. Places of assembly in occupancy class 2B may only be fitted with manually activated evacuation alarms.

Spoken announcements should be used as evacuation alarms as they typically provide quick initiation of evacuation from the building. More basic evacuation alarms, such as bells or sirens, can be used in places of assembly in occupancy class 2B that are designed for up to 300 people or that contain a cinema, theatre, auditorium or similar.

In places of assembly that can be expected to have weak or no lighting, the lighting should turn on automatically when the evacuation alarm is activated. In places of assembly with high ambient noise, music and the like should be turned off automatically when the evacuation alarm is activated. *(BFS 2011:26).*

Places of assembly shall be provided with exit signs for evacuation.

Places of assembly shall be provided with general lighting and emergency lighting. Escape routes from places of assembly shall be fitted with emergency lighting. Emergency lighting shall be provided outside adjacent to the exits.

External escape routes from places of assembly shall be lit and provided with emergency lighting along their entire length. (*BFS 2011:26*).

General recommendation
Staircases in places of assembly should be illuminated by emergency lighting. The lighting intensity should be at least 5 lux in staircases. *(BFS 2011:26).*

5:353 Occupancy class 3

Dwellings in occupancy class 3 shall be fitted with devices for early detection and warning in case of fire. It shall be possible to perceive the signal where people are present other than occasionally.

Path to an escape route in common spaces in occupancy class 3B shall be provided with emergency lighting. *(BFS 2014:3)*

General recommendation

In occupancy class 3A, devices for early detection and warning in case of fire should be smoke alarm devices.

Devices for early detection and warning in case of fire should be evacuation alarms activated with automatic fire alarms in occupancy class 3B. *(BFS 2014:3).*

Habitable rooms in occupancy class 3 that are present in buildings in building class Br2 or Br3 shall be able to be evacuated without assistance from the rescue services. *(BFS 2011:26).*

General recommendation

Escape routes from habitable rooms in occupancy class 3A can be arranged in accordance with one of the following options:

a) Exit to an escape route e.g. stairs outside the dwelling or directly to a secure location.

b) Exit to an exterior stairway or fixed ladder designed in accordance with SS 831340 that leads to a secure location.

c) Openable window with the opening lower edge up to 5.0 meters above ground level.

d) Through another nearby room on the same floor that meets what is stated in a), b) or c) in the first paragraph. Option d) only applies if the adjacent room is separated from, or can be easily separated from the underlying floor.

Evacuation from a habitable room in occupancy class 3B can be arranged in accordance with one of the following options:

a) With an exit to an escape route, e.g. stairs outside the dwelling.

b) Directly to a secure location.

c) Through another nearby room that has an exit to an escape route.

d) Through windows according to section 5:323. *(BFS 2014:3).*

5:354Occupancy class 4

Spaces in occupancy class 4 shall be fitted with devices for early detection and warning in case of fire. *(BFS 2011:26).*

General recommendation

In buildings designed for at least nine people, or with at least five guest rooms, the spaces in occupancy class 4 should be provided with evacuation alarms that can be activated manually and with automatic fire alarms. Buildings in occupancy class 4 with ground floor only that has an exit directly to the open from every guest room can instead be provided with smoke alarm devices and manually activated evacuation alarms. Manual call points should be fitted on every floor and be placed in readily accessible positions and in the reception.

Buildings designed for fewer than nine people and with fewer than five guest rooms should be fitted with smoke alarm devices. Smoke alarm devices should be placed in each guest room. *(BFS 2013:14).*

Spaces in occupancy class 4 shall be provided with exit signs for evacuation. Escape routes shall be fitted with emergency lighting. An evacuation plan shall be posted in every guest room. *(BFS 2011:26).*

General recommendation

The evacuation plan should be placed right next to the door to the escape route. The evacuation plan should describe the significance and nature of the evacuation alarm, what the hotel guests are expected to do and be supplemented with a drawing that shows the building's escape routes. In

buildings with at least nine people, or at least five guest rooms, the evacuation plan should be designed in accordance with SS 2875. *(BFS 2011:26).*

5:3541 ***has been repealed by (BFS 2011:26).***

5:3542 ***has been repealed by (BFS 2011:26).***

5:3543 ***has been repealed by (BFS 2011:26).***

5:355 Occupancy class 5A

Spaces in occupancy class 5A shall be fitted with devices for early detection and warning in case of fire.

Escape routes and spaces in occupancy class 5A intended to be used during night time shall be provided with emergency lighting. *(BFS 2016:6).*

General recommendation
Devices for early detection and warning in case of fire can be smoke alarm devices. Smoke alarm devices should be positioned to ensure they cover the entire area of occupancy. Each fire detector can be expected to have a coverage of up to 60 m^2.

For pre-schools conducted during night time, devices for early detection and warning in case of fire should be made up of evacuation alarms activated with automatic fire alarms. *(BFS 2016:6)*

5:356 Occupancy class 5B

Spaces in occupancy class 5B shall be fitted with devices for early detection and warning in case of fire.

Escape routes from spaces in occupancy class 5B shall be provided with emergency lighting. *(BFS 2011:26).*

General recommendation
Devices for early detection and warning in case of fire should be made up of evacuation alarms that can be activated manually and by automatic fire alarms. The evacuation alarm should in general be adapted to the preconditions for human intervention and the health of the residents. For example, this could mean the use of vibration alarms, light signals or sirens designed for people with limited hearing. *(BFS 2011:26).*

5:357 Occupancy class 5C

Spaces in occupancy class 5C shall be fitted with devices for early detection in case of fire.

Paths to escape routes may pass through adjacent fire compartments. Passage between fire compartments shall be made without the smoke spreading to the section not exposed to the fire.

Escape routes from spaces in occupancy class 5C shall be provided with emergency lighting.

Guidance marking shall be in place in buildings in occupancy class 5C. *(BFS 2011:26).*

General recommendation
Devices for early detection in case of fire should be made up of an automatic fire alarms.

Lobbies should be in place to allow passage between the fire compartments. *(BFS 2011:26).*

5:358 Separated meeting rooms, etc.

General recommendation
In a room in occupancy classes 1, 2A, 2B and 5C, where people may be behind closed doors, which are positioned so that the escape route can only be reached by passing through the corridor or other space, there is a risk of them being trapped by a fire. To achieve the requirement for satisfactory evacuation, evacuation alarms that are activated by automatic fire alarms should be installed if:

– the room holds more than 30 people, or
– the room holds more than ten people, and the walking distance to the nearest escape route exceed 10 meters.

The requirement does not apply to spaces where people are located only temporarily. *(BFS 2011:26).*

5:36 has been repealed by (BFS 2011:26).

5:361 has been repealed by (BFS 2011:26).

5:37 has been repealed by (BFS 2011:26).

5:371 has been repealed by (BFS 2011:26).

5:3711 ***has been repealed by (BFS 2011:26).***

5:3712 ***has been repealed by (BFS 2011:26).***

5:372 has been repealed by (BFS 2011:26).

5:373 has been repealed by (BFS 2011:26).

5:374 has been repealed by (BFS 2011:26).

5:3741 ***has been repealed by (BFS 2011:26).***

5:375 has been repealed by (BFS 2011:26).

5:4 Protection against the outbreak of fire

5:41 General

Buildings and fixed installations shall be designed with adequate protection against the outbreak of fire.

The temperature on the surface of adjacent structural elements and fixtures of combustible material may not be high enough to ignite the material. *(BFS 2011:26).*

General recommendation

Adequate protection against the outbreak of fire can be achieved by securing that high temperatures, radiant heat and sparks do not cause ignition in adjacent structural elements or fixtures.

Structural elements and fixed installations should be designed to ensure the properties that are necessary are not degraded with respect to the temperature they can be expected to be exposed to. Examples of such properties could be the isolation capability or protection against ignition.

The requirement in the provision's second paragraph is satisfied if the temperature of the surface of the adjacent structural elements and fixtures of combustible materials does not exceed 85°C. Other temperature criteria can be used if the material properties are well known and documented.

The design should take into account that the temperature may increase with long-term continuous use or if the fixed installation is concealed in the building construction. When installation components are clad, materials that maybe heated to temperatures exceeding have a temperature higher than 85°C if it is concealed, should be at least A2-s1, d0.

Fixed electrical installations are regulated by the Swedish Electrical Safety Board. *(BFS 2011:26).*

5:42 Heating devices etc.

5:421 General

Heating devices, apart from those specified in Section 5:41, shall be designed to ensure protection to restrict other dangers. *(BFS 2011:26).*

General recommendation
Examples of heating devices can be heat-producing appliances, stoves, sauna heaters, heating panels and similar.

Other dangers refer to chimney fires, incomplete combustion and flue gas leakage from heat-producing appliances, burners, heating installations and flues. *(BFS 2011:26)*

Heat-producing appliances connected to the chimney or flue shall be designed to ensure the system is a safe and well-functioning unit. *(BFS 2011:26).*

General recommendation
Selection of the chimney and flue should be made taking into account the properties of the heat-producing appliance, such as the temperature of the flue or exhaust gases. Consideration should also be taken to the influence of continuous firing over a long period which may affect the resistance of the flue duct.

Rules for emissions into the surroundings are contained in Section 6:7. *(BFS 2011:26).*

5:422 Heat-producing appliances

5:4221 General

General recommendation
Heat-producing appliances and connecting ducts can satisfy the requirement under Section 5:41 protection against thermal effects by having the required safety distances, protection from radiation or a combination of both.

Heat-producing appliances should supply a sufficient amount of combustion air to ensure combustion does not occur with an unchecked shortage of air.

The required safety distance depends on the radiating surface area, temperature and emissivity. The determination of the required distance can be made as follows:

1. For an uninsulated and non-water jacketed heat-producing appliance or an uninsulated flue, the required safety distance to a combustible structural element can be set to at least 0.5 meters.
2. Combustible structural elements can be protected by radiation protection using material of at least fire resistance class A2-s1, d0, and with a sufficient scope horizontally and vertically and be placed at a distance to combustible structural elements or to the heat-producing appliance.
3. For heat-producing appliances, depending on the type, the required safety distance can be verified using SS-EN 13229 or SS-EN 13240.

Guidance for the verification of chimneys is given in SS-EN 15287-1 or SS-EN 15287-2. *(BFS 2011:26).*

5:4222 Loads

Heat-producing appliances and flues shall have sufficient strength to absorb any occurring loads. Heat-producing appliances, burners, and similar shall be placed on a base of sufficient load-bearing capacity. Bases and foundations shall be designed to ensure that fire spread downwards is limited and that leaks due to subsidence do not occur in connected ducts and pipelines. *(BFS 2011:26).*

General recommendation
The foundation for heat-producing appliances should be designed in a minimum fire resistance class R60 except in single-family houses. Single-family houses should be designed at a minimum of fire resistance class R15. *(BFS 2011:26).*

5:4223 Hearths

Heat-producing appliances fired by solid or liquid fuel shall be fitted with protection against fire spread downwards to prevent the ignition of the floor due to spills, embers or sparks.

General recommendation

Protection against fire spread downwards is satisfied if the flooring or hearth is designed in at least fire resistance class A2-s1, d0.

If there is a clear space below the heat-producing appliance or the bottom of the appliance, the hearth should also cover this space.

The hearth for boilers fired by solid fuel should be at least 2 meters in front of the side with a fireplace opening and at least 1 meter away from the other parts. For smaller, enclosed heat-producing appliances, the hearth should extend at least 0.3 meters in front of the appliance and at least 0.1 meters on either side of the appliance or extend a minimum of 0.2 meters on either side of the opening. For large, enclosed heat-producing appliances (such as tiled stoves), however, the lateral scope can be restricted to the appliance opening's width by extending at least 0.2 meters on each side of the opening. For open heat-producing appliances, the hearth should be arranged to ensure the horizontal distance from the centre of the rear part of the source of the fire to unprotected combustible floor is at least 1.0 meters. From a large open hearth fireplace, the hearth should also extend at least 0.3 meters in front of the appliance. If the bottom of the appliance is higher than 0.4 meters above the floor, the distance should be increased by one half of the vertical distance in excess of this figure.

Hearths for smaller heat-producing appliances in spaces in occupancy class 3 may consist of 0.7 mm sheet steel. However, sheet steel should be used for the part of the hearth which is situated below the heat-producing appliance only if there is not less than 50 mm clear ventilated space between the appliance and the hearth and if temperature conditions otherwise permit.

For other activities, hearths can be composed of at least 50 mm concrete, brick or other materials that meet the requirement for A2-s1, d0 and isolating function EI 30. *(BFS 2013:14).*

5:423 Ash containers

In buildings other than single-family houses, a space for the storage of soot and ash, in which the ash can be stored in a secure manner, shall be provided adjacent to a separate boiler room with a heat-producing appliance for solid or liquid fuel. A secure manner means that the space shall be separated to ensure that ash or other burning material cannot ignite or cause pyrolysis in or at the ash tray. *(BFS 2011:26).*

General recommendation

The space may consist of a separate room or a space outdoors.

The space should be designed so that the ash can be expected to have temperatures of up to 200°C and an energy content equivalent to 4 MJ/kg.

The space may meet the provision through isolation in fire resistance class EI 15 with doors or access panels in the minimum fire resistance class EI 15-C. The material in the separation should be at least class A2-s1, d0. *(BFS 2011:26).*

5:424 Burners

A burner shall be designed with adequate safety against fire and against the spread of fire to the fuel magazine. *(BFS 2011:26).*

General recommendation

The burner should be fitted with at least two independent systems to prevent fire from spreading back through the burner to the fuel magazine. *(BFS 2011:26).*

5:425 Chimneys

5:4251 General

Chimneys and flues shall be positioned and designed to ensure adjacent structural elements and fixed installations cannot ignite.

Chimneys and flues, including insulation and the surrounding duct, must not reach a surface temperature on the outside that exceeds 100 °C when the connected device is operated at the highest rating. However, within the room where the heat-producing appliance is placed, higher surface temperature can exist. *(BFS 2014:3).*

General recommendation
The design of chimneys can be verified in accordance with SS-EN 1443 and SS-EN 15287-1 or SS-EN 15287-2.
Rules for protection against burns are contained in section 8:4. *(BFS 2014:3).*

Flues shall be designed with regard to throughput. The cross-section area of a duct, which acts through natural draft, shall be designed with consideration taken to the heat-producing appliance that the duct shall be connected to, the heat output of the appliance, the fuel that will be used and the duct height. *(BFS 2011:26).*

General recommendation
The cross section of the flue for a heat-producing appliance can be calculated in accordance with SS-EN 13384-1.
Verification can be made through the standard series SS-EN 13384-1, SS-EN 13384-2 or SS-EN 13384-3. *(BFS 2011:26).*

5:4252 Loads

When designing the chimney's dead weight, the external load and temperature influence on the construction material properties shall be considered. *(BFS 2011:26).*

General recommendation
The external load on a chimney can be caused by wind and snow loads and the dynamic action of wind. Wind effects can be considered with the load 1.5 kN/m^2. *(BFS 2011:26).*

5:4253 Height

Chimneys and flues shall be high enough to restrict the risk of fire. The design shall be made with consideration to the connected heat-producing appliances and burners and type of fuel. *(BFS 2011:26).*

General recommendation
Rules for chimney heights are also contained in Section 6:743. *(BFS 2011:26).*

5:4254 Vertical direction

The deviation of chimneys and flues from the vertical direction must not affect fire safety or chimney function. *(BFS 2011:26).*

General recommendation
Flues should be designed to ensure the effect of thermal motion is taken into account. *(BFS 2011:26).*

5:4255 Material properties and durability

Walls in chimneys and flues shall be designed to ensure their function is not compromised. In particular, temperature fluctuations, climatic conditions, corrosive flue gases, moisture, and the use of cleaning tools shall be taken into account.

Lining tubes shall be designed to ensure neither the tube nor the adjoining structural elements are likely to be damaged. *(BFS 2011:26).*

General recommendation
The appropriate material grades are indicated in SS-EN 15287-1, Annexes A, D and E and SS-EN 15287-2, Annexes A, D and E. If a lining tube is installed in the flue it should run for the full length.

The risk of moisture and corrosion in the flue should be considered with respect to fuel and flue gas temperature. Under corrosive conditions, corrosion resistant materials should be used. Corrosive conditions are such that the flue gas temperature in the flue is below the acid dew-point and the sulphur content is above 0.1 %, or contains chlorides.

Chimneys and flues should be frost resistant. *(BFS 2011:26).*

5:4256 Airtightness

Chimneys and flues shall be tight enough to prevent fire hazards, the risk of poisoning or other problems from arising. *(BFS 2011:26).*

General recommendation
The airtightness can be checked with a leak meter or by a pressurised smoke test.

The airtightness requirement can be met with a design as specified in the gas tightness classes in Table 5 of SS-EN 1443 Section 6.4.1. When calculating air leakage, the area after the flue's inner surface is included. The tightness of joints can be achieved through temperature-resistant seals that remain stable over time.

A smoke pressure test should be conducted to ensure the airtightness of the entire chimney or flue is examined. *(BFS 2011:26).*

5:4257 Chimney fire

Flues that connect to heat-producing appliances intended for soot generating fuels shall be designed with adequate protection against the development of fire due to a chimney fire. *(BFS 2011:26).*

General recommendation
The requirement can be met with flues that retain their properties after a chimney fire or by flues being enclosed by a chimney shaft. Access panels, connections and other installations that are part of the flue are also subject to the requirement.

Flues in fire resistance class G(x) with the required protective distance x to combustible materials can be designed without chimney shafts. The chimney's airtightness after the chimney fire test should meet the requirements for gas tightness in accordance with 5:4256.

The chimney shaft should be designed in a material that does not contribute to a fire progression and that maintains a fire resistant isolating function in relation to other spaces. The chimney shaft that encloses flues can be designed in materials of A2-s1, d0 and with shaft walls in at least fire resistance class EI 60 except in single-family houses where the shaft walls can be designed in at least fire resistance class EI 15. Chimney shafts designed in this way meet the requirement for protection against chimney fires.

Rules for protection against burns are contained in Section 8:4. *(BFS 2011:26).*

5:426 Connection to flues

Exhaust and flue gases from fixed installations shall not cause increased fire danger, increased risk of poisoning or other problems.

Exhaust gases shall be discharged through the flue. Flue gases shall be discharged through the flue.

Fixed installations for gaseous or liquid fuel need not be connected to the flue, if they are installed in a space where the ventilation is adequate, and in where combustion does not give rise to an increased fire risk, increased risk of poisoning or other problems. *(BFS 2014:3).*

General recommendation
Fixed installations refers to items like heating devices and stoves.

Heat-producing appliances for solid or liquid fuel should be connected to a flue. Heat-producing appliances for gas should be connected to a flue.

The function of the flues can be calculated and verified in accordance with SS-EN 13384-1. Gas appliances should be connected to a flue if the combustion intentionally takes place with a shortage of air or a soot-producing flame.

That combustion does not lead to an increased fire hazard or increased risk of poisoning is dependent on the amount of combustion products and their properties.

Fixed installations for gaseous or liquid fuel with a rated output not exceeding 12 kW that are installed in a space whose volume is greater than 7 m^3 can be designed without connection to a flue.

Rules for air are also given in Section 6:2. *(BFS 2014:3).*

Flues that connect to more than one heat-producing appliance shall be designed to ensure that fire hazards or other problems do not increase. *(BFS 2011:26).*

General recommendation
When multiple heat-producing appliances are connected to the same flue the following risks should be taken into account: condensation, the spread of fire, incoming smoke via a heat-producing appliance not in use, and the function of the heat-producing appliances when used simultaneously. This also applies to flues from fuel-driven motors. The function of the flues that connect to more than one heat-producing appliance can be calculated and verified in accordance with SS-EN 13384-2.

Heat-producing appliances in boiler rooms can be connected to the same flue under the conditions that apply for the flue in accordance with maximum temperature, rated power, and flue gases that can be discharged from the building in a reliable way. *(BFS 2011:26).*

5:427 Separate boiler room

General recommendation:
A boiler or multiple boilers with a total nominal power above 60 kW should be installed in separate boiler rooms. Separate boiler rooms should only be connected to escape routes from dwellings in occupancy class 3 through a lobby, the same applies to offices in occupancy class 1 that are not an integral part of an industrial occupancy or the like. *(BFS 2013:14).*

5:428 Cleaning and inspection

Heat-producing appliances and flues shall be accessible for cleaning, checking and inspection without any problem. Cleaning hatches shall be designed in materials that cannot be ignited and that can withstand temperature fluctuations and corrosion. *(BFS 2011:26).*

General recommendation
The combustion chamber, ash pit and flues should be accessible for cleaning with common chimney-sweeping tools.

Cleaning hatches should fit tightly and be designed in materials of at least class A2-s1, d0. Where necessary, cleaning hatches are bolted to ensure that they do not open where positive pressure occurs in the duct.

Cleaning hatches should not be installed in any spaces where people are present other than occasionally or in garages. If cleaning hatches are placed in rooms where people are present other than occasionally or where explosive gases may be formed, airtightness, surface temperature, protection against unintentional opening and child safety should all be addressed.

Rules for utility rooms are also contained in Section 3:4. *(BFS 2011:26).*

5:43 Food preparation appliances

A stove or other food preparation appliances shall be placed to ensure a protection against the outbreak of fire.

General recommendations
Adequate protection against the outbreak of fire can be achieved through a vertical safety distance, measured from the top of an electric stove to combustible materials or a hood, that is at least 0,5 meters.

For gas stoves the distance should be at least 0,65 meters. *(BFS2011:26)*

5:431 has been repealed by (BFS 2011:26).

5:432 has been repealed by (BFS 2011:26).

5:433 has been repealed by (BFS 2011:26).

5:434 has been repealed by (BFS 2011:26).

5:435 has been repealed by (BFS 2011:26).

5:436 has been repealed by (BFS 2011:26).

5:437 has been repealed by (BFS 2011:26).

5:44 Garages

Garages shall be designed to ensure the risk of fire or explosion is limited due to the presence of flammable or explosive gases. *(BFS 2011:26).*

General recommendation
Heating in garages should not be provided by a naked flame, naked heating element or any other device that may cause fire or an explosion.

Cleaning hatches in garages should be designed to ensure they are tight and that the temperature in the hatches is limited. *(BFS 2011:26).*

5:45 has been repealed by (BFS 2011:26).

5:451 has been repealed by (BFS 2011:26).

5:452 has been repealed by (BFS 2011:26).

5:5 Protection against the development and spread of fire and smoke in buildings

5:51 General

General recommendation
Fire-resistant coatings and linings, fire cells, fire compartmentation, fire resistant installations are examples of protective measures that can restrict the development and spread of fire and smoke in a building. *(BFS 2011:26).*

5:511 has been repealed by (BFS 2011:26).

5:512 has been repealed by (BFS 2011:26).

5:513 has been repealed by (BFS 2011:26).

5:514 has been repealed by (BFS 2011:26).

5:515 has been repealed by (BFS 2011:26).

5:52 Materials, surface finishes and claddings

5:521 Walls, ceilings, floors and fixtures

Materials for roofs, walls, floors and fixtures shall have the necessary properties or be part of the structural elements in such a way that they:

- are difficult to ignite,
- do not contribute to rapid fire spread,
- do not quickly develop large amounts of heat or smoke,
- do not deform following low fire effects meaning danger may arise,
- do not collapse or are otherwise altered meaning the risk of injury increases,
- do not melt and drip outside the immediate vicinity of the fireplace.

The stipulated class of performance for the material depends on the quantity of heat and smoke which can be permitted to develop in the building. *(BFS 2011:26).*

General recommendation

Materials with a fire resistance class lower than D-s2,d0 should be protected from fire impact during the fire's early stage to ensure the same fire protection achieved by surface finishes in fire resistance class D-s2,d0. For dwellings in occupancy class 3 and premises and dwellings in occupancy classes 4 and 5, materials in structural elements should be protected by a lining in fire resistance class K210/B-s1. Examples of materials to be protected include combustible insulation, sheet material or the like in a fire resistance class lower than D-s2,d0.

Except for escape routes and special premises in Sections 5:522 and 5:523, the following surface finishes should be selected:

- In buildings in building class Br1, ceilings should have surface finishes of fire resistance class B-s1,d0, attached to material of A2-s1,d0 or clad in fire resistance class $K_2$10/B-s1,d0. Wall surfaces should have surface finishes of at least fire resistance class C-s2,d0.
- In buildings in building class Br2, ceilings should have surface finishes of at least fire resistance class C-s2,d0, attached to material of A2-s1,d0 or clad in fire resistance class K210/B-s1,d0. Wall surfaces should have surface finishes of at least fire resistance class D-s2,d0.
- In buildings in building class Br3, ceiling and wall surfaces should have a surface finish of at least fire resistance class D-s2,d0.
- In tent structures with a single finish of fabric material, in occupancy classes 1 and 2A, the ceiling and wall surfaces should have a surface finish of at least fire resistance class E.

For smaller structural elements, the surface finish can be designed in a lower fire resistance class, although at least fire resistance class D-s2,d0. Smaller structural elements are consistent with structural elements whose total surrounding area is less than 20 % of the connecting ceiling or wall. Examples of these smaller structural elements could be door leaves, door and window frames, ceiling and floor mouldings, and beams. However, this does not apply to pipe insulation.

The same applies to rooms in those cases where the surface finish does not affect the evacuation from the building. The same applies to pipe insulation in rooms of this type. These rooms may be smaller rooms up to 15 m^2, for example, sanitary rooms or saunas. Lift cars can be designed with a surface finish of fire resistance class D-s2,d0 if the lift shaft is placed in its own fire compartment. *(BFS 2014:3).*

5:522 Walls and ceilings in escape routes

For escape routes, walls and ceilings shall be constructed to ensure the development of fire in the premises does not develop with the help from the surface finish of ceilings and walls.

General recommendation

In buildings of class Br1 and Br2, ceiling surfaces and internal wall surfaces in escape routes should have a surface finish of at least fire resistance class B-s1,d0. The surface finish should be attached to the material in fire resistance class A2-s1,d0 or on cladding of at least fire resistance class K210/B-s1,d0.

In buildings of class Br3, ceiling surfaces and internal wall surfaces should have a surface finish as follows:

a) Escape routes in occupancy classes 4 and 5A should have a surface finish of class B-s1,d0 on ceiling surfaces and at least class C-s2,d0 on internal wall surfaces. The surface finishes should be attached to material of A2-s1,d0 or on cladding in class K210/B-s1,d0.

b) Escape routes which are common to two or more dwellings or office apartments should have a surface finish of class B-s1,d0 on ceiling surfaces and not less than class C-s2,d0 on internal wall surfaces.

c) Escape routes from premises in occupancy class 6 should have ceiling and wall surfaces with a surface finish of class B-s1,d0 attached to material of A2-s1,d0 or cladding in class K210/B-s1,d0. *(BFS 2013:14).*

5:523 Special premises

Ceilings and walls in

- places of assembly in occupancy classes 2B and 2C,
- premises in occupancy class 5A and 5C,
- premises in occupancy class 6,
- separate boiler rooms,
- protected lobbies,
- larger garages that do not belong to single-family houses and
- catering kitchens

shall be designed to ensure their surface finishes can only give a negligible contribution to the development of a fire.

General recommendation

Larger garages refer to garages greater than 50 m^2.

Ceiling and wall surfaces should have surface finishes of at least class B-s1,d0. The surface finish should be attached to material in class A2-s1,d0 or on cladding of at least class K210/B-s1,d0.

