

Building Regulations
Mandatory provisions and general recommendations
Section 9 Energy management

Important information

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

This translation of the reprint of Building Regulations BFS 1993:57 with amendments including BFS 2006:22 (BBR) of the Swedish Board of Housing, Building and Planning contains mandatory provisions and general recommendations pursuant to

- *the Planning and Building Act (1987:10), PBL,*
- *the Planning and Building Ordinance (1994:383), PBF,*
- *the Act on Technical Requirements for Construction Works, etc (1994:847), BVL, and*
- *the Ordinance on Technical Requirements for Construction Works, etc (1994:1215), BVF.*

In the translation the expression client/owner of the building is used. This means anyone who on his own account carry out or commissions any one else to carry out construction, demolition or site improvement work, as stated in PBL 9:1.

9⁷³ Energy management

This section contains mandatory provisions and general recommendations pursuant to Article 8 and paragraph three of Article 10 of BVF. (*BFS 2006:12*)

9:1⁷⁴ General

Buildings shall be designed in such a way that energy consumption is limited by low heat losses, low cooling demands, efficient use of heat and cooling and efficient use of electricity. (*BFS 2006:12*)

General recommendation

Regulations on ventilation are given in Subclause 6:25, on thermal comfort in Subclause 6:42 and on moisture control in Subclause 6:53. (*BFS 2006:12*)

9:11 Area of application

These regulations apply to all buildings other than

- greenhouses or similar buildings which could not be used if these requirements had to be fulfilled,
- buildings or parts of buildings which are only in use for shorter periods of time and
- buildings which do not require heating or cooling for major parts of the year.

The requirements in Clauses 9:2, 9:3 and 9:4 need not be fulfilled for buildings where additional heat from industrial processes within the building covers a major part of the heating requirement. This shall be verified by means of a special investigation. (*BFS 2006:12*)

9:12 Definitions

The energy consumption of the building: The energy which, in normal use, need to be supplied to a building (often referred to as “purchased energy”) for a period of one year for heating, cooling, hot tap water and operating building installations (pumps, fans, etc), as well as other electricity for the property.

Average heat transfer coefficient U_m : Average heat transfer coefficient for parts of buildings and thermal bridges (W/m²K) defined in accordance with prEN ISO 13789 and SS 02 42 30 and calculated in accordance with the following formula,

$$U_m = \frac{\left(\sum_{i=1}^n U_i A_i + \sum_{k=1}^m l_k \Psi_k + \sum_{j=1}^p \chi_j \right)}{A_{om}}$$

where

⁷³ Latest wording BFS 1995:17

⁷⁴ Latest wording BFS 2002:18

U_i	Heat transfer coefficient for the individual part of the building i ($\text{W}/\text{m}^2\text{K}$).
A_i	The surface area of the individual part of the building i in contact with heated indoor air (m^2). For windows, doors, gates and similar fixtures, A_i is calculated using the external frame dimensions.
Ψ_k	Heat transfer coefficient for the linear thermal bridge (W/mK).
l_k	Length of the linear thermal bridge k in contact with heated indoor air (m).
χ_j	Heat transfer coefficient for the thermal bridge j acting at one point (W/K).
A_{om}	Total surface area of the enclosing parts of the building in contact with heated indoor air (m^2). The enclosing parts of the building refer to those parts of buildings, which separate heated parts of dwellings or non-residential premises from the external air, the ground or in partly heated spaces.
A_f :	Total area of windows, doors, gates and similar fixtures (m^2), calculated using the external frame dimensions.
A_{temp} :	Floor area in temperature-controlled spaces intended to be heated to more than $10\text{ }^\circ\text{C}$, enclosed by the inside of the building envelope (m^2).
<i>Household electricity:</i>	Electricity (or other form of energy) consumed for household purposes. For example, electricity consumption for cooking, refrigerating and freezing and other household purposes, as well as lighting, computers, TV and other domestic electronics and similar devices.
<i>Indoor temperature:</i>	Temperature intended to be maintained when the building is in use.
<i>Northern climate zone:</i>	County of Norrbotten, County of Västerbotten, County of Jämtland, County of Västernorrland, County of Gävleborg, County of Dalarnas and County of Värmland.
<i>Southern climate zone:</i>	Other counties outside the northern climate zone.
<i>Average year correction:</i>	Correction of the metered energy consumption of the building based on the difference between the on-site

climates conditions an average year and the actual climate in the period for which the energy consumption of the building is being verified.

Specific fan power (SFP): The sum of electricity output for all fans in the ventilation system of the building divided by the maximum flow of intake air or extraction air in kW/(m³/s).

Outdoor temperature: The representative temperature for the site where the building is constructed.

Operational electricity: Electricity (or other form of energy) consumed for activities in premises. For example, lighting, computers, copiers, TV and other apparatus for operations, as well as for cooking, refrigerating and freezing and other household machines and similar appliances.