The wall surfaces in rooms in occupancy class 5a and 5C and catering kitchens can be designed with a surface finish of class C-s2,d0 attached to material of A2-s1, d0 or cladding in class K210/B-s1,d0. The ceiling surfaces should have surface layers of class B-s1,d0 attached to material of A2 s1,d0 or cladding in class K210/B-s1,d0. *(BFS 2013:14).*

5:524 Flooring

Flooring in

- escape routes in buildings in class Br1,
- escape routes from places of assembly in occupancy classes 2B and 2C,
- protected lobbies

shall be designed with materials with a limited ability to spread fire and develop smoke. *(BFS 2011:26).*

General recommendation

Floorings should be designed in at least class C_{fl}-s1. *(BFS 2011:26).*

Flooring in

- places of assembly in occupancy classes 2B and 2C,
- premises in occupancy class 6 and

shall be designed with materials with a moderate ability to spread fire and develop smoke. *(BFS 2011:26)*

General recommendation

Floorings should be designed in at least class D_{fl}-s1. *(BFS 2011:26).*

Flooring in separate boiler rooms shall be designed using materials that cannot be ignited. *(BFS 2011:26).*

General recommendation
Flooring in separate boiler rooms should be designed in at least class A1fl. *(BFS 2011:26).*

5:525 Pipe insulation

General recommendation
If the total exposed surrounding area of the pipe installations is more than 20 % of the adjacent wall or ceiling surface, the pipe insulation should satisfy class $A2_L$–s1,d0 or the surface finish requirement for the adjacent surfaces of walls, ceilings and floors.

If the total exposed surrounding area of the pipe installations is less than 20 % of the adjacent wall or ceiling surface, the pipe insulation should at least satisfy the following classes:

- B_L–s1,d0 where the surrounding surfaces have the requirement B–s1,d0.
- C_L–s3,d0 where the surrounding surfaces have the requirement C–s2,d0.
- D_L–s3,d0 where the surrounding surfaces have the requirement D–s2,d0. *(BFS 2011:26).*

5:526 HVAC systems

General recommendation
Material in HVAC systems should be of class A2–s1,d0. For the system components listed in the table 5:526 a lower fire resistance class is accepted. *(BFS 2011:26).*

Table 5:526 Properties for HVAC systems

Small components such as filter materials, gaskets, fan belts and electrical systems.	No requirement (Class F)
Ducts in one dwelling houses.	Class E
Ducts, except kitchen flues, in buildings other than one dwelling houses.	The corresponding surface finish requirements that apply to adjoining wall or ceiling surfaces. This exemption applies to both inside and outside of the duct.
Ducts in shafts and plant rooms if these are designed to ensure fire cannot spread to or from the shaft or a plant room during the time that corresponds to the fire resistance of fire compartment boundaries in the building in question.	Class E
Ducts in vents to external air in exterior walls in the room adjacent to the exterior wall.	No requirement (Class F)
Air terminal devices, except range hoods in catering kitchens.	Class E
External air and transfer air devices in dwellings.	No requirement (Class F)

(BFS 2011:26).

5:527 Cables

Cables and suspension devices shall be designed and installed so that they do not contribute to a rapid fore spread or produce large amounts of heat and smoke. *(BFS 2014:3).*

General recommendation
Cables refer to signal cables for telephone and data traffic, and electric cables. Cables should be designed in at least class D_{ca}-s2,d2.

In buildings in building class Br3 and within spaces with an automatic fire suppression system, cables of class E_{ca} can be accepted.

Cables that come from outside into the building can be designed without fire resistance class up to the nearest connection point. A connection point can be an electrical switchboard, a switchgear station or the equivalent. The connection should be done in the fire compartment where the cable enters the building and the cable's length to the connection point should not exceed 20 metres.

If cables constitute more than 5% of the roof surface in an escape route, the cables should be designed in a minimum of class C_{ca}-s1,d1. If the escape route is equipped with automatic fire suppression systems, a minimum of class D_{ca}-s2,d2 can be accepted.

Cable trays and cable ladders can be designed in accordance with SS-EN 61537. Power track systems can be designed in accordance with the SS-EN 61534 series. Suspension devices in escape routes should be made out of materials of class A2-s1,d0. *(BFS 2018:4).*

5:53 Fire compartment division

Buildings should be divided into fire compartments to the extent that it creates sufficient time for evacuation and restricts the consequences of a fire.

For minor buildings with an occupancy where the consequences of a fire are small, there is no need for fire cells.

Fire compartment classification may fully or partially be replaced by fire resistant installations. *(BFS 2011:26).*

General recommendation

Spaces in different occupancy classes should be placed in separate fire cells. As an alternative, all the spaces in different occupancy classes in the fire compartment can be designed to ensure the requirements for fire protection that apply to each of its constituent activities are satisfied.

Escape routes should form separate fire cells. Other spaces that should form their own fire compartments are specified in Section 5:54.

Spaces in buildings with occupancies with a probable risk of the outbreak of fire and where a fire may have major consequences for safe evacuation should be divided into separate fire cells. Typical areas may be premises where hot work is carried out, garages, separate boiler rooms, catering kitchens, waste storage rooms and the like.

Fire compartments should separate rooms with a high fire load (> 1 600 MJ/m^2) or premises in occupancy class 6 from other spaces.

The same fire compartment should not – with the exception of dwellings in occupancy class 3, stairway, shafts and open garages – include spaces on more than two floors.

Rules on fire safety installations are given in Section 5:25. *(BFS 2014:3).*

When buildings are divided into fire cells, these are designed to ensure satisfactory protection against the spread of fire and smoke. The design of the fire compartment shall limit the spread of fire and smoke to the adjacent fire compartment over a specified time. *(BFS 2011:26).*

General recommendation

Penetrations, supports and joints should be taken into account to ensure the fire compartment maintains its separating function. *(BFS 2011:26).*

5:531 Buildings in class Br1

For buildings in class Br1, the spread of smoke is limited between fire compartments by separating structures.

General recommendation

Separating structures in buildings in class Br1 should be designed for at least the fire resistance class given in Table 5:531.

The design fire load should be determined in accordance with Boverket's general recommendations (2013:11) on fire load, BBRBE. *(BFS 2013:14).*

Table 5:531 Fire compartment separating structural elements in a building in class Br1

Structural element	Fire resistance class at fire load f (MJ/m^2)		
	f ≤ 800	**F ≤ 1,600**	**F > 1,600**
Separating structures in general, and building floors above basements	EI 60	EI 120 (EI 60*)	EI 240 (EI 120*)

* For buildings protected by an automatic water sprinkler system. *(BFS 2013:14).*

5:532 Buildings in classes Br2 and Br3

For buildings in classes Br2 and Br3, the spread of fire and smoke is limited between fire compartments by separating structures. *(BFS 2011:26).*

General recommendation
A separating structure should be designed in a minimum of fire resistance class EI 30. Requirements for separating structures are also contained in Section 5:54. *(BFS 2011:26).*

5:533 HVAC systems

HVAC systems shall be placed, designed and suspended to ensure the prevention of the spread of fire and smoke between fire compartments is maintained.

The risk of fire spread due to heat transfer through HVAC systems combustible materials in the other fire compartments is to be considered. The installations shall be designed to ensure all parts needed to maintain protection can withstand the temperature rise that they can be expected to be exposed to. *(BFS 2011:26).*

General recommendation
Adequate protection against the spread of fire and smoke through the HVAC systems between fire cells can be achieved by installations, including suspensions, vents and penetrations being designed to ensure they can maintain fire cells boundaries over the intended period. Installations should be designed to resist fire that occurs in either fire cell. When designing, the risk of fire and smoke spreading through the HVAC systems should be considered.

The risk of the spread of fire due to heat transfer through ventilation ducts should be considered by the ducts being isolated at fire compartment penetrations.

If the HVAC systems is not separated for each fire compartment, the ventilation ducts should be fitted with dampers with the corresponding separation ability as the current fire compartment class. The dampers should be designed to ensure their functionality can be maintained based on the stresses they are likely to be exposed to. *(BFS 2011:26).*

5:5331 Installation shaft

Installation shafts shall be designed to ensure the fire compartment boundaries are maintained. The risk of fire spreading through heat transfer from ventilation ducts to combustible material shall be taken into account. *(BFS 2011:26).*

General recommendation
Installation shafts should be designed as separate fire compartment or separated at every building floor that represents a fire compartment boundary.

The separation capability of ventilation ducts, together with the separation of the installation shaft should ensure that the fire compartment boundary is maintained. In a separate shaft, the ventilation ducts should be separated in at least class EI 15 from flammable structural elements or fixtures, such as piping, insulation, beams and cables. *(BFS 2011:26).*

5:5332 Kitchen flues

Kitchen flues and their associated parts shall be designed with protection against the spread of fire and smoke within and between the fire cells. The protection shall limit the risk of the spread of fire to adjacent structural elements or fixtures, and ensure the fire compartment boundaries are maintained. *(BFS 2011:26).*

General recommendation
Fire protection for kitchen flues in catering kitchens should be adapted to counter the risk from combustible deposits formed in the duct. If large amounts of deposits are likely to form in the kitchen flue, it should meet the requirements in ISO 6944-2, both for fires inside and outside the duct.

Catering kitchens that are not likely to have large amounts of deposits in kitchen flues may be kitchens that are used solely for heating, cooking and kitchens that are only used to a limited extent.

Catering kitchens can, as an alternative to what is specified in the Board's first paragraph be designed with

– filtration system that reduces the risk of deposits forming or
– automatic fire suppression system with sufficient capacity to reduce the risk of fire spreading in the deposits.

Kitchen flues from catering kitchens should be designed with a minimum fire resistance of class EI 60 along their entire length in buildings in building class Br1. For buildings in building classes Br2 and Br3,what is required for other separating structures applies, although with a minimum fire resistance class of EI 30.

However, kitchen flues can be non-insulated within the fire cell if there is a minimum of a 100 mm wide air gap between the duct and combustible structural elements. Kitchen flues may also be non-insulated if they are situated on the outside and the distance to combustible material is not less than 0.5 meters. This distance may be reduced to 0.25 meters if radiation protection is installed between the flue and combustible material. Radiation protection should be designed in at least fire resistance class A2-s1,d0 with resistant properties.

For kitchens in dwellings and other spaces with household stoves or ovens, the kitchen flue should be designed in a minimum fire resistance class of EI 15. As an alternative to EI 15, the kitchen flue can be designed in a minimum of fire resistance class E 15 and with a safety distance from combustible materials of at least 30 mm. Connectors to kitchen flues should be designed with materials in a minimum fire resistance class of E. Ducts and connectors can be placed against combustible materials at through-fittings for shelves or cabinet sides. The top and other smaller parts of the casing of kitchen extractor fans may also be in contact with combustible material. *(BFS 2011:26).*

5:534 Doors, access panels and gates

Doors, access panels and gates in a separating structure shall be designed to ensure the fire compartment boundaries are maintained. *(BFS 2011:26).*

General recommendation
Doors should be designed in the same fire resistance class as the fire compartment boundary specified in Sections 5:531 and 5:532.

Doors that connect to the escape routes can be designed in a minimum fire resistance class EI 30-S_a.

Spaces fitted with an automatic water sprinkler system or that have a fire load less than 250 $MJ/_m^2$ can be designed with half the fire resistance class of the structural element in question and without the need for insulation, although no lower than class E 30.

Doors to stairways, except for lift doors, should be tight, even at the door's lower edge. Such doors can be designed with smoke leakage class S_{200}.

Doors to and in escape routes that cannot be expected to be closed should be fitted with door closers. Doors that can be expected to be closed are those to dwellings in occupancy class 3, lift machine rooms and technical rooms.

That specified for doors also applies to access panels and gates.

Rules for door closers are also given in Section 5:254. *(BFS 2018:4).*

5:535 Attic spaces and ceiling voids

Attic spaces and ceiling voids shall be designed to ensure that the protection against fire spread between fire compartments is maintained. They shall also be designed to ensure that extensive spread of fire is limited.

Ceiling voids that extend over a number of fire compartments shall be separated to the same extent and at not less than the fire resistance class that is required for the underlying fire compartment separating walls. *(BFS 2014:3).*

General recommendation
In order to maintain the protection against fire spread between fire compartments, particular attention should be given to the need for protection against fire spread to and in the attic, and the load-bearing capacity of the roof.

The risk of fire spread from windows through the eaves to an attic, that is a separate fire compartment, should be limited. This can e.g. be done through the eaves being designed with a separation capability of at least class EI 30.

If the attic and the underlying storey are different fire compartments, the attic should be divided into fire compartments of not more than 400 m^2 with fire compartment boundaries in at least class EI 30. In addition, attics in Br1-buildings under the same conditions should be divided into parts not exceeding 1, 200 m^2 with fire compartment boundaries in at least class EI 60. Division is not required if the insulation in the attic building floor is of class A2-s1,d0 and there is only a limited amount of combustible material or combustible structural elements above the attic building floor. Structural elements should then be of at least class B-s1,d0. *(BFS 2014:3).*

5:536 Protection against the spread of fire from an adjacent ceiling

Protection against fire spread to a fire compartment located above an adjacent roof shall be maintained. *(BFS 2011:26).*

General recommendation:
Protection can, for example, be maintained through a combination of protective distance, separating structures, radiation protection and non-combustible roof covering. Examples of acceptable solutions could be that,

– The exterior wall to the higher situated fire cell, including windows, up to a height of 5 meters above the adjacent roof is given a fire-resistance equal to the requirement of the separating structure. However, for windows that make up less than 20 % of the affected area, fire resistance class EW 30 is accepted.

– The adjacent roof at a distance of less than 8 meters from the exterior wall is given a fire resistance equivalent to REI 60. If all adjacent fire compartments have separating structures and load bearing capacity in case of fire for not more than 30 minutes, REI 30 can be accepted.

– An automatic water sprinkler system is installed in lower lying spaces. *(BFS 2014:3).*

5:537 Glazed balconies, access balconies and patios

Protection against the spread of fire and smoke between fire compartments shall be maintained when glazing of spaces that connect to the fire compartment, such as balconies, access balconies and patios. *(BFS 2011:26).*

General recommendation
Protection against the spread of fire and smoke should be made up of fire resistant separating structures, safe distances or a combination of both.

Protection against the spread of fire and smoke between adjacent and overlying spaces mentioned above, or to windows in other fire compartments, should correspond to isolation of at least class E 30. The protection should cover the surfaces facing parallel to each other, such as top to bottom or side to side. The surfaces may be considered parallel if the angle between them is less than 60°.

Separating structures can be combined with, or replaced by, safety distances. For protection by distance alone, the safety distance between parallel horizontal surfaces that are unprotected should be at least 3 meters and between parallel vertical surfaces at least 0.5 meters. *(BFS 2011:26).*

5:538 Separation of access balconies

Structures facing glazed access balconies, and access balconies that constitute the only escape route, shall be designed so that the spread of fire and smoke is limited.

Stairways in three floors or more shall be designed so that fire and smoke spread to access balcony is limited. *(BFS 2014:3).*

General recommendation

Windows, doors and other structures that connect to glazed access balconies should be designed in at least class EI 30.

If evacuation only can be conducted in one direction, and the access balcony constitutes the only route to the nearest escape route, the fire compartments one passes, including windows and doors, should be designed in at least class EI 30.

Doors between stairways and access balconies should be separated in at least class E15-C. *(BFS 2014:3).*

5:54 Special conditions

5:541 Occupancy class 1

General recommendation

Office apartments in occupancy class 1 should be designed as separate fire compartments. *(BFS 2011:26).*

5:542 Occupancy classes 2B and 2C

General recommendation

Places of assembly in occupancy classes 2B and 2C should be designed as separate fire compartments.

In places of assembly in occupancy classes 2B and 2C with major theatre stages, or equivalent, the stage should be designed as a separate fire compartment without regard to the stage opening. The stage opening should be protected with a safety curtain. Where the stage is larger than 120 m^2, the curtain should be supplemented by a curtain sprinkler. Larger theatre stages in places of assembly in occupancy classes 2B and 2C which are fitted with automatic fire suppression systems do not need to be placed in separate fire compartments. *(BFS 2011:26).*

5:543 Occupancy class 3

In occupancy class 3A, fire and smoke spread shall be restricted between dwellings with separating structures. *(BFS 2014:3).*

General recommendation

Dwellings should be designed as separate fire compartments and the separating structure between dwellings should be designed in at least class EI 60. *(BFS 2011:26).*

In occupancy class 3B, fire and smoke spread shall be restricted between each group of habitable rooms with separating structures.

In occupancy class 3B, each habitable room shall also have a separating structure.

Single habitable rooms can be designed without any separating structure if spaces in occupancy class 3B is provided with an automatic fire suppression system. *(BFS 2014:3).*

General recommendation

Each group of habitable rooms should be designed as a fire compartment in one storey, with separating structures of at least class EI 60.

A group of habitable rooms should consist of rooms intended for a total of not more than six people.

Separation of single habitable rooms should be at least class EI 30.

Automatic fire suppression systems can be designed as residential sprinklers. *(BFS 2014:3).*

5:544 Occupancy class 4

In occupancy class 4, fire and smoke spread shall be restricted between each guest room or suite with separating structures. *(BFS 2011:26).*

General recommendation
Guest rooms or suites should be designed as separate fire compartments and the separating structure should be designed to no less than class EI 60. *(BFS 2011:26).*

5:545 Occupancy class 5A

In occupancy class 5A, the spread of fire and smoke shall be restricted if the building is intended to be used during night time or if the building contains more than two sections or functional units. *(BFS 2016:6).*

General recommendation
Buildings that contain occupancy class 5A should be divided into fire compartments to ensure no more than two sections or functional units are included in the same fire compartment.

Room or functional unit intended for sleep during night time should be designed as a separate fire compartment. *(BFS 2016:6).*

5:546 Occupancy class 5B

In occupancy class 5B, fire and smoke spread shall be restricted between dwellings with separating structures. Spaces in occupancy class 5B shall be provided with an automatic fire suppression system.

Doors to apartments may be designed without a door closer if a limited number of rooms are connected to common spaces. *(BFS 2013:14).*

General recommendation
Dwellings should be designed as separate compartments and the separating structure should be designed in at least class EI 60.

Automatic fire suppression systems can be designed as residential sprinklers in accordance with Section 5:2522.

Connecting common spaces could, for example, be corridors including day rooms and kitchens. Apartment doors can be designed without door closers if not more than eight apartments connect to such common spaces. Separating structures between connecting spaces should be designed in at least fire resistance class E 15 with doors in class E 15-C. *(BFS 2013:14).*

5:547 Occupancy class 5C

Spaces in occupancy class 5C shall be provided with an automatic fire suppression system. In occupancy class 5C, the spread of fire and smoke between each hospital ward, surgery department, or other functional unit shall, be restricted by separating structures. *(BFS 2011:26).*

General recommendation
Buildings in occupancy class 5C should be fitted with automatic water sprinkler systems in accordance with Section 5:2521.

Hospital wards, surgery departments or other functional units should be designed as separate fire compartments. *(BFS 2011:26).*

5:548 Premises in occupancy class 6 etc.

Premises in occupancy class 6 shall be designed with separating structures to ensure that the spread of fire and smoke to other fire compartments is limited.

Premises in occupancy class 6 may only connect to places of assembly in occupancy classes 2B and 2C through a lobby. *(BFS 2011:26).*

General recommendation
A separating structure should be designed in a minimum of fire resistance class EI 60. *(BFS 2011:26).*

In premises in occupancy class 6 and other premises with a high probability for the outbreak of fire, special measures shall be taken if the premises connect to an escape route that serves several rooms. *(BFS 2011:26).*

General recommendation
Examples of other premises are catering kitchens and garages that are larger than 50 m^2. Special measures could be the installation of automatic fire suppression systems or protected lobbies. *(BFS 2011:26).*

5:549 Lifts

Lift shafts shall be designed to ensure that protection against fire and smoke spread between fire compartments is maintained. *(BFS 2011:26).*

General recommendation
The protection can be maintained through the lift shaft being designed as a separate fire compartment. Lift shafts that are fitted with lift doors with fire resistance verified in accordance with SS-EN 81-58 should be designed with smoke ventilation.

Protection against the spread of fire and smoke from or through the lift shaft to other fire compartments may also be limited by being designed as separate fire compartments and with lobbies between the lift and adjacent fire compartments.

As an alternative, the lift shaft may be placed in the same fire compartment as the stairway.

The lift machine and diverter pulleys can be placed in the same fire compartment as the lift shaft. Lift machine cabinets with a low fire load can be placed in lift shafts or stairways.

Electric cables for the machinery for a lift permitted to carry passengers, which in the event of power outage does not automatically proceed to the nearest landing, should be run separately in class EI 30 or equivalent. The latter applies in the fire compartments served by the lift with the exception of the lift shaft. *(BFS 2011:26).*

5:55 Exterior walls

Façade linings must only develop heat and smoke to a limited extent in case of fire. *(BFS 2011:26).*

General recommendation
Limited extent means the ability to satisfactorily maintain the evacuation and fire suppression capability.

Rules for protection against fire spread between buildings are contained in Section 5:6. *(BFS 2011:26).*

5:551 Exterior walls in building class Br1

Exterior walls in buildings of class Br1 shall be designed to ensure

1. the separation function is maintained between fire compartments,
2. fire spread inside the wall is limited,
3. the risk of fire spread along the façade surface is limited,
4. the risk of injury due to parts falling from the exterior wall is limited.

General recommendation
Exterior wall constructions that, when tested in accordance with SS-EN 13501-2 with fire affect as specified in Chapter 4.2 (standard fire curve) comply with applicable parts of the requirements in Section 5:531 for separating function, meet the provision's requirements in point 1.

Exterior walls containing only material of at least class A2-s1,d0 or separated in such a way that a fire inside the wall is prevented from spreading past the separating structure, meet the provision's requirement in point 2 for protection against fire spread inside the wall.

Exterior walls meet the provision's requirements in point 3, when designed in at least class A2-s1,d0. As an alternative, the requirements can be met with a cladding in at least class D-s2,d2, and if any of the following conditions are met

– the building has a maximum of two storeys,

– the cladding, regardless of building height, only covers the building's ground floor,
– the building has a maximum of eight storeys and is fitted with automatic fire suppression systems and the façade surface in the ground floor is designed in materials of at least A2-s1,d0,
– the building has a maximum of eight storeys and combustible material of at least class D-s2,d2 only covers a limited part of the façade surface.

Exterior walls should be designed so that the requirement in point 4 is met to ensure the risk of falling structural elements, such as broken glass, small bits of plaster and the like is limited.

Exterior wall constructions that pass the test in SP FIRE 105 with the conditions below, meet points 2, 3 and 4 of the provision.

For exterior walls to buildings with up to eight storeys if the test shows that

a) no major parts of the façade fall down, for example, large pieces of plaster, panels or glass panes, which could cause danger to people evacuating or to rescue personnel,

b) fire spread on the surface finish and inside the wall is limited to the bottom edge of the window two floors above the fire room, and

c) no exterior flames occur which could ignite the eaves located above the window two floors above the fire room. As an equivalent criterion, the gas temperature just below the eaves must not exceed 500 °C for a continuous period longer than 2 minutes or 450 °C for longer than 10 minutes.

For exterior walls in buildings with more than eight storeys, in addition to criteria a–c in the test, the exterior wall must not increase the risk of fire spreading to another fire compartment in a floor above the fire room. As an equivalent criterion when testing according to SP FIRE 105, the total heat flow into the façade in the centre of the window in the storey above the fire room must not exceed 80 kW/m^2. *(BFS 2014:3).*

5:552 Exterior walls in buildings in classes Br2 and Br3

Exterior walls, in buildings in classes Br2 and Br3, shall be designed to ensure that fire spread along the façade surface is limited. *(BFS 2011:26).*

General recommendation
Cladding should meet the requirements for class D-s2,d2.
For tent structures in occupancy class 1 and 2A with a single finish of fabric material, class E can be accepted *(BFS 2014:3).*

5:553 Windows in exterior walls

Windows belonging to separate fire compartments in the same building and facing each other or positioned above each other vertically, shall be designed and located to ensure fire spread between fire compartment boundaries is restricted. It shall not be possible for windows subject to fire resistance classification to be opened other than by a tool, key or similar. *(BFS 2011:26).*

General recommendation
The requirements in the provision or equivalent apply to windows, glazed surfaces or similar that are situated so that direct thermal radiation from a fire can occur from one window to the other.

Examples of designs that comply with the requirements of the above provision regarding prevention of the spread of fire are contained in Table 5:553. Thermal radiation is assumed to occur at right angles to, and up to an angle of 135° from, the plane of the window surface. If the angle of an internal corner is less than 60°, the requirements for opposite, parallel exterior walls apply. *(BFS 2011:26).*

Table 5:553 Examples of the design of windows in exterior walls facing one another or placed one above the other vertically. This applies between fire compartments with requirements equivalent to EI 60 or less.

Relative positions	Distance (meters) between windows	Design of exterior walls
Windows in opposite (parallel) exterior walls	< 5.0 ≥ 5.0	One window in class E 30, or both in E 15 –
Windows in inner corners	< 2.0 ≥ 2.0	One window in class E 30, or both in E 15 –
Windows placed above each other vertically	< 1.2 ≥ 1.2	One window in class E 30, or both in E 15 –

(BFS 2013:14).

5:56 Protection against extensive fire spread

5:561 General

Large buildings should be designed to ensure that the extensive spread of fire within the building is limited. *(BFS 2011:26).*

General recommendation

To limit the extensive spread of fire in large buildings, these should be designed with fire compartments, fire sections, fire safety installations or combinations thereof. When assessing the risk of fire spread, account should be taken to the fire load.

An example of a suitable design would be to divide the building into fire compartments not exceeding 1,250 m^2 or into fire sections as indicated in Table 5:561. If the fire load is at most 250 MJ/m^2 the space can be designed without special protection against extensive fire spread. *(BFS 2011:26).*

Table 5:561 Fire sections in large buildings

Protection systems	Maximum size (net area*) in the fire section for fire load f (MJ/m^2)	
	f ≤ 800	**f > 800**
No automatic fire alarm or automatic fire suppression system	2,500 m^2	1,250 m^2
Automatic fire alarm	5,000 m^2	2,500 m^2
Automatic water sprinkler system	Unlimited	Unlimited

* The net area is determined based on all floors contained in the fire compartment or fire section. Horizontal section limits can be designed as fire compartment boundaries with the appropriate requirements in 5:562 but without the requirement for protection against mechanical impact (M).

(BFS 2011:26).

5:562 Firewalls

General recommendation

Firewalls should be designed in the fire resistance class in accordance with Table 5:562 and break through combustible layers in the ceiling to limit the risk of fire spreading across the firewall.

If different areas have different requirements for protection against fire, the higher requirement should apply.

Doors in firewalls should not be lower than the corresponding fire resistance class in EI_2XX-C. *(BFS 2011:26).*

Table 5:562 Fire resistance class for firewalls

Building class	Fire resistance class at fire load f (MJ/m^2)		
	f ≤ 800	**f ≤ 1,600**	**f > 1,600**
1. Br1	REI 90-M	REI 120-M	REI 240-M
2. Br2, Br3	REI 60-M	REI 90-M	REI 120-M

(BFS 2011:26).

5:6 Protection against the spread of fire between buildings

The provisions in Section 5:61 do not apply to accessory buildings that have a building area limited to 15 m^2. *(BFS 2011:26).*

5:61 General

Buildings shall be designed with adequate protection against fire spread between buildings. *(BFS 2011:26).*

General recommendation

Adequate protection is achieved if buildings are constructed at a distance of more than 8 meters.

Adequate protection is achieved if the fire spread between buildings is limited to protection that corresponds to the maximum requirement for fire compartments or firewalls in each building. Combined buildings with more than two storeys should be separated with a firewall.

If there is a glazed balcony, the distance should be calculated from the balcony slab's outer edge. Other protruding parts, such as roof projection and balcony, which protrude out more than 0.5 meters should be included in the calculation of the distance between buildings.

Rules for exterior walls are contained in Section 5:55. *(BFS 2011:26).*

5:611 Single-family houses etc.

General recommendation

The distance between single-family houses, between accessory buildings or between accessory buildings and single-family houses may be less than 8 meters if constructed in accordance with Table 5:611. This also applies to buildings with a maximum of two storeys and containing only occupancy class 1 or 3.

Single-family houses with one storey and attic floor or single-family houses with two storeys should be divided into groups of up to 800 m^2 of the total building area. This building area does not include the area for terraces, carports and the like. Each group of single-family houses should be separated by firewalls in at least class REI 60-M or with a distance between groups of at least eight meters. *(BFS 2011:26).*

Table 5:611 Combination of exterior walls and safety distances

Protection against fire spread from single-family houses	
Combination of exterior walls and safety distances	
Design of one building's exterior wall	**Minimum relative spacing**
EI 60 (including doors) without window openings	-

Protection against spread of fire between single-family houses, between accessory buildings* or between accessory buildings* and single-family houses	
Combination of exterior walls and safety distances	
Design of both buildings opposite exterior walls	**Minimum relative spacing**
EI 30 (including doors) without window openings	-
EI 30 (including doors) with a maximum of 1 m^2 unclassed window area	2 m
EI 30 with a maximum of 4 m^2 unclassed window area	5 m
EI 30 without restrictions for unclassed window area	7 m

* For accessory buildings, it is sufficient that one of the walls is designed as above. Exterior walls can be considered to be opposite if direct heat radiation can occur from one exterior wall to the other. Direct thermal radiation is assumed to occur at right angles to, and up to an angle of 135° from, the plane of the wall.

(BFS 2014:3).

5:62 Roof covering

Roof coverings on buildings shall be designed to ensure ignition is made difficult, fire spread is restricted and that they only give a limited contribution to a fire. *(BFS 2011:26).*

General recommendation

Making ignition difficult means, for example, protection against glowing airborne particles or sparks.

Roof coverings should be designed with materials of class A2-s1,d0 or with materials of at least class B_{ROOF} (t2) on underlying material of class A2-s1,d0.

Combustible roof coverings, in at least class B_{ROOF} (t2), can be used on combustible surfaces on buildings which are located at least 8 meters apart, or in single-family houses.

Combustible roof coverings on combustible surfaces should not be installed on buildings, except single-family houses, within 8 meters from a chimney connected to a boiler with combustion from solid fuels.

In single-family houses, material of at least class E can be used as roof covering on roofs above outdoor space, protecting roof or similar. The same applies in occupancy classes 1 and 2A for tent structures with a single finish of fabric material.

Guidelines on protection against fire spread from adjacent roofs are contained in Section 5:536 which also apply between buildings. *(BFS 2014:3).*

5:621 has been repealed by (BFS 2011:26).

5:6211 ***has been repealed by (BFS 2011:26).***

5:6212 ***has been repealed by (BFS 2011:26).***

5:6213 ***has been repealed by (BFS 2011:26).***

5:6214 ***has been repealed by (BFS 2011:26).***

5:63 has been repealed by (BFS 2011:26).

5:631 has been repealed by (BFS 2011:26).

5:632 has been repealed by (BFS 2011:26).

5:633 has been repealed by (BFS 2011:26).

5:634 has been repealed by (BFS 2011:26).

5:64 *has been repealed by (BFS 2011:26).*

5:65 has been repealed by (BFS 2011:26).

5:651 has been repealed by (BFS 2011:26).

5:652 has been repealed by (BFS 2011:26).

5:6521 ***has been repealed by (BFS 2011:26).***

5:6522 ***has been repealed by (BFS 2011:26).***

5:653 has been repealed by (BFS 2011:26).

5:66 *has been repealed by (BFS 2011:26).*

5:67 *has been repealed by (BFS 2011:26).*

5:671 has been repealed by (BFS 2011:26).

5:672 has been repealed by (BFS 2011:26).

5:673 has been repealed by (BFS 2011:26).

5:674 has been repealed by (BFS 2011:26).

5:675 has been repealed by (BFS 2011:26).

5:7 Possibility of rescue responses

5:71 General

Buildings shall be designed to ensure action from the rescue service is possible to do with a reasonable confidence. *(BFS 2011:26).*

General recommendation

Rescue responses can be both external and internal. Rescue responses can be performed by the rescue services, the occupancy's own staff or by others.

The possibility of conducting rescue responses with satisfactory safety for the rescue services means that the building is designed to ensure the rescue services are able to get into a building and that the requisite equipment to facilitate fire-fighting and rescue efforts is available. *(BFS 2011:26).*

5:72 Access for rescue responses

Buildings shall be accessible for emergency responses. *(BFS 2011:26).*

5:721 Rescue road

If the street system or equivalent does not provide access, a special rescue road shall be arranged that provides good accessibility. The rescue road shall be signposted and provided with hardstandings for the intended vehicles. *(BFS 2011:26).*

General recommendation
The rescue road and hardstandings should be designed with respect to clearance height, ground slope, width, turning radius and the load-bearing capacity to ensure the rescue service's larger vehicles can reach their target. The load-bearing capacity should correspond to the street system. For rules for load-bearing capacity for building floors, see Section C, Chapter 1.1.1, Section 11 in Boverket´s mandatory provisions and general recommendations (2011:10) on the application of European construction standards (Eurocodes), EKS.
The distance between the rescue vehicles' hardstanding and the building's attack point should be less than 50 meters.

If evacuation is assumed to take place using turntable ladders or hydraulic lift platforms, the distance from the street, rescue road or hardstanding to the building wall should be a maximum of 9 meters. Other conditions may be indicated by the municipality's plan of action.

Outside the window where portable ladders are intended to be used, the land should be suitable for evacuation. *(BFS 2011:26).*

5:722 Access route

An access route for internal rescue responses shall be on every floor. *(BFS 2011:26).*

General recommendation:
The access route could be the escape route.

The access route to an attic may consist of access panels in the roof. If the rescue services cannot be expected to reach the roof with its own equipment, an internal access route separated from the rest of the building by construction complying with fire resistance requirements should be provided. External access routes should be designed in accordance with the requirements in the appropriate parts of Section 8:24. Internal access routes should be separated from attics in accordance with the requirements for separating structures. Internal access routes to the roof may be provided from a stairway or terrace from which the roof can be easily reached.

For basements with two or more basement floors and basements that are connected to a stairway Tr2, the access route to the basement should allow rescue responses without the escape routes from dwellings or premises being in open connection with the basement. Every basement floor should in such cases be separated from the access route to ensure rescue personnel responses. *(BFS 2011:26).*

The length of the access routes shall be limited on each storey in occupancy classes 5A, 5B and 5C. *(BFS 2011:26).*

General recommendation:
The distance between the nearest stairway or the corresponding point of entry and the furthest away part of a room should not exceed 50 meters in occupancy classes 5A, 5B and 5C to take account of the rescue personnel's ability to respond. *(BFS 2011:26).*

5:73 Installations for fire-fighting and rescue responses

5:731 Fire suppression equipment

Fire suppression equipment shall be provided where fire can be expected to spread rapidly or have a very high intensity. *(BFS 2011:26).*

General recommendation
Internal fire hydrants should be installed in factories and warehouses in occupancy class1 if the fire load exceeds 800 MJ/m^2 and in premises in occupancy class 6.

Internal fire hydrants should be constructed in accordance with SS-EN 671-1. *(BFS 2011:26).*

5:732 Smoke ventilation

In buildings in class Br1, stairways that can be assumed to be used as an access route for rescue personnel shall be fitted with smoke ventilation or equivalent.

In addition, smoke ventilation or equivalent shall be installed in every fire compartment in attics used as storage space in buildings with more than four storeys.

Smoke ventilation or its equivalent shall be designed to facilitate internal rescue responses. *(BFS 2014:3).*

General recommendation
The smoke ventilation could be a smoke vent or mechanical fan.

The control device for activating the smoke vent, mechanical fan or the equivalent in stairways should be placed on the ground floor and should be designed to be activated by the rescue services. If smoke vents are installed in the stairway the clear (geometric) area should be at least 1 m^2 in buildings with up to eight storeys.

In stairways, a solution that is equivalent to smoke ventilation could be openable windows on at least every two storeys. A window should be fitted on the top storey. It should be possible to open all windows with a fire key designed in accordance with SS 3654.

In attics, a solution that is equivalent to smoke ventilation could also be other openings such as windows or access panels that are readily openable from the outside or that are easy to break. The openings in the attic should have an area equivalent to at least 1 % of the storage space floor area and be evenly distributed.

Smoke ventilation or its equivalent should be designed to restrict accumulations of smoke and ensure pressure relief. *(BFS 2013:14).*

Basements shall be provided with smoke ventilation or equivalent. *(BFS 2013:14).*

General recommendation
In basements, a solution that is equivalent to smoke ventilation could also be other openings such as windows or other openings to the outside. In Br1 buildings, these should be present to such an extent that the stairways need not be used for the ventilation of smoke. For single-family houses, smoke ventilation through interior staircase can be considered to meet the mandatory provision.

In buildings with more than one basement floor, smoke ventilation should be separate for each basement floor. It should be possible to operate the smoke ventilation in these cases from the ground floor and its control device should have a sign.

The openings should have an area equivalent to at least 0.5 % of the fire compartment's net area for a fire load of up to 800 MJ/m^2. If fire compartments are fitted with automatic water sprinkler systems, 0.1 % can be considered adequate. The latter also applies to a fire load higher than 800 MJ/m^2.

Rules on the design of signs are available from the Swedish Work Environment Authority. *(BFS 2013:14).*

5:733 Fire hydrant risers

In buildings with a building height above 24 meters, the access to firefighting water shall be ensured. *(BFS 2014:3).*

General recommendation
The access to firefighting water should be ensured with fire hydrant risers in stairways. The working pressure at the outlet from the riser should be between 0.8 MPa and 1.2 MPa. Flexible risers should be sized for at least nozzle pipes connected with a flow of 300 l/min for each nozzle.

For buildings with a building height above 40 meters, the flexible risers should be pressurised.

Risers should be designed in accordance with SS 3112 and locked hatches should be openable with a fire key designed in accordance with SS 3654. Intakes and outlets should be fitted with signs. Rules on signage are available from the Swedish Work Environment Authority.

Outlets should be in the stairway from the third storey, and on at least every two subsequent storeys. The distance between the outlet for the flexible riser and the furthest away part of a room should not exceed 50 meters to take into account the rescue personnel's ability to respond. *(BFS 2014:3).*

5:734 Rescue lift

For buildings with more than ten storeys, there shall be at least one rescue lift. The lift may only be connected to other spaces through fire lobbies. The lift shaft to the rescue lift shall form its own fire compartment. *(BFS 2011:26).*

General recommendation

The rescue lift can be designed in accordance with SS-EN 81-72. The fire compartments that are required in accordance with SS-EN 81-72 should be designed in the equivalent class as the fire compartment separating parts in general. At least two rescue lifts should be installed if the storey area exceeds 900 m^2.

Lift that is designed as a rescue lift should accommodate a stretcher according to measurements specified in section 3:144.

Rules on lifts and other lifting devices are contained in Section 3:144 and in Boverket´s mandatory provisions and general recommendations (2011:12) on lifts and other motorised devices, H. *(BFS 2013:14).*

5:74 has been repealed by (BFS 2011:26).

5:8 Requirements for fire protection during alterations to buildings

5:81 General

Buildings shall be designed with the type of fire protection that ensures that fire safety is satisfactory. The design of the fire protection shall assume that a fire could occur.

Fire protection shall be designed with adequate robustness to ensure all or large parts of the fire protection is not knocked out by individual events or stresses.

Buildings shall, following the alteration, comply with the fire protection requirements in Sections 5:1–5:7. However, the requirements may be satisfied in a way other than that specified where the corresponding safety level is still achieved.

Deviations from the safety level may be made if there are exceptional reasons relating to the scope of the alteration and the building's conditions. Rules on allowable deviations are contained in Section 1:22 and in Sections 5:81–5:87. However, deviations must never result in an unacceptable risk to human safety.

If deviations from the requirements in Sections 5:1–5:8 are made, the design shall be verified with analytical design in accordance with 5:112. *(BFS 2011:26).*

General recommendation

In the assessment of the building conditions, account can be taken to the protection needs in the occupancy being undertaken. Exceptional reasons may to a greater extent be justified in buildings that have a lower need of protection. Factors in the occupancy that mean a lesser need for protection are such that the number of people is limited, that people can be expected to be awake, that they have good local knowledge, or that they are mostly likely to evacuate on their own. In assessing the need for protection, account can also be taken to the definition of 'building classes' as specified in 5:22 and the factors affecting the division in building classes.

Concepts and definitions set out in Sections 5:1 and 5:2 also apply for the alterations of buildings. *(BFS 2011:26).*

5:811 Existing fire protection

General recommendation
In order to identify the condition of the existing fire protection for the affected part of the building, a review should be made of existing protection systems. The quality and function of the fire compartment boundaries, surface finishes and other protective devices, passive and active, should be checked, for example, penetrations in and connections to the fire compartment boundaries, automatic water sprinkler systems and fire smoke ventilation. *(BFS 2011:26).*

5:812 Documentation

General recommendation
After the alteration, a fire protection documentation should be prepared that describes the design of the fire protection for the altered part. The documentation should comply with the requirements in Section 5:12. *(BFS 2011:26).*

5:82 Fire resistance classes and other conditions

5:821 Museum environment

For buildings that
- constitute a museum environment,
- are only intended for limited use and
- belong to occupancy class 2A

deviations may be made from the provisions in 5:84–5:87. *(BFS 2011:26).*

General recommendation
Museum environment means buildings or parts of buildings with a significant historical value that the building itself can be considered as an exhibition object.

Limited use means that people who do not have local knowledge are only expected to visit the building with people with good local knowledge.

In the documentation of the systematic fire protection work, limitations in the use of the building should be documented that the chosen design of fire protection means. Rules for systematic fire protection work are issued by the Swedish Civil Contingencies Agency. *(BFS 2011:26).*

5:83 Ability to escape in case of fire

5:831 General

Buildings shall be designed to ensure an adequate time for evacuation during a fire. *(BFS 2011:26).*

General recommendation
Occupancy classes 2B, 2C and 5C should be designed with at least two independent escape routes.

The escape routes should be protected against fire and smoke spread, for example by being designed as separate fire compartments. *(BFS 2011:26).*

5:832 Fire safety installations

The requirements for devices for early detection and warning in case of fire as specified in 5:251 and 5:35, and the exit signs in 5:341 and 5:35 shall be satisfied. *(BFS 2011:26).*

5:833 Altered use of attic

When the use of an attic changes, the equivalent level of safety for the ability to evacuate that is specified in Section 5:3 shall be achieved. *(BFS 2011:26).*

5:84 Protection against the outbreak of fire

Buildings and fixed installations shall be designed with adequate protection against the outbreak of fire. *(BFS 2011:26).*

5:85 Protection against the development and spread of fire and smoke within buildings

5:851 Surface finish and cladding

General recommendation
If there are exceptional reasons for not meeting the requirements for materials in accordance with Section 5:52, the material should at least satisfy class D-s2,d0. *(BFS 2011:26).*

5:852 Separating structures

The equivalent safety level laid down in Sections 5: 543, 5:544, 5:546 and 5:547 concerning separating structures in occupancy classes 3, 4, 5B and 5C shall be achieved. *(BFS 2011:26).*

5:853 Automatic fire suppression system

The requirements for automatic fire suppression systems in occupancy classes 5B and 5C shall be met. *(BFS 2011:26).*

5:854 Exterior walls

General recommendation
If there are exceptional reasons for not meeting the requirements for protection against fire spread along the façade surface as specified in 5:551, the material should at least meet class D-s2,d2. *(BFS 2011:26).*

5:855 Altered use of attic

When the use of an attic is changed, the equivalent level of safety as specified in the requirements for escape routes in Section 5:5, and by the requirements for compartmentation in Section 5:53, shall be achieved. *(BFS 2011:26).*

5:86 Protection against the spread of fire between buildings

Buildings shall be designed with adequate protection against fire spread between buildings. *(BFS 2011:26).*

5:87 Ability for rescue responses

The equivalent level of safety as described in Section 5:722 second paragraph, 5:732 first paragraph and 5:733 shall be achieved. *(BFS 2011:26).*

5:9 *has been repealed by (BFS 2011:26).*

5:91 has been repealed by (BFS 2011:26).

5:911 has been repealed by (BFS 2011:26).

5:912 has been repealed by (BFS 2011:26).

5:92 has been repealed by (BFS 2011:26).

5:921 has been repealed by (BFS 2011:26).

5:922 has been repealed by (BFS 2011:26).

5:923 has been repealed by (BFS 2011:26).

5:93 has been repealed by (BFS 2011:26).

5:94 has been repealed by (BFS 2011:26).

6 Hygiene, health and environment

This section contains mandatory provisions and general recommendations pursuant to Chapter 3, Sections 9, 14 and 20 of PBO. Section 6:9 also contains regulations and general recommendations on Chapter 8, Section 7, of PBA. *(BFS 2011:26).*

6:1 General

Buildings and their installations shall be designed to ensure the quality of air and water, as well as light, moisture, temperature and sanitary conditions are satisfactory during the working life of the building, thereby avoiding conditions detrimental to human health.

General recommendation
The term 'health' refers to health as defined in PBA and includes e.g. the definition given in the Environmental Code (1998:808) insofar as this relates to health in terms of medical and hygienic aspects.

6:11 Materials

Materials and construction products used in a building shall not in themselves, or through their treatment, negatively affect the indoor environment or the local environment of the building, when the performance requirements of these regulations are met.

General recommendation
Rules for chemical substances and mixtures, and for chemicals in goods are primarily contained in Regulation (EC) No 1907/2006 of December 18 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), and in Regulation (EC) No 1272/2008 of December 16 2008 on classification, labelling and packaging of substances and mixtures.

Information about rules for chemicals in goods and products is available at The Swedish Chemical Agency. *(BFS 2014:3).*

6:12 Gamma radiation

The level of gamma radiation must not exceed 0.3 μSv/h in rooms where people are present other than occasionally.

6:2 Air

6:21 General

Buildings and their installations shall be designed to ensure they can provide the conditions for good air quality in rooms where people are present other than occasionally. The requirements for indoor air quality shall be determined on the basis of the room's intended use. The air must not contain pollutants in a concentration resulting in negative health effects or unpleasant odours.

General recommendation
The Swedish Work Environment Authority and the Public Health Agency of Sweden also issue regulations on air quality and ventilation.

When designing, it is important to take into account how air contaminants fluctuate over time and in different parts of the building. Possible local and temporary contamination can be taken care of by means of selective exhaustion, e.g. variable-speed kitchen and bathroom ventilation devices with possible high option of airflows. Materials, which do not emit large quantities of pollutants or emissions, should be selected at first hand to avoid an increased need for air change. *(BFS 2014:3).*

6:211 Scope of application

These rules apply to all rooms or separable parts of rooms where people are present other than occasionally.

6:212 Definitions

Occupied zone	The occupied zone in the room is enclosed by two horizontal levels, one 0.1 meters above floor level and the other 2.0 meters above floor level, and a vertical level either 0.6 meters from the exterior wall or other external limit, or 1.0 meters by windows and doors.
ventilation hatch	Openable vent, the sole purpose of which is to allow air to pass through the building envelope for temporary airing.

6:22 Properties of air supplied to rooms

Buildings and their installations shall be designed and located to ensure the concentration of pollutants in the air supply does not exceed the limit values for outdoor air.

Air supplied to rooms is not allowed to be treated in a way that result in air of poorer quality after treatment than the outside air supplied to the ventilation system. *(BFS 2014:3).*

General recommendation
Environmental quality standards for certain pollutants in outdoor air are contained in the Air Quality Ordinance (2010:477).

The quality of the air supplied to the building should be ensured through the appropriate location and design of the outdoor air intakes, intake chamber, supply air purifying or the like. The outdoor air intakes should be placed in such a way as to minimise the effect of exhaust gases and other sources of pollution. The height above ground, directions and the distance from traffic, exhaust air openings, waste water pipe aeration, cooling towers and chimneys should all be taken into account. Recommendations on the location and distance between exhaust air openings and outside air intakes are contained in Swedac's guidelines *R1 – Riktlinjer för specifikation av inneklimatkrav (R1 – Guidelines for specification of the indoor climate requirements)*.

6:23 Radon in indoor air

The annual average of the activity concentration of radon in the indoor air must not exceed 200 Bq/m^3. *(BFS 2016:6).*

General recommendation
Mätning av radon i bostäder – metodbeskrivning (*Measurement of radon in dwellings – method description)* and *Metodbeskrivning för mätning av radon på arbetsplatser (Method description for measurement of radon in workplaces)* are issued by the Swedish Radiation Safety Authority. Supplementary guidance to the method description for radon measurements in schools and pre-schools are issued by The Public Health Agency of Sweden.

Measures to limit inward leakage of ground radon should be performed. Such a measure can e.g. be sealing of penetrations in the building. The building should also be made as airtight as possible to the ground in other respects. *Radonboken – Förebyggande åtgärder i nya byggnader (The radon book – Preventive measures in new buildings),* Formas, can be used as guidance. *(BFS 2014:3).*

6:24 Micro-organisms

Buildings and their installations shall be designed to ensure micro-organisms cannot affect the indoor air quality to such an extent that harm to human health or annoying odours may arise.

Installations for cooling and humidification of the ventilation air shall be designed and located to ensure no harmful amounts of micro-organisms can be released into the ventilation air or the environment.

Measures taken to prevent the growth of micro-organisms must not in themselves give rise to adverse health effects.

General recommendation

The maximum permitted moisture levels in structural elements are contained in Section 6:52.

Installations for cooling or humidifying air with direct contact between water and air should take into account the risk of spreading legionella bacteria. See also Sections 6:62 and 6:63.

Water for humidifying or cooling should not emit harmful, irritating or odorous material into the indoor air.

6:25 Ventilation

Ventilation systems shall be designed to ensure the required outdoor air flow can be supplied to the building.

The ventilation system shall also be able to carry off hazardous substances, moisture, unpleasant odours and effluent from people and emissions from building materials, as well as pollutants from activities in the building to the extent such inconveniences is not carried of in other ways. *(BFS 2014:3).*

General recommendation

When designing ventilation flows in buildings, the environmental impact aspects of people, activities, added moisture, emissions from material, ground and water should be considered.

When selecting air filters for ventilation systems, SS-EN ISO 16890:2017 may be used as a guide.

Other ways to carry off inconveniences than through ventilation can be to use filters or dehumidifiers. Rules on efficient use of electricity are contained in Section 9:6.

Rules for protection against fire spread through HVAC systems installations are contained in Sections 5:526 and 5:533.

Rules for protection against noise is contained in Chapter 7. *(BFS 2018:4)*

6:251 Ventilation flow

Ventilation systems shall be designed for a minimum outlet air flow corresponding to 0.35 l/s per m^2 floor area. When used, rooms shall be able to have a continuous change of air.

In residential buildings where the ventilation can be controlled separately for each dwelling, the ventilation system is allowed to be designed with presence and demand control systems. However, the flow of outside air must not be lower than 0.10 l/s per m^2 of floor area when the dwelling is unoccupied and 0.35 l/s per m^2 of floor area when the building is occupied.

General recommendation

The requirements for ventilation flow should be verified by calculation and measurement.

When designing outlet air flow, account should be taken of the fact that the flow could be reduced due to dirt in ventilation ducts, changes in differential pressure over filters, etc.

For natural ventilation Boverket's Handbook *Självdragsventilation (Natural ventilation)*, can be used as a guide.

For buildings other than residential buildings, the ventilation system is allowed to be designed to ensure that a reduction of supply airflow, in multiple stages, continuous or by intermittent operation, is possible when the building is unoccupied.

General recommendation

After a period of reduced air flow, normal air flow should be provided at least for a period of such length as is required to achieve a complete change of the volume of air in the room before it is reused.

The reduction of the ventilation air flow is not allowed to cause adverse health effects. Nor should the reduction be allowed to bring about damage to the building or its installations due to moisture etc.

6:252 Air distribution

6:2521 Supply air

Supply air shall primarily be supplied in rooms or separable parts of rooms for everyday social contact and for sleeping and rest.

General recommendation
Rules on thermal comfort in terms of draughts are contained in section 6:42.

6:2522 Air transfer in rooms

The ventilation system shall be designed to ensure that the entire occupied zone is ventilated at the intended air flows.

General recommendation
The requirements in the provision can be satisfied if
- the local ventilation index is at least 90 % when using the Nord test method NT VVS 114, or
- air exchange efficiency is at least 40 % according to the Nord test method NT VVS 047.

6:2523 Internal air transfer

The spread of malodorous or insanitary gases or particles from one room to another shall be limited. Intentional air transfer should only be arranged from rooms with a more stringent requirement regarding air quality to rooms with identical or less stringent requirements.

General recommendation
The requirement regarding air quality is generally lower in for example kitchens and sanitary rooms compared with rooms for everyday social contact and rooms for sleeping and rest.

6:2524 Extract air

Extract air shall in the first instance be taken from rooms with a less stringent requirement regarding air quality. When calculating extract air flow volumes in sanitary rooms and kitchens, the environmental impact of moisture and the presence of cooking smells shall be considered. Ventilation in kitchens shall be designed to ensure good catching capacity in the cooking area is achieved.

General recommendation
If inconveniences to some extent is carried off in other ways than through ventilation, the mandatory provision's requirement for good catching capacity of the ventilation is met if the ventilation has good capacity to catch the inconveniences that is not carried of in other ways. An extract air device with sufficient capacity should be placed above the cooking area.
Rules for exhaust air are contained in Section 6:72.
Rules for noise from the building's installations are contained in Section 7.2. *(BFS 2014:3).*

6:2525 Recirculate air

Recirculate air to rooms shall have a good enough air quality that adverse health effects are avoided and unpleasant odours do not spread. Extract air from kitchens, sanitary rooms or similar spaces is not allowed to be returned. Recirculate air in dwellings is only permitted if the installation is designed to ensure air from one dwelling is returned to the same dwelling.

General recommendation
It should be possible to shut off the recirculate air flow if required.

6:253 Airing

Rooms or separable parts of rooms in homes for everyday social contact, food preparation, sleep, rest and rooms for personal hygiene, shall have the option of forced ventilation or airing. Airing shall be made possible by use of an openable window or ventilation shutter. It shall be possible to open windows and ventilation shutters to the outside or to a separate glazed balcony or outdoor space, which has an openable window or ventilation shutter to the outside. *(BFS 2016:6)*

6:254 Installations

Ventilation installations shall be situated and designed in such a way that they are accessible for maintenance and cleaning purposes. Main and connect ducts shall have stationary measure outlets for flow measuring.

General recommendation

For the appropriate design of duct systems and cleaning hatches, see SS-EN 12097.

Rules concerning the design of utility rooms are contained in Section 3:4.

Rules on execution, operating and maintenance instructions, etc, are contained in Sections 2:31 and 2:5.

Rules on noise from building installations are contained in Section 7:2.