(BFS 2006:12)

9:2 Dwellings

Dwellings shall be designed so that the specific energy consumption of the building does not exceed 110 kWh per m² of floor area (A_{temp}) per year in the Southern climate zone, and 130 kWh per m² of floor area (A_{temp}) per year in the Northern climate zone. For single and two-dwelling houses with direct electrical heating as the main source of heating, the specific energy consumption of the building must not exceed 75 kWh per m² of floor area (A_{temp}) per year in the Southern climate zone and 95 kWh per m² of floor area (A_{temp}) per year in the Northern climate zone. *(BFS 2006:12)*

General recommendation

Household electricity is not included in the specific energy consumption of the building. *(BFS 2006:12)*

Garages shall not be included in the floor area A_{temp} . The specific energy consumption of the building may be reduced with energy from thermal solar collectors and photovoltaic solar cells installed in the building.

The maximum average heat transfer coefficient (U_m) must not exceed 0.50 W/m²K for parts included in the building envelope (A_{om}).

For buildings, which contain both dwellings and non-residential premises the requirement is calculated in proportion to the floor area (A_{temp}). *(BFS 2006:12)*

General recommendation

The requirements in Clause 9:2 should be verified partly by calculating the predicted specific energy consumption of the building and average heat transfer coefficient at the designing stage, partly by measuring specific energy consumption in the finished building. With respect to these requirements, the inspection plan should be drawn up so that the final certificate can be confirmed before measuring, and the building can be put in use.

When calculating the predicted specific energy consumption of the building, appropriate safety margins should be applied so that the requirement for the specific energy consumption of the building is fulfilled when the building is put

in use. Calculations should be carried out based on the current indoor and outdoor temperature; normal consumption of hot tap water and airing.

Measurements of the energy consumption of the building may be carried out in accordance with Subclause 9:71. The energy consumption of the building should be measured over a continuous period of 12 months, completed at the latest 24 months after the building is put in use. Average year correction and possible correction of abnormal hot tap water consumption and airing should be documented in a special report. (BFS 2006:12)

9:21 has been withdrawn by (BFS 2006:12)

9:211 has been withdrawn by (BFS 2006:12)

9:2111 - 9:1113 has been withdrawn by (BFS 2006:12)

9:212 has been withdrawn by (BFS 2006:12)

9:22 has been withdrawn by (BFS 2006:12)

9:221 has been withdrawn by (BFS 2006:12)

9:222 has been withdrawn by (BFS 2006:12)

9:23 has been withdrawn by (BFS 2006:12)

9:231 – 9:236 has been withdrawn by (BFS 2006:12)

9:3⁷⁵ Non-residential premises

Non-residential premises shall be designed so that the specific energy consumption of the building does not exceed 100 kWh per m² of floor area (A_{temp}) per year in the Southern climate zone, and 120 kWh per m² of floor area (A_{temp}) per year in the Northern climate zone. For premises with a flow of external air above 0.35 l/s,m² an addition may be made corresponding to 70(q-0.35) kWh per m² of floor area (A_{temp}) per year in the Southern climate zone and 90(q-0.35) kWh per m² of floor area (A_{temp}) per year in the Northern climate zone, where q is the average flow of external air during the entire heating season (l/s,m²). (BFS 2006:12)

General recommendation

Operational electricity is not included in the specific energy consumption of the building. (BFS 2006:12)

Garages shall not be included in the floor area A_{temp} unless the garage is a separate building. The specific energy consumption of the building may be reduced with energy from thermal solar collectors and photovoltaic solar cells installed in the building.

The maximum average heat transfer coefficient (U_m) must not exceed 0.70 W/m²K for parts included in the building envelope (A_{om}).

⁷⁵ Latest wording BFS 1998:38

For buildings, which contain both dwellings and non-residential premises the requirement is calculated in proportion to the floor area (A_{temp}). (*BFS 2006:12*)

General recommendation

The requirements in Clause 9:3 should be verified partly by calculating the predicted specific energy consumption of the building and average heat transfer coefficient at the designing stage, partly by measuring specific energy consumption in the finished building. With respect to these requirements, the inspection plan should be drawn up so that the final certificate can be confirmed before measuring, and the building can be put in use.

When calculating the predicted specific energy consumption of the building, appropriate safety margins should be applied so that the requirement for the specific energy consumption of the building is fulfilled when the building is put in use. Calculations should be carried out based on the current indoor and outdoor temperature; normal consumption of hot tap water, airing and additional heat from processes within the premises.

Measurements of the energy consumption of the building may be carried out in accordance with Subclause 9:71. The energy consumption of the building should be measured over a continuous period of 12 months, completed at the latest 24 months after the building is put in use.