6:255 Airtightness

Pressure conditions between supply air and extract air installations shall be adapted to the airtightness of the installation to ensure that transfer of extract air to the supply air does not occur.

General recommendation

To prevent pollutants from returning through heat exchangers where air can shift from the extract air side to the supply air side, the pressure level should be higher on the supply air side than on the extract air side.

The building envelope should have adequate airtightness in relation to the selected ventilation system to ensure good functionality and for adjusting flow in individual rooms. The airtightness of the building envelope should also be ensured with regard to the risk of damage due to moisture. Rules on airtightness of a building's envelope are contained in Section 6:531.

Measurements of leakage in sheet metal ducts can be made in accordance with SS-EN 12237. Additional information on airtightness testing of ventilation ducts are contained in the Formas publication *Metoder för mätning av luftflöden i ventilationsinstallationer (Methods for measuring air flow in ventilation installations) (T9:2007)* and instructions in *AMA VVS & Kyl 09* and SS-EN 15727.

6:72 Contaminated air

Exhaust air installations in buildings shall be designed to ensure unpleasant odours or pollutants are not reintroduced to air intakes, openable windows, doors, balconies or similar areas in the building, or to nearby buildings.

General recommendation

Exhaust air openings and air intakes should be designed in accordance with the Swedish Indoor Climate Institute's guidelines *R1 Klassindelade inneklimatsystem (R1 Classified indoor climate systems),* Figures B.6.1A and B.6.1B and Table B.6.1.

Venting of foul water installations based on gravity flow should be designed in accordance with SS-EN 12056-2.

Exhaust air from griddle plates or deep-fat fryers in restaurants, catering kitchens and similar establishments should be cleaned before discharge or dispersed at high altitude.

Particular attention should be taken with regard to the formulation of exhaust air from petrol or grease separators and individual drains.

6:3 Light

6:31 General

Buildings shall be designed to ensure satisfactory light conditions can be achieved without the risk of injury or human health hazards. The light conditions are adequate when sufficient light intensity and the correct brightness (luminance) is reached and when there is no glare or interfering reflections and therefore the appropriate lighting intensity and luminance distribution are present.

General recommendation
Additional rules for windows and lighting are contained in Sections 3:1224, 3:1424, 3:22, 3:42, 5:34, 5:35, 6:253, 8:21, 8:23, 8:24 and 9:52.

The Swedish Work Environment Authority issues regulations on light conditions in workplaces.

6:311 Definitions

Direct daylight	Light through windows directly from outside.
Direct sunlight	Non-reflected sunlight in rooms.
Indirect daylight	Light from the outside which enters the room, other than through the window to the outside.

6:32 Light conditions

6:321 Lighting

Lighting suitable for its intended use shall be arranged in all the spaces of the buildings. The requirement applies to the building as a whole.

General recommendation
SS-EN 12464-1 may be used in respect of lighting designing for indoor workplaces.

6:322 Daylight

Rooms or separable parts of rooms where people are present other than occasionally shall be designed and oriented to ensure adequate access to direct daylight is possible, if this does not compromise the room's intended use.

However, in common spaces according to Section 3:227, access to indirect daylight is sufficient. *(BFS 2016:6)*

General recommendation
For calculation of the area of the window glazing, a simplified method according to SS 91 42 01 can be used. The method applies for room sizes, window glazing, window placement and shielding angles according to the standard. When used, a general figure for the window glazing area in the room should be at least 10 % of the floor area. It entails a daylight factor of approximately 1 % if the conditions of the standard is met. For rooms with other conditions than those specified in the standard, the window glazing area can be calculated for the daylight factor 1.0 % according to the standard's annex. *(BFS 2014:3).*

6:323 Sunlight

At least one room or separable part of a room in dwellings, where people are present other than occasionally, shall have access to direct sunlight. However, student dwellings of not more than 35 m^2 is not required to have access to direct sunlight. *(BFS 2014:3).*

6:33 Views

General recommendation
At least one window in rooms or separable parts of a room where people are present other than occasionally should be situated to ensure the view provides the opportunity to follow the seasonal variations day and night. In dwellings, skylights should not be the only source of daylight in rooms, where people are present other than occasionally.

However, in dwellings intended for one person with common spaces according to Section 3:227, view is not required in common spaces for everyday social contact, cooking or meals. *(BFS 2016:6).*

6:4 Thermal climate

6:41 General

Buildings shall be designed to ensure that a satisfactory thermal environment can be achieved.

General recommendation

Adequate thermal environment means

– when thermal comfort in the occupied zone is achieved,

– when an appropriate climate for the building can be maintained in other spaces in the building with regard to the intended use.

Thermal climate also has an effect on the durability of the building.

The Swedish Work Environment Authority and The Public Health Agency of Sweden also issue regulations on thermal comfort. *(BFS 2014:3).*

6:411 Scope of application

The requirements on thermal climate apply for the entire building. The requirement for thermal comfort is applicable to rooms or separable parts of rooms where people are present other than occasionally.

6:412 Definitions/designations

Occupied zone	The occupied zone is enclosed by two horizontal levels, one 0.1 meters above floor level and the other 2.0 meters above floor level, and a vertical level 0.6 meters from the exterior wall or other external limit, or 1.0 meters by windows and doors.
Winter external design temperature, DVUT	The temperature, for the representative location, as shown in the 1-day value in "n-day mean air temperature" in accordance with SS-EN ISO 15927-5. The temperature may be increased if the building's time constant is greater than 24 hours. The increase is shown in the standard's reported temperatures for 2, 3 or 4 days. The building's time constant, measured in days, is used for selecting the corresponding table value (n-day). The temperature increase due to time constant higher than 96 hours can be determined through a special investigation.
Radiation asymmetry	Difference in thermal radiation to surrounding surfaces.

6:42 Thermal comfort

Buildings and their installations shall be designed in such a way that thermal comfort adapted to a space's intended use can be achieved under normal operating conditions.

General recommendation

Buildings for DVUT should be designed to ensure

– the lowest directed operative temperature in the occupied zone is estimated to be 18 ºC in residential and workrooms and 20 ºC in sanitary rooms and healthcare facilities and in rooms for children in preschools and for the elderly in service buildings and similar establishments,

– the difference in directional operative temperature at different points in the occupied zone of the room is calculated at a maximum of 5K and

– the surface temperature of the floor beneath the occupied zone is calculated at a minimum of 16 °C

(in sanitary rooms at a minimum of 18°C and in premises utilised by children at a minimum of 20°C) and can be restricted to a maximum of 26 °C.

Moreover, the calculated air velocity in the occupied zone of a room should not exceed 0.15 m/s during the heating season and air velocity in the occupied zone from the ventilation systems should not exceed 0.25 m/s at other times of the year.

6:43 Heating and cooling requirements

Heating installations shall be designed to ensure they can achieve the heat effect requirement needed to maintain thermal comfort in accordance with Section 6:42.

Potential cooling devices shall be designed in such a way that troublesome radiation asymmetry, wind and thermal draughts are avoided.

General recommendation
Rules for refrigerating agents are issued by the Swedish Environmental Protection Agency.

6:5 Moisture

6:51 General

Buildings shall be designed to ensure moisture does not cause damage, odours or microbial growth, which could affect hygiene or health. *(BFS 2014:3).*

General recommendation
The requirements in Section 6:5 should be verified at the design phase with the aid of moisture safety design. Measures taken at other stages of the building process also affect the moisture safety. During planning, design, execution and control of moisture safety, *Branschstandard ByggaF – metod för fuktsäker byggprocess (Industry standard ByggaF – method for moisture safe building process) can be used as guidance.*

Buildings, building components and building materials should be protected against moisture and dirt during construction. Documented inspections, measurements or analyses should be carried out to ensure that materials are not damaged by moisture during construction.

The design of structural elements and building components that are of importance for future moisture control should be documented. *(BFS 2014:3).*

6:511 Definitions

Moisture level	The level of moisture in a material. The level of moisture for materials can be described as moisture content mass by volume, moisture content mass by mass, relative humidity, etc.
Critical moisture level	The moisture level when a material's intended properties and function are no longer met. For microbial effect, the level of moisture is critical when growth occurs. Factors of importance for biological growth, such as temperature and duration and their interaction can be included in the determination of the critical moisture level.
Moisture safety design	Systematic measures at the design phase aimed at ensuring that a building is not damaged directly or indirectly by moisture. Conditions, which apply to the construction and management phase to ensure moisture safety in buildings are also specified in this stage.

6:52 Maximum moisture levels

The maximum permitted moisture level is the upper limit where moisture not can be expected to cause damages that affect hygiene or health.

Critical moisture levels shall be used to determine the maximum permitted moisture level, where uncertainty in the calculation model, input parameters or measuring methods shall be taken into account.

Well-researched and documented critical moisture levels shall be used for materials and products where mould and bacteria can grow. A critical moisture level shall be determined taking account of possible contamination of the material or the product. If the critical moisture level is not well-researched and documented, a relative humidity (RH) of 75 % shall be used as the critical moisture level. *(BFS 2014:3).*

General recommendation
For the determination of critical moisture levels for a material or a product, consideration may need to be taken to
- when the growth of mould and bacteria begins,
- when unacceptable chemical and electrochemical reactions take place,
- when unacceptable moisture movement takes place,
- when transport processes for moisture, ions and other water-soluble substances are affected to an unacceptable extent,
- changes in mechanical properties,
- changes in thermal properties,
- infestation rot fungus, and
- infestation of wood destroying insects.

A method for determining critical moisture levels is contained in the report *Bestämning av kritiskt fukttillstånd för påväxt av mögel på byggnadsmaterial (Determination of the Critical Moisture Level for mould Growth on Building Materials). (BFS 2014:3).*

6:53 Moisture safety

Moisture levels in a building component shall not exceed the maximum permitted moisture levels for the materials and products included in the building component. This is not applicable if it is irrelevant to hygiene and health.

The moisture level shall be determined based on the moisture loads that can be expected to affect the building during adverse conditions. *(BFS 2014:3).*

General recommendation
In the design phase, the building components moisture levels should be controlled and the moisture safety of the building should be verified through a moisture safety design. It can be done in the following three principally different ways which can be combined
- quantitative determination,
- proven solution,
- qualitative assessment.

Common for the three ways is that the work with moisture safety should be performed in a systematic way through the entire building process.

Quantitative determination means to check the building components through calculations or tests. Calculations show expected moisture distributions and moisture levels in the building component The plausibility of the calculations should be assessed. Tests are performed through measurements and controlled observations on materials and products, building components or buildings. The test results show for example moisture distribution, moisture levels and if water in an unexpected way can penetrate a building component under the conditions that the test is performed. Consideration should be taken to the measurement uncertainty of the test results.

Proven solution means to check the building component against documented and verified experience from similar building components with comparable climate impact. A proven building component should be controlled and documented for a sufficient time (normally at least 10 years) and have functioned without problems. Included materials and products should not have aged in an unpredictable way during that time.

Qualitative assessment means to check the building component against applicable instructions and design examples from industry guidelines, handbooks and test results. These should be controlled through quantitative determination or evaluated as proven solutions.

In design and execution, consideration should be taken to the combination of materials, joints and connection details that are included in the building. This is so that the moisture levels in

materials and material limits should not, in an unpredictable way, exceed the maximum permitted moisture levels under such a long time that damage can occur.

Sometimes it can take a long time for a building component or a construction detail to become moist. This should be taken into account when comparing the calculated or the estimated moisture level with the maximum permitted moisture levels.

Some building details are placed so that microbial growth normally can't affect hygiene and health and they are not included in the requirement for maximum permitted moisture levels. Examples are well ventilated and drained façade claddings and roof coverings, and eaves and other components outside the façade.

Examples of sources of moisture important for the moisture levels in the building components are

–rain or snow
- air humidity, outdoors and indoors,
- water in the soil (liquid and vapour phase) and on the soil surface,
- construction moisture,
- water from installations etc.,
- moisture associated with cleaning.

Additional information on the environmental impact of moisture is contained in the Swedish Building Centre handbook *Fukthandbok – praktik och teori, avsnitt 51 (Moisture Handbook – practice and theory, Section 51). (BFS 2014:3).*

6:531 Airtightness

General recommendation

To prevent damage due to convection of moisture, the parts of the building that separate spaces with different climatic conditions should have as high airtightness as possible. In most buildings, the risk of convection of moisture is greatest in the building's upper parts, i.e. where internal excess pressure may be prevalent.

Particular care should be taken to ensure airtightness where the environmental impact of moisture is great such as in public baths or where temperature differences are particularly great.

Airtightness can affect the moisture level, thermal comfort, ventilation and a building's heat loss.

Method for determining air leakage is given in SS-EN ISO 9972:2015. When determining air leakage, it should also be investigated if the air leakage is concentrated to any building component. If this is the case, there may be a risk of moisture damage. *(BFS 2017:5).*

6:532 Ground and building components

6:5321 Surface water drainage

To avoid damage to a building from moisture, the adjacent ground surface shall be given an incline to drain away surface water or should be provided with devices to collect and divert surface water, unless the building is designed to withstand water pressure.

General recommendation

The slope of the adjacent ground surface should have an incline of 1:20 to a distance of three meters from the building. If it is impossible to create such a slope, a cut-off trench should be provided.

Rules on access to buildings are contained in Section 3.

6:5322 Drainage

General recommendation

Buildings not designed to withstand water pressure should have a drainage layer adjacent and underneath the building as well as around drainage pipes that is permeable enough to collect and drain off the appropriate quantities of water to draining pipes or corresponding systems.

Guidance on how drainage can be conducted is contained in the Swedish Building Centre's handbook *Fukthandbok – praktik och teori (Moisture Handbook – practice and theory)*, Section 39:4.

Regarding installations for drainage water, see also Section 6:643.

6:5323 Foundation and structural floor

It shall be possible to inspect the crawl spaces in their entirety.

General recommendation

A foundation should be designed with a capillarity barrier.

Particular attention should be taken to ensure that the maximum permitted moisture level is not exceeded in outdoor air-ventilated crawl space foundations.

Section 3:4 deals with the utility rooms.

The final check to ensure that the concrete has dried sufficiently, e.g. before flooring, should be carried out by moisture measurement. Guidance on how to carry out moisture measurements in concrete is contained in the Sveriges Byggindustrier's handbook *Manual – Fuktmätning i betong (Manual – moisture measurement in concrete)*.

Rules for the use of pressure impregnated timber are issued by the Swedish Chemicals Inspectorate.

6:5324 Walls, windows and doors etc.

Façade claddings shall be arranged to ensure that moisture from the outside cannot affect materials and products that are located inside the façade cladding to such an extent that the maximum permitted moisture level is exceeded. This also applies to windows, doors, fittings, ventilation devices, joints and other details, which go through or are connected to the wall or other building components. *(BFS 2014:3)*.

General recommendation

Façade claddings consisting of wooden panels, boards and similar materials, as well as cavity walls and plastered frame walls, are examples of structures that should be designed with capillary break and drainage between the façade cladding and the frame structure’s frame protection, so that penetrating moisture is led out of the building. Such structures should be designed so that dehydration av penetrating moisture happens fast enough even at local moisture impact.

Walls of materials with moisture from the construction process, on which fixed moisture-sensitive fittings, etc. are installed, should be given the opportunity to become dry, otherwise moisture-sensitive materials and products should be protected.

The distance between the ground surface and the lower edge of moisture-sensitive façades should be at least 20 cm to ensure sprinkles of rain do not cause the façade to become damp or dirty.

Rules on accessibility to buildings are contained in Section 3:13 and rules on accessibility in buildings are contained in section 3:14. *(BFS 2014:3).*

6:5325 Roofs and attic spaces

General recommendation

When selecting materials and designing components for roofs, the pitch of the roof should be taken into account.

If the roof covering is made from material which can be damaged by ice, this should be considered when the roof is designed.

It shall be possible to inspect attic spaces in their entirety unless this is clearly unnecessary.

General recommendation
If the entire attic space is clearly visible, the requirement is considered met. Section 3:4 deals with the utility rooms.

Attic spaces over thermally insulated attic building floors should be arranged to ensure moisture does not cause growth of mould and bacteria.

With cold roofs and well-insulated building floors there is an increased risk of microbial growth, e.g. on the inside of the roof. Particular care should be taken to ensure airtightness if the insulation of the attic building floor is increased.

If the attic structural floor is made of materials with moisture from the construction process, e.g. concrete or aerated concrete, which can cause damage to materials, the evaporation of moisture into the attic space should be minimised.

6:533 Spaces with requirements for watertight or water-repellent layers

6:5331 Watertight layers

Floors and walls that will be exposed to water flushing, water spills or leaking water shall have a watertight layer that prevents moisture from coming into contact with building components and spaces that cannot withstand moisture. Watertight layers shall be resistant to alkalinity from concrete and mortar, water, temperature fluctuations and movements in the structural frame, and have sufficiently high water vapour resistance. Watertight layers shall also be able to cope with vibrations from normal equipment in the space. Joints, connections, attachments and penetrations in watertight layers shall be waterproof.

General recommendation
If moisture-sensitive material is placed between two tight materials, for example, between a vapour barrier and a watertight layer, it should be verified, e.g. with moisture safety design, that the highest permitted moisture level for the material has not been exceeded.

The water vapour resistance of the watertight layer should be higher than $1 \cdot 10^6$ s/m ($1.35 \cdot 10^{11}$ m^2 s·Pa/kg) unless it is shown at the moisture safety design that a different vapour penetration resistance may be used. The water vapour resistance should be determined under conditions which are similar to the relevant case, e.g. between 75 % and 100 % RH.

A method for the assessment of water-tightness of joints in plastic bathrooms coverings is given in SS 92 36 21. The standard also applies to painted wall surfaces.

At present, for watertight layers made from liquid applied coverings under or behind ceramic materials, there is no suitable measurement method with which to check the tightness of the finished sealing layer compound. A visual inspection of the membrane and its connections ahead of the ceramic tiles and tiling should be conducted where possible. The check of whether the correct quantity of liquid applied coverings compound has been used per unit area should be documented.

Penetrations and attachments in watertight layers should be avoided in places, which could be covered with water or subject to splashing water. Joints should be situated in places, which are least subject to be covered with water. For penetrations in the floor's watertight layer, a seal should be in place to the pipe penetration and the watertight layer.

Bathrooms and shower rooms are spaces where watertight layers for walls and floors are normally required. Laundry rooms, spaces for water heaters and toilets are spaces where a watertight layer on the floor is normally required. The junction of the watertight layer should be run up the wall.

Rules on replaceability are contained in Section 2:2 and regulations on design and construction in Section 2:31.

Rules on accessibility and usability in sanitary rooms are contained in section 3:14. *(BFS 2014:3).*

6:5332 Water-repellent surface layers

Floors, walls and ceilings subject to splashes of water, wet cleaning, condensation water or high humidity shall have a water-repellent surface layer.

General recommendation
If moisture-sensitive material is placed between two tight materials, for example between a vapour barrier and a sealed, water-repellent surface layer, it should be verified that the maximum permitted moisture level for the material has not been exceeded.

Joints should be situated in places which are least subject to water. For penetrations in the floor's water-repellent surface layer, a sealing should be in place to the pipe penetration and the substrate.

Laundry rooms and spaces for water heaters are spaces where water-repellent layers on the walls are normally required. Floors should also be provided with water-repellent layers in spaces where moisture causes a greater environmental impact than normal, e.g. back door entrances.

6:5333 Underlayments for watertight layers

Underlayments for the watertight layers shall be suitable for their use.

General recommendation
For stiff wall coverings such as ceramic tiles and natural stone that are fixed to a watertight layer, the foundation should also be rigid.

Frame structures and board structures should be designed with sufficient rigidity so that harmful deformations do not occur, even if it means that the load-bearing capacity will higher than the load requires. Boards should be dimensionally stable for the moisture loads they are expected to be exposed to. Where liquid applied covering is applied to a building floor, account should be taken to the reciprocal movements of the building floor and the walls, to ensure the liquid applied covering is not affected negatively. This can be done, for example, by adjusting the anchoring between the wall and the building floor to the properties of the liquid applied covering. *(BFS 2014:3).*

6:5334 Concealed surfaces in rooms or building components

If there is a risk of leaking water or condensation on concealed surfaces in rooms, the outlet from these surfaces shall be arranged to ensure water is quickly made visible. *(BFS 2014:3).*

General recommendation
A watertight layer should be placed under dishwashers, sink units, refrigerators, freezers, ice machines or similar. The layer should be sealed at penetrations and have a wall/floor junction to the wall and other concealed surfaces to a sufficient extent to protect them.

Rules on leaking water from tap water installations are contained in Section 6:625. *(BFS 2014:3).*

A building component shall be designed with watertight layer in such extent that leaking water or condensation water from a tap water installation inside the building component is prevented from coming into contact with materials and products which cannot withstand moisture.

The building component or installation shall be designed to ensure that leakage is quickly made visible and condensation water is dried or led out of the building component to a drain so that growth of algae, mould or bacteria cannot occur. *(BFS 2014:3).*

General recommendation
A building component with a built-in flush tank to a toilet should be designed with a watertight layer.

A leakage safety box, distribution box or seamless safety conduit that including connections have well researched and documented properties for water tightness and durability can be used as watertight layer. *(BFS 2014:3).*

6:5335 The diversion of water to a floor drain

In spaces with a floor drain, the floor and the watertight layer shall have an incline to the floor drain in those parts of the space which are regularly covered with water or overflow water. A negative incline must not occur in any part of the space.

General recommendation
In connection to the floor drain, the incline of the floor in the shower section or corresponding area should be at least 1:150 to ensure drainage and at most 1:50 to reduce the risk of accidents. Other floor surfaces should slope towards the floor gully. Account should be taken of possible deformation of the building floor.

In those parts of the floor, which are regularly exposed to water spray or water spills , it may only be made penetrations of drainage devices. Floor drains shall be anchored in the subfloor structure in such a way that reciprocal movement does not occur between the drain unit, the subfloor, the watertight layer and the floor covering.

General recommendation
The anchoring of the floor drain unit and position in terms of height and ground plane should be inspected before the watertight layer is applied.

6:5336 Cleanability

In wet rooms the surface layer, joints, connections and penetrations shall be arranged to ensure they can be easily kept clean and not provide a favourable environment for microbial growth.

6:6 Water and drainage

6:61 General

Buildings and their installations shall be designed to ensure water quality and hygiene conditions satisfy public health requirements.

6:611 Scope of application

The rules in this Section apply to installations for water and drainage in buildings as well as in building sites.

6:612 Definitions

Cold tap water	Cold water of drinking water quality.
Hot tap water	Heated cold tap water.
Tap water	Generic term for cold and hot tap water.
Other water	Water which does not meet the requirements for tap water but which can be used for heating, cooling, flushing toilets, washing machines, etc. where the requirements for water quality depend on the purpose and where the water does not necessarily have to be tap water.

6:62 Tap water installations

Tap water installations shall be designed to ensure tap water, after the water outlet, is hygienic and safe, and comes in a sufficient quantity. Cold tap water shall meet the quality requirements for drinking water after the water outlet. Hot tap water shall be hot enough to allow personal hygiene and household chores.

Tap water installations shall be designed using materials that ensure that detrimental concentrations of harmful substances cannot be dissolved in the tap water. Installations shall not impart odour or taste to the tap water.

General recommendation

The amount of dissolved lead in the water should not exceed the values in table 6:62, when tested according to NKB 4 or according to SS-EN 15664, The values refer to the taps where drinking water is normally taken, e.g. in kitchens and wash basins. Other test methods than the ones referred to in the table can be used if they show that the requirements of the mandatory provision are met. *(BFS 2014:3).*

Table 6:62 The amount of dissolved lead in the water for taps where drinking water is normally taken, e.g. in kitchens and sinks.

	Lead value in µg in the tap's water amount. Subdivision and test method according to NKB 4.	**Lead value in µg/l. Testing according to SS-EN 15664**
Tap	5 µg	
Material		5 µg/l

(BFS 2014:3).

Rules on drinking water are issued by National Food Agency, Sweden. *(BFS 2014:3).*

6:621 Hot water temperatures for personal hygiene and household purposes

Installations for hot tap water shall be designed to ensure a water temperature of at least 50 °C can be achieved after the water outlet. To reduce the risk of scalding, the maximum hot tap water temperature must not exceed 60 °C after the water outlet.

However, the hot tap water temperature must not be higher than 38 °C if there is a particular risk of accidents occurring. Devices for regulating hot tap water shall be designed to minimise the risk of personal injury from mistaking hot tap water for cold tap water.

General recommendation

Fixed showers, which cannot be regulated from outside the shower space and showers for people who cannot themselves be expected to be able to regulate the temperature themselves are examples of specific accident risks.

6:622 Microbial growth

Tap water installations shall be designed to ensure that the opportunities for growth of micro-organisms in the tap water are minimised. Cold tap water installations shall be designed in such a way that the cold tap water cannot be heated accidentally. Circulation pipes for hot tap water shall be designed in such a way that the temperature of the circulating hot tap water does not drop below 50 °C in any part of the installation.

General recommendation

Tap water installations should be flushed before operation, to reduce the risk of growth of i.a. legionella bacteria. If the water has been stagnant during the construction phase where the ambient temperature has been in excess of 20 °C, the installations may also need disinfecting. Examples of how installations are flushed and disinfected are contained in SS-EN 806-4, Section 6.6.

To reduce the risk of the growth of the legionella bacteria, among others, in cold tap water, cold tap water installations should not be located in places where the temperature is higher than room temperature. There is a risk, for example in warm shafts or in heated floors, in which installations for hot tap water, hot tap water circulation and radiators are situated. If it is not possible to avoid placing cold tap water installations in such locations, all installations should be designed and insulated to ensure increases in cold tap water temperatures are kept to a minimum. In that case, the installations' design and insulation should be dimensioned so that the cold tap water can be stagnant for 8 hours without the temperature of the cold tap water exceeding 24 ˚C.

All pipelines for hot tap water circulation should have the facility for measuring water temperature.

To prevent harmful quantities of legionella bacteria in installations where hot tap water is stationary, among others in heaters or accumulators for heating e.g. by means of electricity, solar

power, wood, heat pumps and district heating, the hot tap water temperature shall not drop below 60 °C.

Towel dryers, underfloor heating and other heaters should not be connected to hot tap water circulation pipes.

Cut off ends, i.e. pipelines, which are not connected directly to the water outlets, in hot tap water installations should be short enough to ensure that the water temperature in these cut off ends does not drop below 50 °C.

Common pipelines for multiple shower places with a maximum temperature of 38 °C should not be longer than 5 meters. *(BFS 2014:3).*

6:623 Tap water flow

Water outlets shall be designed in such a way that water flows remain adequate without causing interfering noise or corrosion due to high water velocity. The design shall also minimise the risk of dangerous surge pressure. Hot tap water at the correct temperature shall be provided without having to wait an inconvenient amount of time.

General recommendation

For dwellings, the requirement of the mandatory provision for water flow at the water outlet for both hot and cold water is met if the draw-off flow is 0.1 l/s for wash basin and bidet, 0.3 l/s for bath tubs and 0.2 l/s for other water outlets. For water outlets in dwellings with cold water only, the requirement of the mandatory provision is met if the draw-off flow is 0.1 l/s for toilet and wash basin and 0.2 l/s for other water outlets.

For the tap water system as a whole, the requirement of the provisions is met if at least 70 % of each water draw-off flow-rate can be achieved when a likely percentage of connected water outlets are opened simultaneously.

A water heater, which only serves a one dwelling house should be designed to ensure for a maximum period of 6 hours, it can heat cold tap water at 10°C to ensure two water draw-offs can each maintain a 140 l flow of mixed hot and cold tap water at 40 °C in one hour.

The design of water pipes and the placement of water heaters should ensure that hot tap water can be obtained within approximately 10 seconds with a flow of 0.2 l/s. However, this does not apply if the hot tap water is heated for a single dwelling house.

Rules on noise from building installations are contained in Section 7:2. *(BFS 2014:3).*

6:624 Back flow

Tap water installations shall be designed in such a way as to prevent back flow of contaminated water or other liquids. Installations shall be designed to ensure gas penetration or leaking of liquids cannot occur.

General recommendation

Installations should be designed in accordance with SS-EN 1717. With regard to the selection of protection modules for filling heating systems, account should be taken to the size of the heating system and possible additives to the hot water.

6:625 Design

Tap water installations shall be designed and made from materials which have adequate durability against the external and internal mechanical, chemical and microbial processes to which they are likely to be exposed.

The risk of damage to nearby structural elements or other inconvenience caused by freezing, condensation or as a result of escaping water shall be limited. *(BFS 2014:3).*

General recommendation

Tap water pipes and joints on such pipes should be designed and placed to ensure any leaking water from the pipes can quickly be discovered and to ensure the water does not cause any damage. Tap water installations that are concealed and cannot be inspected, e.g. in shafts, walls, building floors or behind fixtures, should be made without joints.

The shaft for tap water pipes should be easily accessible and designed with a leak indicator, such as a pipe with sufficient capacity which discharges into rooms with floor gullies or watertight

floors. Rules on the replaceability of installations are contained in Section 2:2 and regulations on design and construction in Section 2:31. Rules on concealed surfaces in rooms or construction elements are contained in Section 6:5334. *(BFS 2014:3).*

Stop valves and facilities for draining the tap water system shall be installed to the required extent.

General recommendation
Dishwasher and washing machine connections, etc., should be fitted with stop valves which have visible and easily accessible actuation. Stop valves should be installed to ensure that tap water to individual apartments can be shut off on an individual basis. *(BFS 2014:3).*

Tap water installations shall be designed for a static water pressure of at least 1 MPa and take into account the consequences of impacts of surge pressure.

General recommendation
Plastic pipes for hot tap water installations should be designed to withstand the static pressure of 1 MPa at a temperature of 70 °C.

Flexible hose sets must not be used to connect tapping valves, mixers or similar appliances.

Pipelines in tap water installations shall be run to ensure the necessary provision is made for expansion.

Fixed equipment connected to a water installation and placed in a space without a floor gulley, shall be provided with protection to prevent unintentional discharge of water.

General recommendation
Washing machines and water heaters should be placed in spaces with floor gulleys.

6:626 Documentation and commissioning

General recommendation
An inventory, assessment and documentation of the risks for growth of legionella bacteria in tap water installations should be conducted in multi-dwelling blocks, hospitals, hotels, sports halls, swimming baths and special forms of dwellings for the elderly. This should also be undertaken for water installations which spread aerosols, e.g. whirlpool baths, open cooling towers and humidifier installations. The documented risk assessment should contain measurements of water temperatures and legionella bacteria during the commissioning.

Rules on operation and maintenance are contained in Section 2:51.

6:63 Other water installations

Other water installations must not be connected to tap water installations.

General recommendation
Other water installations should meet all requirements set out in Section 6:62 unless the area of application permits otherwise.

6:631 Marking

All component parts of installations for other water shall be marked along their entire length so as not to be confused with tap water installations.

6:632 Microbial growth

Other water installations shall be designed to ensure the opportunities for growth of micro-organisms are minimised.

General recommendation
Process water is an example of installations where the growth of legionella bacteria can occur.

6:64 Waste water installations

6:641 Waste water installations

Waste water installations shall be designed to ensure waste water can be discharged without the installation or sewage plant being damaged and to ensure their functions are not affected.

Waste water installations shall be designed in such a way that they can continuously drain at least 150 % of the draw-off flow-rates of the water outlets. However, the rate of waste water must not be so small that it cannot remove the impurities for which the installation is intended. Odours must not be spread in the drainage system.

General recommendation

Installations for the diversion of waste water by gravity flow systems can be designed in accordance with SS-EN 12056 Parts 1 and 2.

For the design of gravity sewers for gravity systems, the following shall be considered

- pipe size should not decrease in the flow direction,
- pipes from toilets should have a dimension (pipe designation) of at least 100 mm,
- pipes in the ground should have a dimension (pipe designation) of at least 75 mm.

Water outlets and safety valves shall be provided with drainage devices, unless the waste water can be dissipated by other means without any inconvenience.

General recommendation

Washing machines and water heaters should be placed in spaces with a floor gulley. *(BFS 2014:3).*

Safety devices, such as sprinklers, emergency showers and fire hydrants do not require such discharge units.

In apartments, at least one space used for personal hygiene shall be provided with a floor gulley.

In gravity drainage systems, the discharge unit shall be connected in such a way that waste water from a discharge unit with a water seal cannot enter the water seal of another discharge unit.

Discharge units where waste water can cause inconvenience due to odours must not be connected to the floor gulley.

Discharge units for waste water which could contain inflammable or explosive liquids must not be fitted with water seals. Outlets from toilets must not be connected to a petrol, oil or grease separator.

In foul water installations where the water can contain more than insignificant quantities of hazardous substances, the waste water shall be treated or separators installed. The design of separators shall ensure that the separated material cannot be released unintentionally or in an uncontrolled manner.

General recommendation

Separators should be installed if the waste water could contain more than insignificant amounts of

- sludge or solid particles that could be a real risk for deposits
- grease or other substances that are separated at waste water cooling
- petrol or other flammable or explosive liquids

or

- oil and other water-insoluble substances.

Grease separators can be designed in accordance with SS-EN 1825-2. Oil and petrol separators can be designed in accordance with SS-EN 858-2.

Waste water installations for gravity shall be designed and vented to prevent pressure changes that break water seals. Vent pipes shall be arranged to ensure they do not cause inconvenience due to odours or condensation on structural elements. Gravity drainage systems must not be vented via the ventilation system of the building.

General recommendation

Separators containing inflammable or explosive gases, oil or grease, or that may develop excess pressure should be vented by separate vent pipes.

6:642 Surface water installations

Surface water installations shall be able to drain away rainwater and melt water to ensure the risk of flooding, accidents or damage to buildings and the ground are limited.

General recommendation
Installation for rainwater can be planned in accordance with SS-EN 12056-1 and 12056-3.

Surface water installations shall have devices for separating or processing of substances that may interfere with the functionality or damage the installation, waste water plant or receiver.

General recommendation
Separators should be provided if the surface water could contain more than insignificant quantities of petroleum products, sludge or solid particles. *(BFS 2014:3).*

6:643 Drainage water installations

Drainage water shall be discharged either by gravity directly into the ground if this can be done without affecting the drainage, or to pipes carrying surface water.

Pipes for drainage water shall be provided with a sludge trap placed before their connection to the surface water drain.

General recommendation
For drainage see also Section 6:5322.

6:644 Design

Waste water installations shall be designed and made from materials which have adequate durability against the external and internal mechanical, chemical and microbial processes to which they are likely to be exposed. The risk of damage to nearby structural elements or other inconvenience caused by freezing, condensation or as a result of escaping water shall be limited. Pipelines in waste water installations shall be run to ensure the necessary provision is made for expansion.

Waste water installations shall be designed to ensure sludge deposits do not reduce the capacity and cleaning devices are accessible. It shall be possible to clean the installation with cleaning equipment in general use.

General recommendation
Floor gullies should be situated to ensure they are easily accessible for cleaning when they are alongside bath tubs, shower cabinets, washing machines and similar appliances.

Rules on the replaceability of installations are contained in Section 2:2 and regulations on design and construction in Section 2:31.

6:7 Discharges to the environment

6:71 General

Buildings shall be designed in such a way that pollutants, which may occur as a result of the activities in the building, can be removed without any adverse effects with respect to the health and hygiene of people in the building or in the surroundings of the building. The discharge must not have an adverse effect on the ground, water or air in the surroundings of the building either.

General recommendation
Pollutants refer to contaminated air, waste water and combustible gases, among others.

6:72 Contaminated air

Exhaust air installations in buildings shall be designed to ensure unpleasant odours or pollutants are not reintroduced to air intakes, openable windows, doors, balconies or similar areas in the building, or to nearby buildings.

General recommendation
Exhaust air openings and air intakes should be designed in accordance with the Swedish Indoor Climate Institute's guidelines *R1 Klassindelade inneklimatsystem (R1 Classified indoor climate systems),* Figures B.6.1A and B.6.1B and Table B.6.1.

Venting of foul water installations based on gravity flow should be designed in accordance with SS-EN 12056-2.

Exhaust air from griddle plates or deep-fat fryers in restaurants, catering kitchens and similar establishments should be cleaned before discharge or dispersed at high altitude.

Particular attention should be taken with regard to the formulation of exhaust air from petrol or grease separators and individual drains.

6:73 Waste water

Waste water installations shall be designed in such a way that waste water is either carried away via the municipal sewerage system or purified via private sewerage systems.

The connection to the municipal sewerage system shall be made above the backwater level of the municipal sewerage system.

General recommendation
Rules on private sewerage systems are issued by the Swedish Agency for Marine and Water Management.

6:74 Combustion and combustible gases

Inconvenience caused by the contents of fumes and gases emitted from buildings shall be limited.

6:741 Solid fuel heating

6:7411 Solid fuel boilers

From buildings with solid fuel boilers with a nominal power (Q) of up to 500 kW, the emissions of particles, organic gaseous compounds (OGC) and carbon monoxide (CO) may, as a maximum, amount to the values stated in Table 6:7411. *(BFS 2017:5).*

Table 6:7411 Maximum permitted values for emissions of particles, organic gaseous compounds (OGC) and carbon monoxide (CO)

Nominal power Q≤500 kW	**Particles mg/m^3**	**OGC mg/m^3**	**CO mg/m^3**
	The values apply to dry gas at 10% O_2. The values are corrected to 1013 hPa and 0 °C (273 K).		
Manually fed boilers	60 mg/m^3	30 mg/m^3	700 mg/m^3
Automatically fed boilers	40 mg/m^3	20 mg/m^3	500 mg/m^3

(BFS 2017:5).

The efficiency at nominal power may not be lower than 87 per cent for solid fuel boilers with a power of less than 100 kW, and no lower than 89 per cent for solid fuel boilers with a power from 100 kW and up to 500 kW. *(BFS 2017:5).*

General recommendation
Determination of emissions of particles, OGC and CO from solid fuel boilers and of the efficiency should be done in accordance with SS-EN 303-5:2012. Other test methods than those stated in SS-EN 303-5:2012 may be used if they show that the regulation's requirements are met.

Solid fuel boilers with manual fuel supply should be designed with an accumulator or equivalent that enables good energy conservation. *(BFS 2017:5).*

6:7412 Space heating appliances

From buildings with space heating appliances, the emissions of carbon monoxide (CO) at nominal power may, as a maximum, amount to the values stated in Table 6:7412. The efficiency at nominal power may not be lower than that stated in the Table. *(BFS 2018:4).*

Table 6:7412 Maximum permitted values for emissions of carbon monoxide (CO) and levels of the minimum permitted efficiency at nominal power

	CO vol. % (max) The values apply to dry gas at 13 % O_2	**Efficiency % (min)**
Solid fuel room heaters	0,12 vol.%	65 %
Wood pellet room heaters	0,024 vol.%	79 %
Kitchen boilers	0,12 vol.%	65 %
Solid fuel cookers	0,12 vol.%	65 %
Fireplace inset appliances	0,12 vol.%	65 %

(BFS 2018:4).

General recommendation
Determination of emissions of CO from space heating appliances and of the efficiency should be done in accordance with SS-EN 13240, SS-EN 14785, SS-EN 12809, SS-EN 12815 and SS-EN 13229. *(BFS 2018:4).*

6:742 Oil heating

From buildings with oil heating devices with a power up to 400 kW, the emission of total hydrocarbons (THC), carbon monoxide (CO) and nitrogen oxides (NOx) and the soot figure may, as a maximum, amount to the values stated in Table 6:742. *(BFS 2017:5).*

Table 6:742 Maximum permitted values for emissions of total hydrocarbons (THC), carbon monoxide (CO) and nitrogen oxides (NO_x) as well as for the soot figure.

Total hydrocarbons (THC)	10 ppm
Carbon monoxide (CO)	110 mg/kWh
Nitrogen oxides (NO_x)	250 mg/kWh
Soot figure	1

(BFS 2017:5).

General recommendation
Testing of oil heating devices should be done in accordance with SS-EN 303-2 and SS-EN 304.

For some boilers, the applicable regulations are given in Boverket's mandatory provisions and general recommendations (2011:11) regarding procedures for the assessment of conformity for new boilers fuelled by liquid or gaseous fuel, EVP. *(BFS 2017:5).*

6:8 Protection from vermin

6:81 General

Buildings shall be designed to make it more difficult for vermin to enter the building and in its building parts, if it is not unreasonable with regards to the building's design and use.

Apartment separation structures shall be designed with sufficient impenetrability and durability against damages caused by vermin.

Vermin refers to animals that can cause damages, odour or microbial growth that can affect human hygiene or health. *(BFS 2014:3).*

General recommendation

Examples of animals that can become vermin are birds, rats, bats and certain insects, including wasps and old house borer.

Buildings that only have a roof or trellis walls are examples of buildings where the requirement for protection from vermin is unreasonable.

Vents, ventilation hoods and similar openings may be fitted with a durable metal mesh with a maximum mesh width of 5 mm and with an insect-proof screen. Ventilation slits to attics may be fitted with insect proof screens. *(BFS 2014:3).*

6:9 Requirements for hygiene, health and environment during alterations to buildings

This section contains, in addition to what is specified in Section 6, provisions and general recommendations to Chapter 8, Article 7 of PBA. *(BFS 2011:26).*

6:91 General

Buildings and their installations shall be designed to ensure the quality of air and water, as well as light, moisture, temperature and sanitary conditions are satisfactory thereby avoiding conditions detrimental to human health. Rules on alterations of buildings are also in Section 1:22.*(BFS 2011:26).*

General recommendation

In order to be able to verify that the building after an alteration meets the regulatory requirements, a preliminary investigation is needed. An inventory of the building and installation technology in the building is then made.

The investigation should also include the results of any housing surveys and other studies of the indoor environment. The investigation should, for example, clarify if there is any damage from damp or materials that may cause harm to human health. See also 2:311. *(BFS 2011:26).*

6:911 Material

Material included in the building must not cause pollution in a concentration that results in hazards to human health.

Materials and construction products used in a building shall not in themselves, or through their treatment, negatively affect the indoor environment or the local environment of the building. *(BFS 2011:26).*

General recommendation

When altering a building, an inventory of the materials that could cause harm to human health or the environment should be made.

Materials that could affect the indoor environment and building's local environment adversely should be removed unless there are exceptional reasons to retain them. You can also encapsulate them or minimise their impact through an appropriate ventilation. Any remaining hazardous substances should be documented.

Rules for hygienic limit values in the environment and rules for the handling of asbestos are issued by the Swedish Work Environment Authority.

Rules for the management of hazardous waste are issued by the Naturvårdverket.

The Kemikalieinspektionen has information on rules on chemicals contained in goods and products.

New materials should have well researched and documented properties. *(BFS 2011:26).*

6:92 Air

Buildings and their installations shall be designed to ensure they can provide the conditions for good air quality in rooms where people are present other than occasionally.

The air must not contain pollutants in a concentration resulting in adverse health effects or unpleasant odours. *(BFS 2011:26).*

General recommendation

In order to be able to verify that the building after an alteration meets the regulatory requirements, a preliminary investigation is often needed. The investigation should, where appropriate, include the report of the performance inspection of the ventilation system, and results of radon measurements.

The Swedish Work Environment Authority and The Public Health Agency of Sweden also issue regulations on air quality and ventilation. *(BFS 2011:26).*

6:921 Definitions

S-ventilation	Natural ventilation
F-ventilation	Mechanical ventilation where the extract air flow is controlled by fan.
FT-ventilation	Mechanical ventilation in which both the extract and supply air flows are controlled by fan.
FX ventilation	F-ventilation with heat recovery
FTX ventilation	FT-ventilation with heat recovery.

(BFS 2011:26).

6:922 Properties of air supplied to rooms

General recommendation

The quality of the air supplied to the building can be ensured by supply air purification and by the outdoor air intake, intake chamber or similar being located and designed in an appropriate manner.

The outdoor air intakes should be placed in such a way as to minimise the effect of exhaust gases and other sources of pollution. The height above ground, directions and the distance from traffic, exhaust air openings, waste water pipe aeration, cooling towers and chimneys should all be taken into account. Recommendations on the location and distance between exhaust air openings and outside air intakes are contained in Swedac's guidelines *R1 – Riktlinjer för specifikation av inneklimatkrav (R1 – Guidelines for specification of the indoor climate requirements)*.

The existing outdoor air intake may need to be moved if the outdoor air is polluted by car exhaust fumes and other pollutants. *(BFS 2014:3).*

6:923 Radon in the indoor air

Buildings shall be designed to ensure the concentration of radon gas does not cause harm to human health. *(BFS 2011:26).*

General recommendation

Rules for radon in dwellings and public buildings are issued by The Public Health Agency of Sweden and for workplaces by the Swedish Work Environment Authority.

The Swedish Radiation Protection Authority provides a description of the method for measuring radon in dwellings.

At high levels of radon, measures should be taken to prevent the leakage of the gas. Examples of such actions may be to seal penetrations to the ground or to change the pressure conditions in the building.

In the event of radon from building materials (known as blue light concrete) examples of measures could include:

– removing the materials

– increased air change in the home by improving the existing ventilation or installing a new ventilation system
– encapsulation, for example, by a gas-tight wallpaper.

As a guide, Formas' *Radonboken – Åtgärder mot radon i befintliga byggnader* (The Radon Book - Measures against radon in existing buildings) and FunkiS compendia *Radon 1* and *Radon 2* can be used. *(BFS 2014:3).*

6:924 Ventilation

Ventilation systems shall be designed to ensure the required outlet air flow can be supplied to the building.

Ventilation systems shall also be able to carry off hazardous substances, moisture, unpleasant odours and effluent from people and emissions from building materials, as well as pollutants from building works to the extent such inconveniences is not carried of in other ways. *(BFS 2011:26).*

General recommendation
Other ways to carry off inconveniences than through ventilation can be to use filters or dehumidifiers
When changing a ventilation system, account should be taken to how it was originally designed to operate. In addition, the impact on human health and the building's cultural values and aesthetic and functional values should be considered. This could lead to choosing an alternative way of ensuring an acceptable air quality than when constructing a new building. You could, for example, examine whether it is possible to reconstruct and modify existing ventilation systems.

Requirements for the inspection of ventilation systems in existing buildings are contained in Chapter 5, PBO. To meet the requirements of the ordinance for operation and maintenance instructions, it may be necessary to update or create new documents such as as-built drawings, etc.

When selecting air filters for ventilation systems, SS-EN ISO 16890:2017 can be used as a guide. *(BFS 2018:4).*

6:9241 Ventilation flow

A minimum outlet air flow equivalent to 0.35 l/s per m^2 of floor area and continuous exchange of air in the room when it is used shall be pursued. *(BFS 2011:26).*

General recommendation
The entire building should be ventilated based on its intended use. As an alternative to the requirements in Section 6:251, you should demonstrate how the requirement for good air quality in accordance with Section 6:921 can still be met.

After the building work has been carried out, it should be ensured that ventilation flows are sufficient to remove emissions and pollution from new construction materials.

When renovating existing natural ventilation systems, Boverket´s Handbook *Självdragsventilation* (Natural ventilation), can be used as a guide. *(BFS 2011:26).*

6:9242 Air distribution

General recommendation
The requirements in Section 6:252 should be met. If these requirements are not met, the following should apply:
– extract air ventilation in the kitchen is fitted with a forced option, and
– the bathroom has the option of forced extract air ventilation or airing.

For buildings with an existing ventilation system with return air, a special investigation relating to air quality should be made. If necessary, the return air flow should be switched off.

When installing ventilation with heat exchangers, you should consider the air quality and comfort criteria. Recycling of air from the kitchen hood through heat exchangers should be avoided. *(BFS 2011:26).*

It should be possible to shut off the recirculate air flow if required. *(BFS 2011:26).*

6:9243 Airing

The option of airing in Section 6:253 shall be pursued. *(BFS 2011:26).*

General recommendation
Airing options through existing windows and hatches should be maintained. *(BFS 2011:26).*

6:9244 Installations

For new installations, the requirements in Section 6:254 regarding accessibility for cleaning and maintenance and flow measurement and adjustment shall be met. *(BFS 2011:26).*

General recommendation
Main and connect ducts should be provided with cleaning devices and stationary measure outlets for flow measurement.

The material and execution of internal insulation in ventilation ducts should be of a type that does not complicate cleaning.

Rules on the design of utility rooms are contained in 3:42. *(BFS 2011:26).*

6:9245 Airtightness

For new installations, the requirements for airtightness in Section 6:255 shall be met.

Ventilation ducts that are not used shall be removed or sealed. *(BFS 2011:26).*

General recommendation
To meet the performance requirements of the ventilation system, existing ducts may need to be sealed or replaced.

An airtightness test of the ventilation ducts can be performed in accordance with "Methods for measuring in ventilation installations", T9:2007 or the directions in AMA VVS & Kyl 2009 and SS-EN 15727:2010. *(BFS 2011:26).*

6:93 Light

Buildings shall be designed to ensure satisfactory light conditions can be achieved without the risk of injury or human health hazards. The light conditions are adequate when sufficient light intensity and the correct brightness (luminance) is reached and when there is no glare and interfering reflections and therefore the appropriate lighting intensity and luminance distribution is present. *(BFS 2011:26).*

General recommendation
The same requirements for lighting conditions as for construction of new buildings should be met if it is not unreasonable or does not cause damage to the building's cultural values or the building's architectural or aesthetic values.

The Swedish Work Environment Authority issues regulations on light conditions in workplaces. *(BFS 2011:26).*

6:931 Lighting conditions

6:9311 Lighting

Lighting suitable for its intended use shall be arranged in all the spaces of the buildings. *(BFS 2011:26).*

6:9312 Daylight

If the building does not meet the requirements for daylight as specified in Section 6:322, alterations to the windows must not result in daylight conditions deteriorating further unless there are exceptional reasons. *(BFS 2011:26).*

General recommendation
In existing dwellings, normal daylight conditions should be accepted as they are.

When replacing or supplementing windows, you should think about how the window's glazed area is affected by the new dimensions of the frame and arches. It should also be clarified how the entry of daylight is influenced by the new glass quality and changes in carpentry profiling.

It should also be clarified how the daylight conditions are affected by additional insulation. *(BFS 2011:26).*

6:94 Thermal climate

Buildings shall be designed to ensure a satisfactory thermal climate based on the building's preconditions and usage. *(BFS 2011:26).*

General recommendation

The thermal indoor climate and requirement for heat output that apply in accordance with Section 6:4 in BBR should be sought.

If this is not achievable, you should reduce the risk of draughts due to the lack of insulation in exterior walls, windows and other elements.

Structures with a U value higher than 1.0 W/m^2K may result in thermal draughts.

The Public Health Agency of Sweden and The Swedish Work Environment Authority also have rules pertaining to indoor temperatures. *(BFS 2014:3).*

6:95 Moisture

Buildings shall be designed to ensure moisture does not cause damage, odours or microbial growth, which could affect human health. *(BFS 2014:3).*

General recommendation

The change may need to be designed to ensure the environmental impact of moisture does not increase unchecked in the existing structural elements and given the moisture resistance of existing materials and products.

Examples of modifications leading to changes in moisture levels in existing structural elements include insulation and changed ventilation.

Examples of modifications to buildings that could lead to changes in moisture in the structural elements of the building are alterations to attics, basements and garages belonging to dwellings or premises.

New structural elements may need to be designed and new materials and products chosen for their moisture resistance and the expected environmental impact of the moisture. The requirements can be met and verified using moisture safety planning and monitoring of the design ensuring the intended moisture safety is achieved.

When planning, designing, executing and monitoring moisture safety, the industry standard ByggaF – metod för fuktsäker byggprocess (ByggaF – method for moisture safe building process) can be used as guidance.

Buildings, construction materials and construction products should be protected from precipitation, moisture and dirt during the construction period. *(BFS 2014:3).*

6:951 Maximum permitted moisture levels

The maximum permitted moisture level is the upper limit where moisture not can be expected to cause damages that affect hygiene or health

The existing building's technical status for moisture shall be well researched and documented. The maximum permitted moisture levels for existing materials and products shall be assessed by the result of the investigation. Consideration shall be given to uncertainties in the basis for the assessment and to climate variations.

The moisture levels in the construction elements that are affected by the alteration shall be assessed by the moisture loads that can be expected to affect the building during adverse conditions.

The maximum permitted moisture levels for new materials and products shall comply with Section 6:52. *(BFS 2014:3).*

General recommendation
Existing moisture damage shall be addressed in the context of maintenance requirements contained in Chapter 8, Article 14 of PBA. The Public Health Agency of Sweden issues rules on moisture and micro-organisms. *(BFS 2014:3).*

6:952 Moisture safety

The moisture level in a structural element shall not exceed the maximum permitted moisture levels for the materials and products included in the construction element. This is not applicable if it is irrelevant to hygiene and health.

Moisture-damaged structural elements that are an essential part of the building's construction or character, may still be retained if other measures are taken to protect the indoor environment from emissions and micro-organisms.

A building's airtightness shall be such that the convection of moist air does not cause the material's maximum permitted moisture levels to be exceeded. *(BFS 2014:3).*

General recommendation
The moisture impacts to existing materials and products from the alteration should be checked through moisture safety planning.

Some construction details are placed so that microbial growth normally can't affect hygiene and health and they are not included in the requirement for maximum permitted moisture levels. Examples are well ventilated and drained façade claddings and roof coverings, and eaves and other components outside the façade rib

An example of a measure to protect the indoor environment from emissions and micro-organisms could be to reduce the environmental impact of moisture and implement a ventilation system.

Changes to the environment and climate may involve other technical designs for the alteration than those in the existing building. These changes may be a higher groundwater table and increased risk of flooding from water courses. *(BFS 2014:3)*

6:953 Spaces with water installations or high humidity

6:9531 Water exposed interior floors and walls

Alterations to floors and walls that will be exposed to water flushing, water spills or leaking water shall be designed to ensure moisture does not entail that the material's maximum permitted moisture level is exceeded. Moisture shall not come into contact with structural elements and spaces that cannot withstand moisture.

A watertight layer shall be durable, adapted to the movements of the foundation, and have sufficient water vapour resistance. Joints, connections, attachments and penetrations in the watertight layers shall also be watertight, durable and adapted to suit the movements in the foundation.

In rooms with floor gullies, the floor and waterproofing shall be designed to ensure water from water-exposed surfaces is diverted to the floor gulley. *(BFS 2011:26).*

General recommendation
The slope to the floor gulley should be at least 1:150. To reduce the risk of accidents, the maximum slope should be no more than 1:50. A negative slope that directs water to walls, openings or penetrations other than floor gullies should not occur.

Consideration should be given to any deformations that may arise in the building floor.