Average year correction and possible correction of abnormal hot tap water consumption, airing and additional heat from processes within premises should be documented in a special report. (*BFS 2006:12*)

9:4⁷⁶ Alternative requirements on the energy consumption of the building

As an alternative to the requirements for buildings given in Clauses 9:2 and 9:3, where

- the floor area A_{temp} does not exceed 100 m^2 ,
- the window and door area A_f does not exceed $0.20 A_{\text{temp}}$ and
- there is no requirement for cooling,

the following requirements relating to the thermal insulation of the building, the airtightness of the building envelope and heat recovery may be applied.

The maximum heat transfer coefficient (U_i) must not exceed the following values for the enclosing parts (A_{om}) of the building:

	$U_i, \text{W/m}^2\text{K}$
U_{roof}	0.13
U_{wall}	0.18
U_{floor}	0.15
U_{window}	1.3
$U_{\text{outer door}}$	1.3

If direct electrical heating is installed as the main heating source in a single or two-dwelling house, the following values shall not be exceeded:

	$U_i, \text{W/m}^2\text{K}$
U_{roof}	0.08
U_{wall}	0.10

⁷⁶ Latest wording BFS 1998:38

U_{floor}	0.10
U_{window}	1.1
$U_{\text{outer door}}$	1.1

The building envelope shall be of sufficient tightness to ensure that the average air leakage rate at a pressure difference of ± 50 Pa does not exceed 0.61 l/s m^2 . In relation to this, the area A_{om} shall be applied. (BFS 2006:12)

General recommendation

A method for determining air leakage rate is given in SS-EN 13 829. (BFS 2006:12)

If the floor area of the building A_{temp} exceeds 60 m^2 , the building shall be provided with a heat recovery system for the ventilation air. (BFS 2006:12)

General recommendations

With regard to distribution losses and prevalent driving energy, the building should be provided with appropriately designed ventilation heat exchangers to transfer heat from the extract air to the supply air with minimum 70% temperature efficiency, or an extract air heat pump which produces corresponding savings. (BFS 2006:12)

9:5 Heating, cooling and air handling installations

9:51 Heating and cooling production

Heating and cooling installations in buildings shall be designed in such a way that they provide adequate efficiency during normal operation. (BFS 2006:12)

General recommendation

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 certain boilers, the regulations given in the mandatory provisions and general recommendations on efficiency requirements for new boilers heated by liquid or gaseous fuels of the National Board of Housing, Building and Planning (BFS 1997:58) apply. See also Subclauses 6:741 and 6:742.

Heating and cooling installations, as well as installations for heating tap water should be designed and insulated so that energy losses are limited. See also Subclause 6:62.

Air handling installations should be designed, insulated and sealed in such a way that energy losses are limited. See also Subclause 6:255. (BFS 2006:12)

The demand for cooling shall be minimised by constructional and engineering measures. (BFS 2006:12)

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, electric efficient lighting and equipment to reduce

internal heat loads, night cooling and accumulation of cold in the building structure. See also Subclause 6:63. (*BFS 2006:12*)

9:52 Control and regulating systems

To ensure that the building can maintain thermal comfort and adequate energy efficiency, building installations must have a regulation system. See also Subclause 6:42. Heating, cooling and air handling installations shall be provided with automatic regulation equipment so that the supply of heating and cooling is regulated in accordance with the power demand in relation to the outdoor and indoor climate and the intended use of the building. (*BFS 2006:12*)

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 design. Heating installations in buildings containing dwellings should be provided with automatic heat control devices in each room. Simultaneous heating and cooling of spaces should be avoided. (BFS 2006)

9:6 Efficient use of electricity

Building services installations, which require electrical energy, such as ventilation, lighting fixtures, electrical heaters, circulation pumps and motors shall be designed so that the power requirement is limited and energy is used efficiently. (*BFS 2006:12*)

General recommendation

Energy efficiency of the ventilation system should, at the designed airflow, not exceed the following values for 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 m³/s or operational periods less than 800 hours per year.

Fixtures and 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. Fixtures and fittings for lighting premises should be provided with presence detection and daylight control devices where appropriate.

Electric towel dryers and comfort floor heating should be provided with timer control or other regulating equipment.

Circulation pumps, other than for hot tap water installations, should be designed so that they are normally shut off when no flow is required. (*BFS 2006:12*)

9:7 Measuring systems for energy consumption

9:71 Measuring systems

The energy consumption of the building shall continuously be monitored by a method of measurement. The method of measurement shall have a function so that the energy consumption of the building can be calculated for the required time period. (*BFS 2006:12*)

General recommendation

The energy consumption of the building may be measured, and the requirements in Clauses 9:2 and 9:3 may be verified, by reading and summing up the amounts of energy (kWh) supplied to the building for heating, cooling, hot water and for operating building installations (pumps, fans, etc.) and other electricity for the property (excluding household electricity and operational electricity).

For types of energy not expressed directly in kWh, e.g. oil and biofuels, the measured volume of fuel may be calculated in kWh with the aid of the heat values of the fuel type in question. (*BFS 2006:12*)