Rules on accessibility and usability in sanitary rooms are contained in 3:511. *(BFS 2011:26).*

6:9532 Concealed surfaces in rooms or construction elements

If there is a risk of leaking tap water or condensation on the concealed surfaces in rooms, the outlet from these surfaces shall be arranged to ensure water is quickly made visible. *(BFS 2011:26).*

General recommendation
A watertight layer should be placed under dishwashers, sink units, refrigerators, freezers, ice machines or similar. The layer should be sealed at penetrations and have a wall/floor junction to the wall and other concealed surfaces to a sufficient extent to protect them.

Rules on leaking water from tap water installations are contained in Section 6:625. *(BFS 2014:3).*

A structural element shall be designed with watertight layer in such extent that leaking water or condensation water from a tap water installation within the structural element is prevented to coming into contact with materials and products which cannot withstand moisture.

The structural element or installation shall be designed to ensure that leakage is quickly made visible and condensation water is dried or led out of the structural element to a drain so that growth of algae, mould or bacteria cannot occur. *(BFS 2014:3).*

General recommendation
A structural element with a built-in flush tank to a toilet should be designed with watertight layer.

A construction element where a new tap water installation connects to an existing installation should be designed with watertight layer.

A leakage safety box, distribution box or seamless safety conduit that including connections have well researched and documented properties for water tightness and durability can be used as watertight layer. *(BFS 2014:3).*

6:9533 Cleanability

Surfaces that are designed to be exposed to water, splashes from liquid, condensed moisture or wet cleaning are arranged to ensure they can easily be kept clean and maintained so they do not promote microbial growth. *(BFS 2011:26).*

6:96 Water and drainage

Buildings and their installations shall be designed to ensure water quality and hygiene conditions satisfy public health requirements. *(BFS 2011:26).*

6:961 Tap water

If a wholly or partially new system is installed, this shall be designed and constructed to ensure the corresponding performance levels in Section 6:62 are met. Pipes that are no longer used shall be dismantled or plugged. Tap water pipes should be plugged as close to the water-bearing pipe as possible. *(BFS 2011:26).*

General recommendation

A risk assessment should be made as part of a preliminary investigation. The risk assessment for the tap water systems should, from a microbiological aspect include how the rebuilt installation components are connected to the existing installation components, taking into account the risk of proliferation of, for example, legionella bacteria. The preliminary investigation should also include the risk of future problems with corrosion, water damage and back flow of contaminated water.

When reinforcing a pipe with an interior surface finish known as relining, a new material will come into contact with water. This should have documented properties that show that it does not affect drinking water adversely. The pipe should have an internal diameter to allow a sufficient volume of water after the alteration.

New installation also refers to the replacement of an existing system or parts of an existing system. *(BFS 2014:3).*

6:9611 Documentation and commissioning

General recommendation

When tap water pipes are put in service, they should be flushed first.

To reduce the risk of growth of micro-organisms in the existing hot water systems, the systems should where necessary be modified to ensure a temperature of at least 50 °C in the hot tap water and hot tap water circulation and at least 60 °C where the water is stationary, such as in accumulators and water heaters.

An inventory, assessment and documentation of the risks for growth of legionella bacteria in tap water installations should be conducted in multi-dwelling blocks, hospitals, hotels, sports halls, swimming baths and special forms of dwellings for the elderly. This should also be undertaken for water installations which spread aerosols, e.g. whirlpool baths, open cooling towers and humidifier installations. The risk assessment should include a check of the temperatures of the cold water, hot water and hot water circulation systems in the parts of the installation that are representative for the building, such as substations, for various hot water circulation loops, and at water outlets. It should also include testing for legionella bacteria where the likelihood of legionella bacteria is greatest.

Rules on operation and maintenance are contained in Section 2:51.

For the changed routing of water and sewage pipes, the consequences for the building's cultural values and aesthetic and functional values should be considered. *(BFS 2014:3).*

6:962 Waste water

If a wholly or partially new system is installed, this shall be designed and constructed to ensure the corresponding performance levels in Section 6:64 are met. Pipes that are no longer used shall be dismantled or plugged. *(BFS 2011:26).*

General recommendation
A risk assessment should be made as part of a preliminary investigation. The preliminary investigation should cover the risk of future problems of corrosion and water damage and the risk of flooding in the building.

New installation also refers to the replacement of an existing system or parts of an existing system.

The option for local disposal of surface water should be considered. *(BFS 2011:26).*

6:97 Discharges to the environment

6:971 Emissions in general

Buildings shall be designed in such a way that pollutants, which may occur as a result of the activities in the building can be removed without any adverse effects with respect to the health and hygiene of people in the building or in the surroundings of the building. The discharge must not have an adverse effect on the ground, water or air in the surroundings of the building either. *(BFS 2011:26).*

6:972 Contaminated air

Exhaust air installations in buildings shall be designed to ensure unpleasant odours or pollutants are not reintroduced to air intakes, openable windows, doors, balconies or similar areas in the building, or to nearby buildings. *(BFS 2011:26).*

General recommendation
If the requirement is not fully met, the exhaust air is cleaned to prevent the emitted air being worse than the values shown in the Air Quality Ordinance (2010:477). *(BFS 2011:26).*

6:973 Waste water

Waste water installations shall be designed in such a way that waste water is either carried away via the municipal sewerage system or purified via private sewerage systems. *(BFS 2011:26).*

General recommendation
Connection to a public water and waste water grid should, if possible, be above the backing-up level to the grid. If this is not possible, another solution that meets the requirements should be selected.

Rules on private sewerage systems are issued by the Swedish Environmental Protection Agency. *(BFS 2011:26).*

6:974 Combustible gases

Inconvenience caused by the contents of fumes and gases emitted from buildings shall be limited. *(BFS 2011:26).*

General recommendation
Reasons for ignoring the requirements contained in Section 6:74 could be if, for example, there is no room to install the required accumulator tanks. *(BFS 2011:26).*

7 Protection against noise

This Section contains provisions and general recommendations pursuant to Chapter 3, Section 13 of PBO. Section 7:4 also contains regulations and general recommendations on Chapter 8, Section 7, of PBA. *(BFS 2011:26).*

7:1 General

Buildings, containing dwellings or premises in the form of health care facilities, pre-schools, leisure-time centres, classrooms in schools, and also rooms in work premises intended for office work, conversations or similar, shall be designed to ensure the occurrence and spread of noise is limited to avoid any inconvenience to people's health.

General recommendation
Rules on acoustic environment in public premises for people with limited orientation capacity are contained in Section 3:145.

The Swedish Work Environment Authority, The Public Health Agency of Sweden and the Swedish Environmental Protection Agency all issue regulations regarding noise.

7:11 has been repealed by (BFS 2013:14).

7:12 Definitions/designations

D_{nT}	Sound level difference, a measurement for a buildings ability to isolate a space to airborne noise from another space or from outside according to SS-EN ISO 140-4:1998. Standardized to 0.5 s reverberation time.
$D_{nT,w,50}$	Weighted standardized sound level difference with spectrum adaption term [dB], a shorthand term for $D_{nT,w} + C_{50\text{-}3150}$ according to SS-EN ISO 717-1:2013.
$D_{nT,w,100}$	Weighted standardized sound level difference [dB], a shorthand term for $D_{nT,w} + C$ according to SS-EN ISO 717-1:2013.
$D_{nT,A,tr}$	Weighted standardized sound level difference with spectrum adaption term for noise from mixed street traffic and similar [dB], a shorthand term for $D_{ls,2m,nT,w} + C_{tr}$ according to SS-EN ISO 140-5:1998 and SS-EN ISO 717-1:2013.
L	Sound pressure level, or shortened sound level, a measurement of noise in a building.
L_{nT}	Standardized impact sound pressure level, a measurement of a buildings ability to isolate a space against structure borne sound from another space or from the outside according to SS-EN ISO 140-7. Standardized to 0.5 s reverberation time.
$L_{nT,w,50}$	Weighted standardized impact sound pressure level [dB], a shorthand term for $L_{nT,w} + C_{I,50\text{-}2500}$ according to SS-EN ISO 717-2:2013. If the adaption term $C_{I,50\text{-}2500}$ is negative it shall be set to zero.
$L_{pAeq,nT}$	Equivalent A-weighted sound pressure level [dB], according to SS-EN ISO 16032:2004 during the time the sound occurs more than temporarily. Standardized to 0.5 s reverberation time.
$L_{pAFmax,nT}$	Maximum A-weighted sound pressure level with time weighting F (FAST) [dB], according to SS-EN ISO 16032:2004 for intermittent and more than temporarily occurring sounds of short duration. Standardized to 0.5 s reverberation time.
L_{pCeq}	Equivalent C-weighted sound pressure level [dB], according to SS-EN ISO 16032:2004 during the time the sound occurs more than temporarily. Standardized to 0.5 s reverberation time.
T	Reverberation time, the time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. Refers to T_{20} according to SS-EN ISO 3382-2 :2008/AC:2009.

(BFS 2014:3).

7:2 Noise conditions

7:21 Dwellings

Buildings containing dwellings, their installations and lifts shall be designed to ensure noise from these and from adjacent premises and outside sound is attenuated. This shall be achieved to the extent required by the intended use and to ensure building residents are not disturbed by the noise.

However, the installations the user himself can control and that do not affect noise levels in someone else's dwelling in the same building, are not included in the noise requirements.

If a noisy occupancy occurs adjacent to dwellings, special sound insulation measures shall be taken. *(BFS 2013:14).*

General recommendation

The second paragraph of the mandatory provision can e.g. include noise from dishwasher and kitchen hood at forced flow. However, noise from installations that need to have continuous function, e.g. noise from ventilation base-flow and noise from heat pump are not included.

The requirements in Sections 7:1 and 7:21 are normally met if the following general recommendations are achieved. *(BFS 2014:3).*

Table 7:21a Minimum sound level difference and highest impact sound pressure level in dwellings when special sound insulation measures does not need to be taken.

	Sound level difference $D_{nT,w,50}$ between spaces [dB]	**Impact sound pressure level $L_{nT,w,50}$ In space [dB]**
From space outside the dwelling to space in the dwelling	52	56 [1]
However, in the following cases:		
from business and service activities and common garages to dwelling	56	52
Between dwellings, without direct connection, in special forms of dwellings for the elderly[2]	52	62
Between dwellings in other means-tested special accommodations where high levels occur[2]	56	56
from stairway and corridor to dwelling	52	62
from access balcony, stairway or corridor with door or window to space for sleep, rest or everyday social contact[2]	44 / 40 [3] / 48 [4]	62
from common outdoor area, e.g. balcony or terrace to dwelling	See table 7.21c	62

1) From sanitary room and storage to dwelling the level can be waived if it can be verified that structure sound from installations does not exceed the values in table 7.21b. The level can also be waived when measuring on floor surface immediately inside hall door. (about 1 m^2).
2) Air sound refers to $D_{nT,w,100}$.
3) Applies for a common and from other spaces separated corridor to space for sleep and rest in e.g. student dwellings and special forms of dwellings for the elderly.
4) Applies from space outside dwelling where significant pedestrian traffic and high levels can be expected more than temporarily, e.g. at post boxes or lift.

Special sound insulation measures can be needed when dwelling is adjacent to noisy activity, e.g. laundry room or exercise premises. Low frequency noise from compressors and fans normally require special measures to insulate from structure sound and airborne sound. *(BFS 2013:14).*

Table 7:21b Highest total sound levels in dwellings from installations and lifts.

	Equivalent sound pressure level, $L_{pAeq,nT}$ / L_{pCeq} [dB]	**Maximum sound pressure level, $L_{pAFmax,nT}$ [dB]**
Continuous wideband sound, e.g. from extract air devices and radiators		
in space for sleep and rest	30 / 50[1]	35
in space for everyday social contact	30 / -	35
in space for cooking	35 / -	40
in space for personal hygiene	35[2] / -	40[2]
Sound containing clearly audible variations, impulses or tones, e.g. from lift, toilet and washing machine		
In space for sleep, rest or everyday social contact	25 / -	35
in space for cooking	30 / -	40
in space for personal hygiene	30[2] / -	40[2]

1) Deviations are acceptable if sound levels at the frequency bands 31,5 Hz to 200 Hz according to the rules of The Public Health Agency of Sweden are not exceeded.

2) Deviations are acceptable in smaller spaces for personal hygiene intended to be used during shorter time. Deviations are not acceptable in spaces for personal hygiene where the relaxation factor is essential, e.g. in spaces with sufficient space for a bathtub or sauna.

Sound levels from adjacent activities, e.g. restaurants, shops and exercise premises, regarding sound with impulses, tones or low frequency sound, should not exceed $L_{pAeq,nT}$ = 25 dB in spaces for sleep, rest or everyday social contact. Sound insulation can be dimensioned by calculation according to SS-EN 12354, with regard to sound levels in the relevant activities. *(BFS 2013:14).*

Table 7:21c Dimensioning of the buildings sound insulation to external sound sources.

	Equivalent sound pressure level from traffic or other external sound source, $L_{pAeq,nT}$ [dB] [2]	**Maximum sound pressure level night time, $L_{pAFmax,nT}$ [dB] [3]**
Sound insulation is determined based on determined sound levels outside so that the following sound levels are not exceeded indoors[1]		
in space for sleep, rest or everyday social contact	30	45
in space for cooking or personal hygiene	35	-

1) Dimensioning can be performed simplified or detailed according to SS-EN 12354-3. For sound from e.g. mixed street traffic and railway traffic with low speeds, simplified calculations can be performed with $D_{nT,A,tr}$ values for the construction elements. Detailed calculations weighing together the construction elements' insulation to sound at different frequencies with respect to the relevant sound sources.

2) Refers to dimensioning day and night equivalent sound level. See Boverket's handbook *Bullerskydd i bostäder och lokaler (Noise protection in dwellings and premises)*. Other external sound sources than traffic refer to equivalent sound levels for the time periods when the sound sources are in use more than temporarily.

3) Refers to dimensioning maximum sound level that can be expected more than temporarily during an average night. Night refers to the period between 22:00 and 06:00. The dimensioning can be performed for the most noisy types of road vehicles, trains and airplanes, as well as other external sounds e.g. from activities or high voices and screams, so that the specified value is not exceeded more often than five times per night and never by more than 10 dB.

Table 7:21d Longest reverberation time in multi-dwelling blocks.

Space	Reverberation time, *T* [s] [1]
Stairway	1,5
Corridor	1,0

[1)] Reverberation time refers to the highest value in the octave bands 500, 1 000 and 2 000 Hz.

If better sound conditions are desired than stated in the tables above, sound class A or B can be chosen according to SS 25267 for dwellings. *(BFS 2013:14).*

7:22 Premises

Buildings containing premises, their installations and lifts shall be designed to ensure noise from these and from adjacent premises and outside sound is attenuated. This shall be achieved to the extent required by the intended use and to ensure that the users of the building are not disturbed by the noise.

However, the installations the user himself can control and which do not affect the noise levels in any other premises in the same building, are not included in the noise requirements.

The reverberation time in premises is selected to suit the purpose of the premises. *(BFS 2013:14).*

General recommendation
The requirements of sections 7:1 and 7:22 are fulfilled if the building-related requirements in sound class C are, according to SS 25268, achieved for the respective premises.

If better sound conditions are desired than stated, sound class A or B can be chosen according to SS 25268 for premises. *(BFS 2013:14).*

7:3 Documentation and control

General recommendation
General recommendations on documentation are contained in Section 2:1 and general recommendations on verification are contained in Section 2:32.

Building acoustic documentation can be performed according to Boverket's handbook *Bullerskydd i bostäder och lokaler (Noise protection in dwellings and premises).*

Sound requirements can be verified with a combination of calculations and site controls or measurements in finished building. Also, see the handbook. *(BFS 2013:14).*

7:4 Requirements for noise protection during alterations to buildings

7:41 Noise conditions

Buildings, their installations and lifts shall be designed to ensure the occurrence and spread of noise is limited to avoid any inconvenience to people's health. Rules on alterations of buildings are also in section 1:22. *(BFS 2011:26).*

General recommendation
In order to achieve acceptable noise conditions, an acoustic survey of the building needs to be conducted before the selection of alteration measures. This review can, for example, include surveys of the residents to determine in which areas the potential problems are greatest. *(BFS 2011:26).*

The requirements for noise and sound insulation that apply to construction of new buildings in accordance with Section 7:2 shall be sought. *(BFS 2011:26).*

General recommendation
Good acoustic properties are particularly important in rooms designed for sleep and rest.

Reasons for conceding that the requirements are not met fully, could be if the extent of the noise-protection measures needs to be adapted to suit the building's cultural values and architectural and aesthetic values. From these aspects, valuable fixtures should not normally need to be changed as part of the sound insulation measures.

When altering installations, you should consider that this could also affect the noise conditions in other parts of the building than those directly affected by the change. The installation may then have to be installed with extra care to reduce any nuisance from noise emissions. Penetrations in the apartment's separation structures should also be designed with attention paid to the acoustic properties.

For newly added walls, there is normally no reason to deviate from the requirements in Section 7:2.

The Swedish Work Environment Authority and the Swedish National Board of Health and Welfare also issue rules on noise. *(BFS 2011:26).*

Alterations must not mean any impairment to the acoustic properties of the building. However, these may impair if the alteration still meets the requirements in Section 7:2. *(BFS 2011:26).*

General recommendation
Alterations to a structure may reduce its ability to reduce noise. For example, noise properties impair if the building floor filling of heavier material is removed and replaced with a lighter filling. *(BFS 2011:26).*

7:42 Documentation and control

General recommendation
General recommendations on documentation are contained in Section 2:1 and general recommendations on verification are contained in Section 2:32.

Building acoustic documentation can be performed according to Boverket's handbook *Bullerskydd i bostäder och lokaler (Noise protection in dwellings and premises).*

Sound requirements can be verified with a combination of calculations and site controls or measurements in finished building. Also, see the handbook. *(BFS 2013:14).*

8 Safety in use

This section contains the mandatory provisions and general recommendations for Chapter 8, Sections 1, 4 and 9 of PBA and Chapter 3, Sections 4, 9, 10 and 18 of PBO. Section 8:10 also contains mandatory provisions and general recommendations for Chapter 8 Article 7 of PBA.

8:1 General

Buildings shall be designed so as to minimise the risk of accidents such as falls, collisions, crushing, burns, explosions, being locked in, poisoning and electric shocks. Sites that are used for development shall be designed so as to minimise the risk of accidents.

General recommendation
Rules concerning safety for utility rooms are contained in Section 3:4.

8:11 Scope of application

The rules in this Section apply to buildings, to undeveloped sites to be provided with one or more buildings and other civil engineering works than buildings on sites. The rules for sites and other civil engineering works than buildings are combined in Section 8:9. In certain specified cases, the rules shall only apply to spaces in buildings where children may be present. *(BFS 2014:3).*

General recommendation
The term spaces where children may be present refers to such rooms, parts of rooms or spaces where children of pre-school age are allowed to be, or may be, present without permanent supervision of adults.

Examples of such spaces include dwellings and common spaces in residential buildings such as corridors, stairways, laundry rooms and recreational premises. This also includes guest rooms in hotels and spaces in nursery schools, child care centres, children's clinics, libraries, shopping centres and other similar premises. The special requirements also apply to those circulation routes or escape routes that belong to spaces where children of pre-school age may be expected to spend time.

Boverket´s handbook *Bygg barnsäkert – i byggnader, på tomter och i utemiljön* contains additional advice.

8:2 Protection against falling

General recommendation
Rules for protection against falling through glass are contained in Section 8:352. Rules for protection against falling on sites are contained in Section 8:91. Rules for protection against falling are also issued by the Swedish Work Environment Authority.

8:21 Lighting in circulation spaces

The lighting in circulation spaces shall be designed with sufficient power and uniformity to enable people to move around safely within the building.

General recommendation
Rules concerning lighting in escape routes are contained in Section 5:34 and 5:35.

Lighting installations should be designed in accordance with SS 437 01 46. The fixed lighting should not be dazzling.

In public buildings, it should be possible for large glass surfaces facing the outside and windows at the end of corridors to be screened off to ensure that daylight does not dazzle people.

8:22 Protection against slipping and tripping

Walking surfaces shall be designed so as to minimise the risk of slipping or tripping. In spaces where an incline, moisture, spillage or ice accretion increases the risk of slipping, the properties of the surface material shall be adapted accordingly. Unexpected changes to the surface material's slip-related properties shall be avoided, particularly when the path direction changes. The surfaces shall be

designed without unexpected small changes in level, irregularities or low obstacles which are difficult to detect.

General recommendation
For dry walking surfaces, the friction factor should be at least 0.30, measured in accordance with SS-EN 13893.

A reference method for testing floor products with more stringent requirements for step safety are contained in SS-EN 13845.

Support handles should be provided in the shower space of the accessible sanitary room referred to in Section 3:146.

Rules concerning the maximum permissible floor incline in shower spaces are contained in Section 6:5335.

Rules concerning thresholds are contained in Section 3:143. *(BFS 2014:3).*

8:23 Protection against falling from heights

8:231 Openable windows, balcony doors etc.

In spaces where children may be present, openable windows and glazed panels – e.g. glazed-in balconies – with the bottom of the frame lower than 1.8 meters above floor level shall have safety fittings, locking devices or other protection which limits the risk of children falling out. Balcony doors and openable windows where the distance between the glass surface and the floor is less than 0.60 meters shall have safety fittings and a locking device to prevent children from opening and going through the door or window.

Safety devices are not necessary on windows or French windows on the ground floor.

General recommendation
Safety fittings refer to fittings with a lock which can fix e.g. a window in a closed position. The term locking device refers to a device with a lock that prevents a window, for example, from being opened more than 10 cm. Both these devices should be designed to ensure the lock cannot be removed by children, but nevertheless can be used by people with limited mobility.

Child safety, strength and durability can be tested in accordance with SS-EN 13126-5 or SS-EN 16281. *(BFS 2014:3).*

8:232 Stairs, ramps and balconies

Stairs and ramps in or adjacent to buildings shall be designed to ensure that people can move about safely.

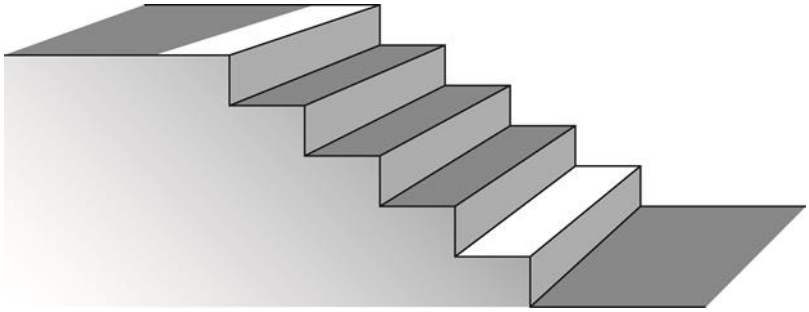
General recommendation
In order for the stairs to be designed safely account should be taken to the incline and length of the stairs and the relationship between the height and depth of the steps. The incline along the walking line should not change within the same flight. There should be no treads which have a height that is different from others. If this cannot be avoided, the step should be clearly marked. The depth of a tread on stairs should be not less than 0.25 meters measured along the walking line.

For the design of ramps, see Section 3:1422.

Stairs that are wider than 2.5 meters should be divided by balustrades or handrails into two or more flights.

Stairs, except in single-family houses and inside individual dwellings in multi-dwelling blocks, should be fitted with contrast markings to ensure people with limited vision can detect any changes in level. The lowest tread of a staircase and the corresponding part of the front edge of the landing at the uppermost riser in every flight should have a lightness contrast of at least 0.40 according to the NCS (Natural Color System). The markings should be consistent throughout the building.

Figure 8:232 Contrast marking of stairs



(BFS 2014:3).

The width of a landing should not be less than that of the stairs. Doors on landings should be located to ensure passage is not impeded. In multi-dwelling blocks, landings should be at least 1.5 meters deep. Within individual dwellings, landings should be at least 1.3 meters.

Strings, skirting's, balustrades, handrails and similar should not encroach on the width of the flight by more than 100 mm on either side. The distance between an enclosing wall and the sides of the flight should be not more than 50 mm.

Stairs and ramps from dwellings and other spaces where people are present other than occasionally shall be designed to ensure stretchers can be carried safely. However, this does not apply if the stretcher can be carried in a lift or other lifting device.

General recommendation
For straight stairs leading to more than two dwellings, the provision's requirement for the safe carriage of stretchers is met if the flight has a width of at least 1.20 meters. For bent or curved stairs a larger turning radius may be required.

Stairs, ramps, balconies and similar in spaces where children may be present shall be designed to ensure the risk of accidents to children is limited.

General recommendation
Openings between treads should be not greater than 100 mm.

In dwellings, stairs should be designed to ensure a gate can be fixed at the top and bottom of the stairs.

8:2321 Balustrades

Flights of stairs, landings, ramps and balconies that are not bounded by walls shall have balustrades that limit the risk of personal injury as a result of falling. Balustrade padding and its attachments shall withstand the dynamic effect caused by people.

General recommendation
Balustrades on flights should be not less than 0.9 meters high. If an opening on the side of a flight of stairs is greater than 0.4 meters in any one lengthwise direction and the height of the storey is more than 3.0 meters, measured from floor to floor, the balustrade should be at least 1.1 meters.

Balustrades on landings in an individual dwelling should be not less than 0.9 meters high. If the floor height is greater than 3.0 meters, measured from floor to floor, the balustrade should be at least 1.1 meters. Balustrades on landings outside of individual dwellings and balustrades on balconies and access balconies should be at least 1.1 meters high.

Rules for glass balustrades are contained in Section 8:35.

Balustrades in spaces where children may spend time shall be designed to ensure children cannot injure themselves as a result of climbing or crawling.

General recommendation
Balustrades on balconies, landings and flights of stairs should be designed, up to a height of 0.8 meters, in such a way that it is not possible to climb on them. Vertical openings should not be wider than 100 mm.

The clear space between the lower edge of a balcony balustrade and the balcony floor, or between the lower edge of a stair balustrade and the nosing of an individual stair should not be greater than 50 mm. The clear vertical space between the bottom of a balustrade on stairs and a landing or floor should be not more than 100 mm.

Horizontal openings above the front of a balcony should be designed to ensure children cannot get their heads stuck. Openings in the range 110–230 mm should be avoided.

8:2322 Handrails

Ramps and stairs shall have balance support in the form of handrails. Handrails shall be easy to grip.

General recommendation
Ramps and stairs in public premises should have handrails on both sides. Other ramps and stairs with more than three steps should have handrails on both sides. Lower ramps and stairs should have at least one handrail. Within a dwelling, bent or curved stairs that are not more than 0.9 meters wide may have no handrail if instead there is a trellis, centre post or similar that can be easily grasped.

Handrails should have a height of 0.9 meters. It should also be possible to hold the handrail past the attachment. They should extend beyond the beginning and end of the stairs or ramp by at least 30 cm.

The lightness of handrails in public buildings and stairways in multi-dwelling blocks should contrast with the surrounding surfaces.

Where a continuous handrail does not work because of the special use of the space, such as a gallery, an alternative design of balance support can be made that corresponds to the function of the handrail.

8:233 Protection in connection with openings in buildings

If there are openings in surfaces that are intended to be walked on, these shall be covered by access panels, grating, duckboard or other suitable protective devices. The openings may also be demarcated by guard rails or similar. In spaces where children may be present, access panels, grating, duckboard and similar shall be designed to ensure they cannot be lifted by children and to ensure the risk of personal injury is limited.

8:24 Roof safety

General recommendation
Rules on utility rooms and access routes to these are contained in Section 3:4.

8:241 General

Buildings shall be fitted with
- access arrangements to roofs,
- permanent safety equipment for transportation on roofs and
- protective devices against falling from roofs

Unless it is clearly unnecessary with respect to personal safety during building use or operation. *(BFS 2014:3).*

General recommendation
Special arrangements for access to roof, permanent safety equipment and protective devices against falling, can be considered as clearly unnecessary if
- the roof has no permanent workstation and

– there are no other particular reasons to assume that there is a need to access the roof for the building's use or operation.

It can be considered as clearly unnecessary with permanent safety equipment for transportation on roofs and protective devices against falling if the roof has a low pitch and the work that needs to be performed for the building's use and operation is performed at a safe distance from the edge of the roof.

Example of permanent workstations are chimneys, ventilation installations, solar panels and roof drainage systems that need to be accessed via the roof. *(BFS 2014:3).*

Permanent access and protective devices shall have adequate strength and rigidity and be made of a durable material. Installations intended for fall protection lifelines shall be strong enough to guarantee safety in the event of a fall. The strength requirement also applies to the attachments for such installations.

General recommendation
Permanent devices for access to roofs should be made with a corrosion resistance corresponding to that of hot-dip galvanised steel with a protective layer at least 50 µm thick. Specifications and test methods are contained in SS-EN ISO 1461.

Devices intended for the attachment of fall protection lifelines should also be able to handle with the dynamic lifeline shock described in SS-EN 516. *(BFS 2014:3).*

Roofs that can be accessed shall have reasonable protection against tripping and be designed so as to limit the risk of stepping through the surface of the roof.

General recommendation
Rules for accessing roofs for professional purposes are issued by The Swedish Work Environment Authority.

8:242 Access devices, permanent safety equipment and permanent workstations

8:2421 Access routes to roofs

Buildings shall be fitted with fixed access arrangement to the extent that is necessary to ensure that the access routes are safe. Non-fixed devices may be used if the risk of injury is low.

It shall also be possible to use access routes for transporting work materials and equipment. *(BFS 2014:3)*

General recommendation
If the height of the façade of a building at the point of access to the roof is

– 4 meters or less, a non-fixed ladder can be used if there is a device at the eaves that prevents the ladder from slipping,

– higher than 4 meters but lower than 8 meters, access should be provided, either from the inside or from the outside, via a fixed or telescopic wall ladder with protection against falling,

– 8 meters or higher, access to the roof should be provided from indoors.

If access to the roof is provided from indoors, the access openings should be provided with guard rails so as to limit the risk of falling.

Roof hatches for access to the roof should have a clearance of at least 0.6 x 0.9 meters (w x h) and wall hatches shall have a clearance of at least 0.6 x 1.2 meters (w x h).

If the difference in level between the top storey or attic floor and the roof hatch or wall panel is greater than 1.2 meters, a fixed or telescopic ladder should be provided. *(BFS 2014:3).*

Fixed ladders shall terminate at the bottom so as to prevent children from climbing up them unaided.

It shall be possible for roof and wall hatches that do not form part of an escape route to be locked.

General recommendation
Rules for escape routes are contained in Section 5:3.

8:2422 Fixed safety equipment for movement on roofs

Fixed roof ladders and walkways, or other corresponding arrangements shall be provided to such an extent that the risk of personal injuries is limited for transportation on the roof between the points of access to the roof and permanent workstations, Landings shall be arranged if necessary for the transport of work materials and equipment to the workstation. *(BFS 2014:3).*

General recommendation

Fixed roof ladders and walkways should be provided if the pitch of the building's roof is greater than 1:10 (≈ 6º).

A walkway should be provided at the ridge if the building's façade is more than 8 meters high.

Chimneys should be provided with a climbing device if the height from the workstation on the roof to the top of the chimney is greater than 1.2 meters. The climbing device should be provided with protection against falling if the height is greater than 4 meters from the workstation to underlying floor that prevents the person from falling further. The protective device should be designed so as not to impede the carriage of work materials and equipment.

If roof safety steps for roof battens are used as a fixed roof ladder they should be supplemented by clearly marked attachment devices for a lifeline. *(BFS 2014:3).*

8:2423 Permanent workstations

Permanent workstations shall be designed with regard to the total height of a fall, the nature of the work and the risks that are present when the work is to be carried out.

General recommendation

Permanent workstations which require regular maintenance should have an accessible surface at least 0.30 x 0.60 meters in size. This may be a horizontal surface on the chimney crest or a platform that is not more than 0.5 meters below the crest. The guard rail should be not less than 1.0 meters high and it should have handrails at the top and at mid-rail height.

8:243 Protective devices

8:2431 Anchorages for lines for safety harnesses

Anchorages for lines for safety harnesses shall be fitted to the extent that is necessary to ensures personal safety during the building's use or operation. *(BFS 2014:3).*

General recommendation

Irrespective of the pitch of the roof, anchorages for lines for safety harnesses should be provided at the ridge or a correspondingly high part of the roof, if the façade is more than 3 meters high. Such anchorages should also be provided on other parts of the roof, if necessary for moving safely on the roof,.

Anchorages may be in the form of suitably designed ridge rails, roof ladders or walkways.

On roofs with a pitch not greater than 1:10 (≈ 6º) where roof work needs to be performed closer than 10 meters from the eaves, individual anchorage points not more than 5 meters apart may be used.

Anchorages are normally not needed on roofs with a pitch not greater than 1:10 (≈ 6º) where roof work does not need to be performed closer than 10 meters from the eaves. *(BFS 2014:3).*

8:2432 Footholds at the eaves and at changes in roof pitch

At eaves, and where the pitch of the roof changes, secure footholds shall be fitted, where the fall height and the roof design so require, to such extent as to ensure the personal safety.

General recommendation

Footholds should be fitted when the height of the building's façade is greater than 8 meters and the pitch is greater than 1:3. (≈ 18º).

8:2433 Protective devices for preventing people from stepping through roofs

Surfaces and fixed devices which may be trodden on by mistake and which cannot support a person's weight shall be fitted with a safety device to prevent people from stepping their feet through the roof or falling.

General recommendation
A balustrade at least 0.5 meters high or grating on the underside of the opening will reduce the risk of someone going through the roof or falling. Skylights that slope more than 60 degrees or that are raised at least 0.35 meters above the roof surface need not be fitted with protective devices.

8:2434 Devices providing protection against falling ice and snow

Devices providing protection against falling ice and snow shall be installed at the entrances of buildings if there is a particular risk of injury as a result of ice and snow falling from the roof.

General recommendation
There is a particular risk of injury at the entrances to buildings
- if the building's façade is more than 8 meters high, or
- if the pitch of the building's roof is greater than 1:3 (≈ 18º).

Examples of the design of snow fences can be found in SS 831335.

8:3 Protection against collision and crushing

8:31 General

Buildings shall be designed so as to limit the risk of personal injury as a result of collision. The parts and devices of buildings that are capable of movement shall be positioned and designed to ensure the risk of personal injury due to being trapped or similar is limited.

General recommendation
Parts of buildings and other fixed devices located at a height lower than 2.20 meters above the walkway should be built in or specially marked to ensure they do not pose a risk to people with limited vision.

Swing doors should be designed to ensure it is possible to see through them.

Doors in schools and pre-schools as well as entrance doors to residences should have crush protection.

8:32 Fixtures, fittings and equipment

In spaces where children may be present, both fixtures, fittings and equipment which are readily accessible to children shall be designed to ensure that children cannot be injured as the result of that
- fixtures, fittings and equipment can tip,
- children can open drawers or panels intended for safe storage,
- children can climb on drawers or oven doors,
- children can get caught in strings, chains, ribbons or other arrangements for operating fixed curtains, blinds or other fixtures, fittings or equipment. *(BFS 2014:3).*

General recommendation
A drawer with safety fittings or some other safety appliance should be provided for the storage of sharp household implements.

Stove should be equipped with tipping protection.

To avoid that children gets scalding or burns by climbing, drawing units or open shelves should not be placed adjacent to the stove.

Fixed curtain fittings, blinds and similar should be designed and installed according to SS-EN 13120 to meet the mandatory provision's requirement that children shall not get caught in loose strings, chains and ribbons. *(BFS 2014:3).*

8:33 Protection against accidents involving moving devices

Doors, gates, walls, gratings and barriers that are opened by a motor and closed by stored energy or vice versa shall be designed so as to limit the risk of personal injury. This shall also apply to motorised barriers that are both opened and closed by a motor and to manual overhead doors.

General recommendation
Manual overhead doors should be attached with through bolts with nuts or similar to structural elements of sufficient load-bearing capacity. Attachment by hexagon headed wood screws does not comply with the requirement in the provision regarding limitation of the risk of personal injury.

Doors, gates, walls, gratings and barriers manufactured and installed in accordance with SS-EN 12978 and SS-EN 13241-1 meet the requirements of the provisions.

Energy may, for example, be stored by means of springs, rubber bands or as a result of the elevation of the gate.

Provisions concerning lifts, escalators, passenger conveyors as well as doors, gates, walls, grids and gratings that are both opened and closed by means of a motor are contained in Chapter 5 PBO and in the Boverket´s mandatory provisions and general recommendations on lifts and certain other motorised devices (BFS 2011:12), H.

8:34 Clear height

The clear height in escape routes, on stairs, through doors and in other circulation spaces shall be at least 2.00 meters.

8:35 Glass in buildings

Glazed surfaces that are unprotected and positioned in such a way that people can come into contact with them shall be designed to ensure the risk of personal injury is limited. Glazed surfaces and mountings shall withstand the dynamic effect caused by people.

General recommendation
A test method for resistance to heavy impacts and a classification are contained in SS-EN 12600.

8:351 Protection against collision

Large glazed surfaces in doors and glazed surfaces which may be mistaken for doors or openings shall be clearly marked.

General recommendation
The markings should differ from the background and be visible to people whether they are standing or sitting.

8:352 Protection against falling through glass

Glazed surfaces shall be designed so as to limit the risk of falling through the glass.

General recommendation
The risk of falling can be considered to exist when
- the vertical drop is more than 2.0 meters to the underlying ground or floor and
- the distance between the glazed surface and the bottom floor is less than 0.6 meters.

Laminated safety glass in accordance with Section 8:353, balustrade or the equivalent may serve as protection.

8:353 Protection against cuts

Glazed surfaces shall be designed to limit the risk of people cutting themselves.

General recommendation
Tempered safety glass in accordance with SS-EN 12150-2 that meets the requirements of at least Class 1(C)3 or laminated safety glass in accordance with SS-EN 14449 that meets the requirements of at least Class 2(B)2 in accordance with SS-EN 12600 should be used in

– glass railings
– glazed surfaces in entrances and circulation spaces if the distance from the lower edge of the glazed surface to the floor or ground is less than 1.5 meters
– glazed surfaces in dwellings if the distance from the lower edge of the glazed surface to the floor or ground is less than 0.6 meters
– glazed surfaces in other spaces in which children may spend time if the distance from the lower edge of the glazed surface to the floor or ground is less than 0.8 meters. Glazed surfaces in doors in schools and preschools should, however, have tempered or laminated glass if the distance from the lower edge of the glazed surface to the floor or ground is less than 1.5 meters.

Where a door or partition is glazed using small panes, glass that is not classed as safety glass may be used. *(BFS 2014:3)*

8:4 Protection against burns

Buildings and their installations shall be designed so as to limit the risk of burns.

8:41 Heating installations

Readily accessible parts of heating installations shall be fitted with protection against unintended contact if their surface temperature is so high that they may cause burns on contact. In spaces where children may be present special attention shall be given to the risk of accidents to children.

General recommendation
Protection against unintended contact should be provided if the surface temperature exceeds 90 °C. In sanitary rooms and in nursery schools and after-school centres, readily accessible parts should be provided with protection against unintended contact if the surface temperature exceeds 60 °C.

The specified surface temperatures relate to enamelled or unpainted metal surfaces. Methods for determining the surface temperatures for other materials, which correspond to the surface temperature for metal with regard to the risk of burns is described in SS-EN ISO 13732-1.

Permanently fixed radiant heat sources must be designed to ensure that people in the vicinity may not sustain burns or suffer discomfort.

General recommendation
Rules concerning the safety of electric radiant heat sources are issued by the Swedish Electrical Safety Board.

For hot water temperature, see Section 6:621.

8:42 Stoves, ovens, etc.

Readily accessible surfaces on stoves and ovens etc. shall be protected against contact if their surface temperature is so high that they may cause burns on contact.

General recommendation
Stoves should have a hob guard that extends at least 0.1 meters above the hob and covers the front edge of the stove and its sides up to 0.2 meters from the front edge. If the stove is accessible from the side, the entire accessible side should be covered by the hob guard.

The doors of ovens which are lower than 0.8 meters above the floor should have safety fittings. The outer temperature of glass doors in ovens and on the surfaces of handles, knobs, buttons etc. of metal that are held for a short time should not exceed 60 ºC.

Accessible metal surfaces on stoves and ovens etc. at heights lower than 0.8 meters above the floor should have a surface temperature not exceeding 60 ºC during normal operation. Methods for determining the surface temperatures for other materials, which correspond to the surface temperature for metal with regard to the risk of burns are described in SS-EN ISO 13732-1.

8:43 Protection against scalds

Deflectors shall be placed so as to limit the risk of scalding.

General recommendation
A slop sink should be placed along the same line of fixtures and fittings as the stove.

8:5 Protection against explosions

8:51 General

General recommendation
Rules concerning the handling of flammable and explosive goods are issued by the Swedish Civil Contingencies Agency.

High pressure boilers with an operating pressure greater than 1 MPa and water and steam spaces totalling more than 0.5 m^3 should be located in a separate building. This also applies to larger pressure vessels of other types such as steam accumulators, digesters and gas holders. *(BFS 2014:3)*

8:52 Heating installations etc.

Boiler installations or other installations for heating water and other pressurised devices shall be fitted with safety devices which limit the risk of personal injury due to excessive pressure or excessive temperature in the installation.

General recommendation
The Swedish Work Environment Authority issues rules on pressure vessels and for the inspection and use of pressure devices.

A sealed boiler installation should be equipped with oil conservator. An enclosed expansion vessel should be sited to ensure heating of the vessel due to natural circulation, convection and radiation is prevented.

Boiler plants and other installations for heating water should be fitted with safety valves that prevent excessive pressure. A boiler plant operating on solid fuel should also be fitted with a thermal safety device that prevents the maximum water temperature being exceeded. When a boiler is fitted with a thermal safety device that requires cooling by water, the installation should be connected to a public water supply and sewage system. Alternatively, it can be connected to a separate water supply and sewage system that provides secure access to water.

8:6 Protection against being locked in

Doors leading to sanitary rooms, saunas and other spaces where someone could be accidentally locked in shall have a closing device so that a bolted or locked door can be opened from both the inside and the outside without a key or special tool.

Saunas shall be designed so as to allow rapid escape. The door shall open outwards or be a swing-type door. The door must not have a lock and it shall not be possible for the door leaf to get stuck in the frame as a result of thermal expansion or the effect of moisture.

In spaces where children may spend time, doors to utility rooms shall be fitted with a closing device so that they can be opened from the inside without a key.

In spaces where children may spend time, doors or locks to freezers, refrigerators and coolers etc. that are readily accessible to children shall have closing devices so that the door or lock can be opened from the inside by a child.

General recommendation
The appropriate design of doors or locks which can be opened from the inside is set out in SS-EN 60335-2-24.

Rules concerning protection against being locked in are also issued by The Swedish Work Environment Authority.

8:7 Protection against poisoning

Connections between premises where toxic gases occur and premises where people are present other than occasionally shall be provided only if adequate measures are taken to limit the risk of personal injury due to poisoning.

General recommendation
Examples of premises where toxic gases may be present are garages in multi-dwelling houses and stores for certain fuels.

The connection should be sealed and fitted with door closers.

Rules for the isolation, in certain cases, of premises with hazardous substances are also issued by The Swedish Work Environment Authority. *(BFS 2011:26)*

In dwellings and other similar spaces where children may spend time, it shall be possible for chemical compounds, medicines and similar products to be stored safely.

General recommendation
Such spaces should have safety fittings, or access to them by children should be made difficult in some other way. For the storage of medicine and hazardous chemical compounds such as dishwasher fluids, cleaning fluids and petroleum products, a lockable space should be provided, for instance one situated high up in a broom cupboard. For the storage of less hazardous preparations such as mild washing up fluids and detergents, a low level unit with safety fittings or a cupboard placed not less than 1.4 meters above floor level should be provided.

In a garage with a net area of more than 50 m^2, clearly visible signs shall be provided that warn of the risk of carbon monoxide poisoning.

General recommendation
The sign should state that it is prohibited to let a vehicle run idle.

8:8 Protection against electric shocks

Buildings shall be designed so as to limit the risk of personal injury as a result of electric shocks.

General recommendation
Provisions concerning electrical safety are issued by Elsäkerhetsverket[4].

8:9 Protection against accidents on sites

8:91 Protection against falls on sites

Stairs and ramps on footpaths between a building's accessible entrances in accordance with Section 3:132 and parking spaces and lay-bys for cars shall be designed to ensure people can move around safely.

General recommendation
Stairs and ramps should have a handrail on one side. The handrail should have a height of 0.9 meters.

In order for the stairs to be designed safely account should be taken to the incline and length of the stairs and the relationship between the height and depth of the steps. The incline along the walking line should not change within the same flight. There should be no treads which have a height that is different from others. The depth of the step on stairs should be at least 0.30 meters, measured along the walking line. In order to minimise the risk of someone tripping, stairs should have more than two steps.

For the design of ramps, see Section 3:1222.

Stairs, except in single-family houses, should be provided with contrast marking to ensure people with limited eyesight can detect the changes in level. The lowest tread of a staircase and the corresponding part of the front edge of the landing at the uppermost riser in every flight should

[4] Elsäkerhetsverket: The Swedish Electrical Safety Board

have a lightness contrast of at least 0.40 according to the NCS (Natural Color System). The markings should be made in a consistent manner.

8:92 Protection of openings in the ground on sites

If there are openings or chutes for e.g. waste, in or at surfaces that are intended to be walked on, these openings shall be covered by access panels, duckboard, grating or other suitable protective devices. The openings may also be demarcated by guard rails or similar. In spaces where children may be present, such access panels, gratings, duckboard and similar shall be designed to ensure they cannot be lifted or opened by children and to ensure the risk of personal injury is limited.

General recommendation
Rules on waste facilities are contained in Section 3:422. *(BFS 2014:3).*

8:93 Protection against accidents on fixed playground equipment on sites

Fixed playground equipment shall be arranged so as to limit the risk of personal injury. The ground covering beneath swings, climbing frames and similar playground equipment shall be shock-absorbing and otherwise designed so as to limit the risk of personal injury in the event of an accident.

General recommendation
Examples of how fixed playground equipment can be designed are contained in SS-EN 1176-1 and SS-EN 1176-7. Examples of shock-absorbing ground coverings and test methods for shock-absorbing ground coverings are contained in SS-EN 1177.

8:94 Protection against accidents involving moving devices on sites

Doors, gates, walls, grating and barriers that are opened by a motor and closed by stored energy or vice versa shall be arranged so as to limit the risk of personal injury. This shall also apply to motorised barriers that are both opened and closed by a motor and to manual overhead doors.

General recommendation
Manual overhead doors should be attached with through bolts with nuts or similar to structural elements of sufficient load-bearing capacity. Attachment by hexagon headed wood screws does not comply with the requirement in the provision regarding limitation of the risk of personal injury.

Doors, gates, walls, gratings and barriers manufactured and installed in accordance with SS-EN 12978 and SS-EN 13241–1 meet the requirements of the provisions.

Energy may, for example, be stored by means of springs, rubber bands or as a result of the elevation of the gate.

Doors, gates, walls, and gratings that are both opened and closed by a motor are governed by Boverket's provisions and general recommendations on lifts and other motorised devices (BFS 2011:12), H.

8:95 Protection against drowning on sites

General recommendation
Chapter 3, Section 5 of the Public Order Act (1993:1617) states that wells, pools and similar facilities shall have the necessary safety devices, depending on where the facility is and how it is designed. Protection to prevent children having accidents is particularly important.

8:951 Permanent pools for bathing or swimming

Permanent pools on sites shall have adequate protection to prevent children having accidents. However, a permanent plastic pool or similar with a maximum water depth of 0.2 meters need not have special protection.

The discharge openings of pools shall be designed so as to limit the risk of accidents.

General recommendation
Examples of appropriate protective devices for pools and similar which are intended for bathing or swimming may be following:

– A fence that is at least 0.9 meters high and that children cannot crawl under or climb over. It should not be possible for children to open any gates in the fence.

– A protective cover or protective netting. These should be intended for the purpose and be designed so that the risk of accidents is limited. Protective netting should have a mesh width not greater than 50 mm.

Where, due to velocity or flow rate design, satisfactory protection against accidents is not possible, the discharge openings should be fitted with grating or similar devices. *(BFS 2014:3).*

8:952 Ponds, fixed wells and fixed reservoirs

Ponds, fixed wells and fixed reservoirs that are not enclosed and in which water or some other liquid is stored shall be designed to have satisfactory protection which limits the risk of personal injury due to falls into the water or liquid.

General recommendation
Protection to prevent children having accidents is particularly important. An example of a design that reduces the risk of children having accidents is a flat bank or an at least 0.9 meters high fence that children cannot crawl under or climb over. It should not be possible for children to open any gates in the fence. *(BFS 2014:3).*

Covers and gratings on wells shall have adequate strength. The design shall limit the risk of children having an accident.

General recommendation
Well covers should have a locking device that cannot be opened by children.

8:10 Requirements for safety in use in the alteration of buildings

This section contains, in addition to what is specified in Section 8, provisions and general recommendations to Chapter 8, Section 7 of PBA. *(BFS 2011:26).*

8:10:1 General

Buildings shall be designed so as to minimise the risk of accidents such as falls, collisions, crushing, burns, explosions, being locked in, poisoning and electric shocks.

Buildings shall, following the alteration, comply with the safety requirements for use specified in Sections 8:2–8:8. The requirements may be satisfied in a way other than that specified where the corresponding safety level is still achieved.

However, deviations from the safety level may be made taking into account the extent of the alteration and the conditions of the building. Rules on this are contained in this section and in Section 1:22. However, deviations must never result in an unacceptable risk to human safety. *(BFS 2011:26).*

General recommendation
When making alterations you should aspire to the same level of safety as for construction of new buildings. Factors that may justify a different level of safety could be that the measure damages the building's cultural values or the building's architectural and aesthetic values.

That the safety level is acceptable can be verified through a risk assessment. The assessment should show why a lower safety level is selected, the risks this involves and what can be done to minimise them. In the assessment, the proposed use and those who have access to a certain space should be considered.

When altering a building, the requirements cannot be lower than what applied when the building was erected. To verify that the building meets this safety level, you should review the current safety devices to ensure that they have for the most part retained their original functionality. Attachments of balustrades and other protective devices in particular should be checked to ensure they have not been weakened by factors such as corrosion, wear or cracking.

Additional rules on safety in use are included in Boverket´s mandatory provisions and general recommendations (2011:13) on easily eliminated obstacles, to which and in premises where the public has access and in public places, HIN.

In older buildings it can be required to improve roof protection devices, motorised gates, waste facilities, lifts and cable way facilities regardless of what alterations are planned,

Rules for electrical installations are issued by the Swedish Electrical Safety Board. They also include requirements for alterations to buildings. *(BFS 2014:3).*

8:10:11 Protection against falling

General recommendation

Structural elements such as thresholds, support handles in shower rooms, contrast marking of stairs, floor surfaces. Balustrades, handrails and similar devices should be designed to ensure that the risk of falls is limited.

Stairways are often an essential part of the building's historical value. For alterations, the existing stairs may be acceptable if no other changes are made in the stairway. The existing stair balustrades may also be acceptable, with possible additions, if their safety is judged to be acceptable. *(BFS 2011:26).*

8:10:12 Openable windows, balcony doors etc.

In spaces where children can be expected to spend time without constant supervision by adults, openable windows, balcony doors and the like shall be fitted with safety devices as specified in Section 8:231, unless there are exceptional reasons. *(BFS 2011:26).*

General recommendation

Exceptional reasons may be that the measure would significantly harm the building's cultural values. *(BFS 2011:26).*

9 Energy conservation

This section contains the mandatory provisions and general recommendations for Chapter 3, Article 14 of the PBO. Section 9:9 also contains the mandatory provisions and general recommendations for Chapter 8, Article 7 of the PBA. *(BFS 2017:5).*

9:1 General

Buildings shall be designed in such a way that energy use is limited by low heat losses, low cooling demands, efficient use of heat and cooling and efficient use of electricity.

General recommendation
Rules on ventilation are contained in Section 6:25, on light conditions in Section 6:32, on thermal comfort in Section 6:42, on moisture control in Section 6:53, and on hot tap water use in Section 6:62.

Rules on investigation on alternative energy supply systems are contained in Boverket's mandatory provisions (2013:8) on rules on investigation on alternative energy supply systems, ALT. *(BFS 2014:3).*

9:11 Scope of application

The regulations in this section apply to all buildings except for

– greenhouses or similar buildings that could not be used for their intended purpose if these requirements had to be met,

– residential buildings used, or intended for use, either less than four months per year or during a limited part of the year corresponding to an energy use estimated to be less than 25 per cent of what would be the case in full-year use,

– buildings that do not require space heating or air conditioning for the major part of the year, and

– buildings where no space is intended to be heated to more than 10 ºC and where the need for energy for comfort cooling, hot water and building property energy is low.

The requirements in section 9:2 need not be met for buildings where the heating supply from industrial processes within the building covers the majority of the space heating needs. This shall be shown through a special investigation.

The requirement on electrical energy conservation does not apply to premises intended for operations of temporary nature or free-standing buildings with an area less than 50 m^2. *(BFS 2017:5).*

9:12 Definitions

A_f	Total area for windows, doors, gates, etc. (m^2), calculated using the external frame dimensions.
A_{temp}	The area enclosed by the inside of the building envelope of all storeys including cellars and attics for temperature-controlled spaces are intended to be heated to more than 10 ºC. The area occupied by interior walls, openings for stairs, shafts, etc., are included. The area for garages, within residential buildings or other building premises other than garages, are not included.
The building's energy use, E_{bea}	The energy that in normal use during a standard year needs to be supplied to a building (most often called purchased energy) for space heating (E_{uppv}), air conditioning (E_{kyl}), hot tap water (E_{tvv}) and the building's property energy (E_f). If underfloor heating, towel dryers or other devices for space heating are installed, their energy use is also included. Energy from the sun, wind, ground, air or water that is produced in the building or on its site and is used for the building's space heating, air conditioning, hot water and property energy is not included in the building's energy use. $E_{bea} = E_{uppv} + E_{kyl} + E_{tvv} + E_f$
E_{uppv}	Energy for space heating, kWh/year
E_{kyl}	Energy for air conditioning, kWh/year
E_{tvv}	Energy for hot tap water, kWh/year
E_f	Property energy, kWh/year
F_{geo}	Geographical adjustment factor, -
The building's property energy, E_f	The part of the building's energy use that is related to the building's needs where the energy-intensive device is within, below or placed on the outside of the building. Property energy includes fixed lighting in public spaces and operating spaces. Energy used in heating cables, pumps, fans, engines, control and monitoring equipment and the like is also included. Externally locally placed devices that supply the building, such as pumps and fans for free cooling, are included. Devices intended for other use than for the building, such as engine and cab heaters for vehicles, battery chargers for external users, lighting in the garden and on walkways, are not included. Property electricity refers to the part of the property energy that is electricity-based.

The building's primary energy number (EP_{pet})

The value that describes the building's energy performance expressed as a primary energy number. The primary energy number is comprised of the building's energy use, where energy for space heating has been corrected with a geographical adjustment factor (F_{geo}), multiplied by a primary energy factor for energy carriers and distributed on A_{temp} (kWh/m^2 per year). The primary energy number (EP_{pet}) is calculated according to the equation below

$$EP_{pet} = \frac{\sum_{i=1}^{6}\left(\frac{E_{uppv,i}}{F_{geo}} + E_{kyl,i} + E_{tvv,i} + E_{f,i}\right) \times PE_i}{A_{temp}}$$

where

PE_i — Primary energy factor per energy carrier

Winter external design temperature, DVUT

The temperature, for a representative geographical location, that results from the 1-day value in "n-day mean air temperature" according to SS-EN ISO 15927-5. The temperature may be increased if the building's time constant exceeds 24 hours. The increase is shown by the standard's reported temperatures for 2, 3 or 4 days. The building's time constant, measured in days, is used for the selection of the corresponding table value (n-day). Temperature increase depending on a time constant higher than 96 hours can be determined through special investigation.

Energy for air conditioning

The amount of cooling or energy supplied to the building that is used to reduce the building's indoor temperature for human comfort. Cooling energy that is taken directly from the surroundings without a cooling appliance, e.g. from lake water or outdoor air (so-called free cooling), is not included.

Average heat transfer coefficient U_m

Average heat transfer coefficient for building components and thermal bridges (W/m^{2}K) determined in accordance with SS-EN ISO 13789:2007 and SS 24230 (2) and calculated according to the equation below.

$$U_m = \frac{\sum_{i=1}^{n} U_i A_i + \sum_{k=1}^{m} l_k \Psi_k + \sum_{j=1}^{p} \chi_j}{A_{om}}$$

where

U_i — Heat transfer coefficient for building component i (W/m^{2}K).

A_i — The area of the building component i's surface against heated parts of dwellings or premises. For windows, doors, gates and the like, A_i is calculated with the outer frame dimension. The building's entire indoor height is used in the calculations, i.e. from the upper edge of the lower joists to the lower edge of the attic joists.

ψ_k — The heat transfer coefficient for the linear thermal bridge k (W/mK).

l_k — The length of the linear thermal bridge k (m).

χ_j — The heat transfer coefficient for the point thermal bridge j (W/K).

A_{om}	Total area of enclosed building components' surfaces against heated parts of dwellings or premises. Enclosed building components refer to such building components that border on heated parts of dwellings or premises towards the outside, towards the ground or towards partially heated spaces.
Household energy	The electricity or other energy used for household purposes. Examples are the electricity used for dishwashers, washing machines, dryers (including in a shared laundry room), stoves, refrigerators, freezers and other household appliances as well as lighting, computers, TV and other home electronics and the like.
Indoor temperature	The temperature that is intended to be kept indoors when the building is used.
Installed electric input for space heating	The total electric input power that, as a maximum, can be used by the electric appliances for heating needed to maintain the intended indoor climate, hot tap water production and ventilation when the building's maximum heat demand exists. The maximum power need can be calculated at DVUT and hot tap water use corresponding to at least 0.5 kW per dwelling, unless higher load cases are known at the project planning.
Standard year	The average outdoor climate (e.g. temperature) over a longer time period (e.g. 30 years).
Standard year correction	Correction of the building's measured climate-dependent energy use, based on the difference between the climate at the location during a normal year and the actual climate during the period that the building's energy use is verified.
Primary energy factor, PE_i	Primary energy divided by the energy supplied to the building for a given energy carrier.
Specific fan power (SFP)	The total electric input for all fans in the ventilation system divided by the greater of the supply air flow rate or the exhaust air flow rate, kW/(m^3/s).
Activity energy	The electricity or other energy used for activities in the premises. Examples are process energy, lighting, computers, copying machines, TV, refrigerated/frozen food displays/counters, appliances and other devices for the activities, as well as ovens, refrigerators, freezers, dishwashers, washing machines, dryers, other household appliances and the like.

(BFS 2017:5).

9:2 Dwellings and premises

Dwellings and premises shall be designed to ensure

- primary energy number (EP_{pet}),
- the installed electric input for heating,
- the average air leakage of the building envelope, and
- the average thermal transmittance (U_m) of the building envelope (A_{om}),

amounts, as a maximum, to the values stated in Table 9:2a. When determining the building's primary energy number, consideration shall be taken to primary energy factors according to Table 9:2b and geographical location according to Table 9:2c.

A higher primary energy number and higher electric input than those stated in Table 9:2a can be accepted if special conditions exist. *(BFS 2017:5).*

General recommendations
Examples of special conditions where a higher primary energy number and higher electric input can be justified are when alternatives to electricity for space heating and hot tap water are not available and a heat pump cannot be used.

How much the highest permitted primary energy number and electric input in accordance with Table 9:2a need to be exceeded as a result of the special conditions should be shown in a special investigation. *(BFS 2017:5).*

If a building is supplied with energy for space heating or cooling from a nearby building or appliance, the energy carrier and the cooling technology for the receiving building is considered to be the same as for the supplying building provided that the buildings are on the same real property unit or the buildings have the same owner. The same applies to real property units within the same building in three-dimensional property registration.

If the building has an installed electric input for space heating and hot tap water that is below 10 W/m^2, electric energy for air conditioning is multiplied by 1.875 in addition to multiplication by the primary energy factor PE_{el} for electric energy.

For buildings that contain both dwellings and premises, the requirements on average heat transfer coefficient (U_m), primary energy number (EP_{pet}) and installed electric input for space heating are weighted in proportion to the floor area (A_{temp}). *(BFS 2017:5).*

General recommendations
Handling of energy from the sun, wind, ground, air or water is regulated in Boverket's mandatory provisions and general recommendations (2016:12) regarding determination of the building's energy use at normal use and in a standard year, BEN. *(BFS 2017:5).*

Table 9:2a **Maximum permitted primary energy number, installed electric input for space heating, average heat transfer coefficient and average air leakage rate, for single-family houses, multi-dwelling blocks and premises.**

	Energy performance expressed as primary energy number (EP_{pet}) [kWh/m^2 A_{temp} per year]	**Installed electric input for heating (kW)**	**Average heat transfer coefficient (U_m) [W/m^2 K]**	**Climate envelope's average air leakage rate at 50 Pa pressure difference (l/s m^2)**
Dwellings				
Single-family houses	90	4.5 + 1.7 x (F_{geo} – 1)[1)]	0.40	In accordance with 9:26
Single-family where A_{temp} is less than 50 m^2	No requirement	No requirement	0.33	0.6
Multi--dwelling blocks	85[4)]	4.5 + 1.7 x (F_{geo} – 1)[1) 5)]	0.40	In accordance with 9:26
Premises				
Premises	80[2)]	4.5 + 1.7 x (F_{geo} – 1)[1), 3)]	0.60	In accordance with 9:26

	Energy performance expressed as primary energy number (EP_{pet}) [kWh/m^2 A_{temp} per year]	**Installed electric input for heating (kW)**	**Average heat transfer coefficient (U_m) [W/m^2 K]**	**Climate envelope's average air leakage rate at 50 Pa pressure difference (l/s m^2)**
Dwellings				
Premises where A_{temp} is less than 50 m^2	No requirement	No requirement	0.33	0.6

1) Addition may be made by (0.025 + 0.02(F_{geo} -1)) x (A_{temp} – 130) when A_{temp} is greater than 130 m^2. If the geographical adjustment factor F_{geo} is less than 1.0, it is set at 1.0 when calculating the installed electric power.

2) Addition may be made by 70 x (q_{medel} – 0.35) when the outdoor air flow in temperature-regulated spaces, for reasons of increased hygiene, is greater, than 0.35 l/s per m^2, where q_{medel} is the average specific outdoor air flow during the heating season and may as a maximum be included up to 1.00 l/s per m^2.

3) Addition may be made by (0.022 + 0.02(F_{geo} -1)) x (q – 0.35)A_{temp} when the outdoor air flow, for reasons of continuous hygiene, is greater, than 0.35 l/s per m^2 in temperature regulated spaces. Where q is the maximum specific outdoor air flow at DVUT. If the geographical adjustment factor F_{geo} is less than 1.0, it is set at 1.0 in the calculation of installed electric input.

4) Addition may be made by 70(q_{medel} – 0.35) in multi-dwelling blocks where A_{temp} is 50 m^2 or greater and that predominantly (>50 % A_{temp}) contain apartments with a living area of no more than 35 m^2 each and q_{medel} the outdoor air flow in temperature-regulated spaces exceeds 0.35 l/s per m^2. The addition can only be used due to requirements for ventilation in special spaces, such as bathrooms, toilets and kitchens and may as maximum be included up to 0.6 l/s per m^2.

5) Addition may be made by (0.022 + 0.02(F_{geo} -1)) x (q – 0.35)A_{temp} in multi-dwelling blocks where A_{temp} if 50 m^2 or greater and that predominantly (>50 % A_{temp}) contain apartments with a living area of no more than 35 m^2 each. The addition can only be used when the maximum outdoor air flow at DVUT in temperature regulated spaces q exceeds 0.35 l/s per m^2 due to requirements for ventilation in special spaces, such as bathrooms, toilets and kitchens. If the geographical adjustment factor F_{geo} is less than 1.0, it is set at 1.0 in the calculation of installed electric input.

(BFS 2018:4).

Table 9:2b Primary energy factors

Energy carrier	**Primary energy factor (PE_i)**
Electricity (PE_{el})	1.6
District heating (PE_{fjv})	1.0
District cooling (PE_{kyl})	1.0
Bio fuel (PE_{bio})	1.0
Oil (PE_{olja})	1.0
Gas (PE_{gas})	1.0

(BFS 2017:5).

Table 9:2c Geographical adjustment factors

County	**Geographical location Municipality**	**Geographical adjustment factor F_{geo}**
Blekinge	All municipalities	0.9
Dalarna	Avesta, Hedemora and Säter	1.1
	Borlänge, Falun, Gagnef, Leksand, Ludvika, Mora, Orsa, Rättvik, Smedjebacken and Vansbro	1.2
	Malung-Sälen and Älvdalen	1.4
Gotland	Gotland	0.9
Gävleborg	Gävle, Ockelbo and Sandviken	1.1
	Bollnäs, Hofors, Hudiksvall, Nordanstig and Söderhamn	1.2
	Ljusdal and Ovanåker	1.3

County	**Geographical location Municipality**	**Geographical adjustment factor F_{geo}**
Halland	All municipalities except Hylte	0.9
	Hylte	1.0
Jämtland	Berg, Bräcke, Ragunda and Östersund	1.4
	Härjedalen, Krokom and Strömsund	1.5
	Åre	1.6
Jönköping	Aneby, Gislaved, Gnosjö, Habo, Jönköping, Mullsjö, Tranås, Vaggeryd, Vetlanda and Värnamo	1.0
	Eksjö, Nässjö and Sävsjö	1.1
Kalmar	Borgholm, Emmaboda, Kalmar, Mönsterås, Mörbylånga, Nybro, Oskarshamn, Torsås and Västervik	0.9
	Hultsfred, Högsby and Vimmerby	1.0
Kronoberg	All municipalities	1.0
Norrbotten	Piteå	1.4
	Boden, Haparanda, Kalix, Luleå and Älvsbyn	1.5
	Arvidsjaur, Överkalix and Övertorneå	1.6
	Arjeplog and Pajala	1.7
	Jokkmokk	1.8
	Gällivare and Kiruna	1.9
Skåne	Höganäs, Landskrona, Lomma, Malmö and Vellinge	0.8
	Bjuv, Bromölla, Burlöv, Båstad, Eslöv, Helsingborg, Hässleholm, Hörby, Höör, Klippan, Kristianstad, Kävlinge, Lund, Perstorp, Simrishamn, Sjöbo, Skurup, Staffanstorp, Svalöv, Svedala, Tomelilla, Trelleborg, Ystad, Åstorp, Ängelholm and Östra Göinge	0.9
	Osby and Örkelljunga	1.0
Stockholm	All municipalities	1.0
Södermanland	All municipalities	1.0
Uppsala	Enköping, Håbo, Knivsta and Uppsala	1.0
	Heby, Tierp, Älvkarleby and Östhammar	1.1
Värmland	Grums and Säffle	1.0
	Arvika, Eda, Filipstad, Forshaga, Hammarö, Karlstad, Kil, Kristinehamn, Munkfors, Storfors, Sunne and Årjäng	1.1
	Hagfors and Torsby	1.2
Västerbotten	Nordmaling and Umeå,	1.3
	Bjurholm, Robertsfors, Skellefteå and Vännäs	1.4
	Dorotea, Lycksele, Vindeln and Åsele	1.5
	Malå, Norsjö and Vilhelmina	1.6
	Sorsele	1.7
	Storuman	1.8
Västernorrland	Härnösand, Kramfors, Sundsvall, Timrå and Örnsköldsvik	1.3
	Sollefteå and Ånge	1.4
Västmanland	Arboga, Hallstahammar, Kungsör, Köping, Surahammar and Västerås	1.0
	Fagersta, Norberg, Sala and Skinnskatteberg,	1.1
Västra Götaland	Göteborg, Härryda, Kungälv, Lerum, Lysekil, Mölndal, Orust, Partille, Sotenäs, Stenungsund, Strömstad, Tanum, Tjörn, Uddevalla and Öckerö	0.9

County	Geographical location Municipality	Geographical adjustment factor F_{geo}
	Ale, Alingsås, Bengtsfors, Bollebygd, Borås, Dals-Ed, Essunga, Falköping, Färgelanda, Grästorp, Gullspång, Götene, Herrljunga, Hjo, Karlsborg, Lidköping, Lilla Edet, Mariestad, Mark, Mellerud, Munkedal, Skara, Skövde, Svenljunga, Tibro, Tidaholm, Trollhättan, Töreboda, Vara, Vårgårda, Vänersborg and Åmål	1.0
	Tranemo and Ulricehamn	1.1
Örebro	Hallsberg, Kumla, Laxå, Lekeberg and Örebro	1.0
	Askersund, Degerfors, Hällefors, Karlskoga, Lindesberg and Nora	1.1
	Ljusnarberg	1.2
Östergötland	All municipalities	1.0

(BFS 2017:5).

9:21 has been repealed by (BFS 2017:5).

9:22 has been repealed by (BFS 2017:5).

9:23 has been repealed by (BFS 2017:5).

9:24 has been repealed by (BFS 2017:5).

9:25 Requirements on verification

The building's primary energy number shall be verified. Upon verification of the building's primary energy number, the building's energy use shall be determined in accordance with Boverket's mandatory provisions and general recommendations (2016:12) regarding determination of the building's energy use at normal use and in a standard year, BEN. *(BFS 2017:5).*

General recommendation

At the project planning, the building's average heat transfer coefficient and primary energy number should be calculated as a part of the verification that the building meets the requirements in 9:2.

Installed electric input for space heating should be calculated at the project planning and verified in the finished building by summation of the rated electric input.

Verification that a building meets the requirements of primary energy number in 9:2 should be done based on measurement in the finished building. The building's energy use is determined based on the measured energy use, corrected so that the energy use reflects a normal use according to Boverket's mandatory provisions and general recommendations (2016:12) regarding determination of the building's energy use at normal use and in a standard year, BEN.

Measurements of the building's energy use can be done in accordance with Section 9:7. The building's energy use should be measured during a continuous 12-month period, completed no later than 24 months after the building has been put into service. An energy performance certificate that is prepared in accordance with the Energy Declaration Act (2006:985) can be used upon verification through measurement.

Verification that a building fulfils the requirements of primary energy number in 9:2 can also be done through calculation according to Boverket's mandatory provisions and general recommendations (2016:12) regarding determination of the building's energy use at normal use and in a standard year, BEN. *(BFS 2017:5)*

9:26 Climate envelope's airtightness

The building's climate envelope shall be so air tight that the requirements of the building's primary energy number and installed electric input for space heating are met. *(BFS 2017:5).*

General recommendation
Additional rules regarding the climate envelope's airtightness from moisture and ventilation perspectives are presented in Sections 6:255 Airtightness and 6:531 Airtightness. Rules regarding airtightness against the spread of fire are in Section 5 Safety in case of fire. *(BFS 2017:5).*

9:3 *has been repealed by (BFS 2015:3).*

9:4 *has been repealed by (BFS 2017:5).*

9:5 HVAC systems

9:51 Heating and cooling installations

Heating and cooling installations in buildings shall be designed in such a way that they provide adequate efficiency during normal operation.

General recommendation
The installations should be designed in such a way that adjustment, testing, inspection, supervision, servicing and exchange can be easily effected and adequate efficiency maintained.

For some boilers, the applicable regulations are given in Boverket's mandatory provisions and general recommendations (2011:11) regarding procedures for the assessment of conformity for new boilers fuelled by liquid or gaseous fuel, EVP. See also Sections 6:7411 and 6:742.

Heating and cooling installations and installations for domestic hot water heating should be designed and insulated to ensure that energy losses are limited. See also Section 6:62.

HVAC systems should be designed, insulated and sealed to ensure that energy losses are limited. See also Section 6:255. *(BFS 2017:5).*

The need for cooling shall be minimised through design and technical measures.

General recommendation
To reduce the demand for cooling in the building, further measures should be considered such as the selection of window size, window location, sun-shading, sunlight protection glass, (electrically) efficient lighting and equipment to reduce internal heat loads, night cooling and accumulation of cold in the building structure. See also Section 6:43.

9:52 Control and monitoring systems

The building shall have a control and monitoring system in order to maintain a high energy efficiency and thermal comfort in accordance with Section 6:42. Heating, cooling and HVAC systems shall be fitted with automatic control equipment to ensure that the supply of heating and cooling is controlled in accordance with the power demand in relation to the outdoor and indoor climate and the intended use of the building**.**

General recommendation
With regard to the regulation of the supply of heating and cooling, the building should be divided into zones, with respect to use, orientation and floor layout.

Space heating installations in buildings containing dwellings should be fitted with devices for automatic heat control of each room.

Simultaneous heating and cooling of spaces should be avoided.

9:6 Efficient use of electricity

Technical building systems, which require electrical energy, such as ventilation, fixed lighting fittings, electrical heaters, circulation pumps and motors shall be designed to ensure the power requirement is limited and energy is used efficiently.

General recommendation

Energy efficiency of the ventilation system should, at the designed airflow rate, not exceed the following values for the specific fan power (SFP):

	SFP, kW/(m^3/s)
Extract and supply air with heat recovery:	2.0
Extract and supply air without heat recovery:	1.5
Extract air with recovery:	1.0
Extract air:	0.6

Higher SFP values may be acceptable for ventilation systems with variable air flows, air flows less than 0.2 m^3/s or operational periods less than 800 hours per year.

Fixed light fittings in kitchens and bathrooms should be provided with efficient light sources, such as fluorescent lamps, compact fluorescent lamps, low-energy lamps or similar devices. Fittings for outdoor lighting should be provided with efficient light sources, reflectors and optical devices, and controlled by dusk sensors, motion detectors or similar devices. Fittings for lighting in premises should be provided with presence detection and daylight control devices where appropriate.

Electric towel dryers and comfort underfloor heating should be provided with timer control or other regulating equipment.

Circulation pumps, other than for hot tap water installations, should be designed to ensure they are normally shut off when no flow is required.

9:7 Measuring systems for energy use

It shall be possible to continuously monitor the building's energy use by using a measuring system The measuring system shall ensure that the energy use of the building can be read to enable calculation of the building's energy use for a desired time period. *(BFS 2016:13).*

General recommendation

In the construction of a new building of multi-dwelling blocks and premises, it should be possible to measure the energy use for space heating, air conditioning, hot tap water and the building's property energy separately.

For extensions, measuring can be done through the existing building's measuring system

In buildings that have an installed electric input in excess of 10 W/m^2 for heating and hot tap water, it should be possible, when present, to read household energy and activity energy separately. A building that has an installed electric input below 10 W/m^2 for space heating and hot tap water and has an electric cooling device should be provided with the possibility of a separate reading of the cooling device´s electricity consumption.

Reading energy measuring should be made easily accessible to the subscriber, in or adjacent to the building. *(BFS 2017:5).*

9:71 has been repealed by (BFS 2016:13).

9:8 *has been repealed by (BFS 2017:5).*

9:9 Requirements for energy conservation in case of alterations to buildings

9:91 General

Buildings shall be designed in such a way that energy use is limited by low heat losses, low cooling demands, efficient use of heat and cooling and efficient use of electricity. Rules on alteration are contained in section 1:22.

The requirements for energy conservation shall be applied to ensure the other technical characteristics requirements can be met and to ensure the building's cultural values are not impaired and that the architectural and aesthetic values can be safeguarded.

Upon verification of the requirements in 9:2, the building's energy use shall be determined according to Boverket's mandatory provisions and general recommendations (2016:12) regarding determination of the building's energy use at normal use and in a standard year, BEN. *(BFS 2016:13).*

General recommendation
To verify the requirement for energy conservation, if the requirements for the building's primary energy number stated in Section 9:2 are not met, a review may be needed of which measures that can be implemented to reduce the building's energy use. If an energy performance certificate has been prepared in accordance with the Energy Declaration Act (2006:985), there may be proposals there for measures to improve the building's primary energy number. *(BFS 2017:5).*

Alterations to buildings must not result in a reduced energy efficiency, unless there are exceptional reasons. However, energy efficiency may be reduced if the alteration to the building still meets the requirements in Sections 9:2–9:6. *(BFS 2011:26).*

General recommendation
Exceptional reasons may be when there is a need to meet other technical characteristics requirements, such as a good indoor environment. *(BFS 2011:26).*

9:911 Coordination of measures.

General recommendation
To meet the requirement for energy conservation, coordination needs to be done when multiple measures are taken simultaneously in a building.

After the measures are implemented, the relevant technical systems should be adapted and optimised for operation. For example, for window replacement one should normally adjust the heating or ventilation systems. *(BFS 2011:26).*

9:92 Building envelope

If the building does not meet the requirements for the primary energy number in Section 9:2 after changes have been made, the following U-values shall be pursued in changes to the building envelope. *(BFS 2017:5).*

Table 9:92 U_i [W/m^2,K]

U_i	[W/m^2,K]
U_{roof}	0.13
U_{wall}	0.18
U_{floor}	0.15
U_{window}	1.2
$U_{exterior\ door}$	1.2

(BFS 2011:26).

General recommendation
Simple measures to improve the building's energy efficiency could be sealing or additional measures for windows and doors and supplementary insulation of the attic floors.

If the building envelope is sealed, the outdoor air supply should be ensured. When installing supplementary insulation the condensation point will change in the structure. Rules on how this shall be considered are contained in Sections 6:92 and 6:95.

Exterior wall: Reasons to allow a higher U-value could for example be when

– only a portion of an exterior wall is affected or
– it means that the usability of a balcony is significantly reduced.

For technical reasons it may be inappropriate to add insulation to certain wall constructions.

When applying external supplementary insulation, the effects on the building's character, details such as door and window coverage, and the relationship between the façade and eaves and plinth are to be considered. For example, windows may be moved out to maintain the building's character. In case of internal supplementary insulation, the consequences on the building's internal cultural values need to be clarified.

Windows: Windows are often of great importance for how the building is perceived and its cultural values. Reasons for deviation from the requirement for maximum U-value could be if the windows are manufactured specifically to meet the building's aesthetic or cultural values. Original windows should only be replaced using windows that in respect of materials, proportions, division and profiling are well suited to the character of the building. Windows may also have a highly significant cultural value to the extent that they should not be replaced unless there are exceptional reasons. Other measures to increase thermal resistance should be taken instead.

Entrance door: Doors are often of great importance for how the building is perceived and its cultural values. Reasons for deviation from the requirement for maximum U-value could be if the door is manufactured specifically to meet the building's aesthetic or cultural values. Original doors should be replaced only by those that are well suited to the character of the building. Doors may also have a highly significant cultural value which means that they should not be replaced unless there are exceptional reasons. They could, for example, be hand-made or be specially designed for a particular building. Other measures to increase thermal resistance should be taken instead.

Roofs: If the attic space is not intended to be heated, its insulation can be placed in the attic building floor. For additional insulation of the attic, the potential for moisture damage shall be considered. Rules on this are contained in Section 6. Reasons for deviation from the U-value requirements could be if moisture problems cannot be handled in a satisfactory manner, or if the requirement significantly impairs the usability of the attic space. *(BFS 2011:26).*

9:93 Ventilation system

HVAC systems shall be designed, insulated and sealed to ensure energy losses are limited. *(BFS 2011:26).*

General recommendation
When making alterations that change the pressure distribution in the building, for example, when changing the heating device, you should examine the option of producing an energy-efficient ventilation-efficient solution by modifying or tuning the ventilation system.

Proposals for energy efficiency measures can be contained in the minutes of the mandatory performance control of the ventilation system. *(BFS 2011:26).*

9:94 Heating and cooling installations

The heating installation shall be selected, designed, insulated, adjusted and calibrated to ensure the other technical characteristics requirements can be met in an energy efficient manner. *(BFS 2011:26).*

General recommendation
The opportunities to achieve energy efficiency through change or tuning of the heating system should always be investigated. Control and monitoring systems should, when needed, be supplemented to ensure that regulation of the heat output can be selected according to particular applications and any additional heat. During installation, replacement or modification of the

heating or cooling system, the same level as regards energy conservation as that defined in Section 9:5 should be pursued with regard to heating and cooling production, and control and monitoring systems. *(BFS 2011:26).*

The building's need for air conditioning shall be minimised. *(BFS 2011:26).*

General recommendation:
Instead of installing cooling systems other measures such as sun-shading and reduce internal heat loads through electrically efficient lighting and equipment should be chosen if possible. *(BFS 2011:26).*

9:95 Efficient use of electricity

Installations that require electrical energy, such as ventilation, fixed light fittings, electrical heaters, circulation pumps and motors shall be designed to ensure the power requirement is limited and energy is used efficiently.

When changes are made to the ventilation system, the aim should be to have a ventilation system where the SFP values in Table 9:95 are not exceeded. If only the unit is replaced, the aim should be to ensure the SFPv values specified in the table below are not exceeded. *(BFS 2011:26).*

Table 9:95 Maximum values for SFP (Specific fan power for a ventilation system) and SFPv (Specific fan power for a unit)

	SFP, [kW/(m^3/s)]	SFPv [kW/(m^3/s)]
Extract and supply air with heat recovery:	2.0	2.0
Extract and supply air without heat recovery:	1.5	1.5
Extract air with recovery:	1.0	1.0
Extract air:	0.6	0.6

(BFS 2011:26).

General recommendation
Higher SFP values may be acceptable for ventilation systems with variable air flows, air flows less than 0.2 m^3/s or operational periods less than 800 hours per year.

In the event of an alteration, the possibility of achieving more efficient electricity use through the replacement or addition of installations that use electrical energy should always be considered. This may relate to ventilation, fixed light fittings, electric heaters and motors, and equipment such as fridges/freezers, washing machines and drying equipment. *(BFS 2011:26).*

9:96 Measuring systems for energy use

It shall be possible to continuously monitor the building's energy using a measuring system. The system shall ensure that the energy use of the building can be read to enable calculation of the building's energy use for the desired time period. *(BFS 2011:26).*

General recommendation
If the building does not meet requirements corresponding to those in Section 9:7, it should be pursued that their energy use can be continuously monitored when changing installations of significance to the building's energy use.

How the building's energy use can be measured is stated in the general recommendations under Section 9:7. *(BFS 2016:13).*