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ICS

English version

Energy performance of buildings - Methods for expressing energy performance and for energy certification of buildings

Performance énergétique des bâtiments - Méthodes d'expression des performances énergétiques et de certification énergétique des bâtiments

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Foreword

This document (prEN 15217:2005) has been prepared by Technical Committee CEN/TC 89 “Thermal performance of buildings and building components”, the secretariat of which is held by SIS.

This document is currently submitted to the CEN Enquiry.

Introduction

Expression of the energy performance of buildings is needed:

to enable the establishment of regulations regarding energy performance of buildings;

to provide a means for defining energy ratings for buildings;

to encourage specifiers, building designers, owners, operators and users to improve the energy performance of buildings.

This standard provides methods to present the energy performance of buildings in a way that serves these purposes. It is based on standards that provide methods to calculate or measure energy performance.

This standard is intended to be used:

- by developers of energy certification schemes;
- by building authorities setting up of minimum requirements on the energy performance;
- by specifiers, building designers, building owners, building operators and building users to assess the performance of a planned or existing building and ways to improve it, and to express this performance .

1 Scope

This standard defines:

- a) Global indicators to express the energy performance of whole buildings, including heating, ventilation, air conditioning, domestic hot water and lighting systems. This includes the different possible indicators as well as a method to normalize them.
- b) Ways to express energy requirements for the design of new buildings or renovation of existing buildings.
- c) Procedures to define reference values and benchmarks
- d) Ways to design energy certification schemes including:

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 410, *Glass in building – Determination of luminous and solar characteristics of glazing*

prEN 14501, *Blinds and shutters – Thermal and visual comfort – Assessment of performances*

EN 13779, *Ventilation for non-residential buildings – Performance requirements for ventilation and room-conditioning systems*

prEN wi 4, *Energy performance of buildings — Assessment of energy use and definition of energy ratings*

prEN wi 22, *Calculation methods for energy efficiency improvements by the application of integrated building automation systems*

prEN ISO 6946:2005, *Building components and building elements – Thermal resistance and thermal transmittance – Calculation method*

prEN ISO 13789:2005, *Thermal performance of buildings – Transmission and ventilation heat transfer coefficients – Calculation method*

prEN ISO 14683:2005, *Thermal bridges in building construction – Linear thermal transmittance – Simplified methods and default values*

3 Terms and definitions

For the purposes of this European Standard, terms and definitions given in prEN wi 4 and the following apply.

3.1

energy certification

assessment related to the energy performance of a building performed following a certification scheme

3.2

energy certificate

documented result of an energy audit

NOTE The meaning of the terms "certificate" and "certification" in this standard differ from that in EN 45020, *Standardization and related activities – General vocabulary*.

3.3

certification scheme

rules, procedures and management for carrying out energy audits and producing an energy certificate

NOTE Certification schemes are defined at the national or regional level

3.4

audit

documented process for obtaining records, statements of fact or other relevant information and evaluating them objectively to determine the extent to which specified requirements are fulfilled and procedures followed

3.5

reference value

standard legal or calculated value against which an asset rating is compared

3.6

benchmark

value against which an operational rating is compared

3.7

tailored benchmark

benchmark customised to individual buildings which deal fairly with the intensity and diversity of activities carried out in non-domestic buildings

NOTE The definition of tailored benchmarks is the responsibility of national bodies.

3.8

energy class

easy to understand metric (e.g. A to G) for headlining the energy efficiency of a building

3.9

global performance indicator

indicator expressing the performance of a whole building including heating, ventilation and air conditioning systems

3.10

asset rating

rating based on calculations of the energy used by a building for heating, cooling, ventilation, hot water and lighting, with standard input data related to internal and external climates and occupancy

NOTE It represents the intrinsic energy potential of the building under standardized conditions of weather and occupancy. This is particularly relevant to certification of standard performance. The asset rating represents a weighted sum per energyware of the total energy for heating, hot water heating, cooling, ventilation and lighting. This rating quantifies the calculated energy intensity of the building under standardized conditions for a given set of energy end uses.

3.11

design rating

rating based on calculations using building drawings and design values, calculated for a building at the design phase

NOTE The design rating is calculated on the basis of building plans, whereas the asset rating is calculated using data for the building as actually constructed.

3.12

operational rating

rating based on measured energy use.

NOTE The operational rating is the weighted sum of all energywares used by the building. It is a measure of the in-use performance of the building. This is particularly relevant to certification of actual performance. The operational rating

represents the sum per energyware of the total energy used by the building, as measured by meters or other means described in Annex B of prEN 15217:2005. This rating quantifies the total actual energy use of the building.

3.13

cost effective improvement

improvement that has an acceptable payback time

3.14

energyware

tradable commodity used mainly to produce mechanical work or heat, or to operate chemical or physical processes, and listed in Annex A of ISO 13600 [ISO 13600:1997]

NOTE Energywares form a proper subset of energy carriers. The set of energy carriers is open.

3.15

conditioned area

floor area of heated or cooled spaces excluding non-habitable cellars, including the floor area on all storeys if more than one

NOTE 1 The standard permits the use of internal, overall internal or external dimensions. This leads to different areas for the same building.

NOTE 2 This area can be taken as the useful area mentioned in the EPBD Articles 5, 6 and 7 unless this is otherwise defined in National Regulations.

3.16

thermal envelope area

total area enclosing completely a conditioned space

3.17

internal dimension

length measured from wall to wall and floor to ceiling inside each room of a building

3.18

overall internal dimension

length measured on the interior of a building, ignoring internal partitions

3.19

external dimension

length measured on the exterior of a building

3.20

mean thermal transmittance

transmission heat transfer coefficient divided by the thermal envelope area

NOTE The transmission heat transfer coefficient is calculated in accordance with prEN ISO 13789:2005.

4 Symbols and abbreviations

Table 1 — Symbols and units

Symbol	Quantity	Unit
<i>A</i>	area	m ²
<i>A_C</i>	conditioned area	m ²
<i>A_E</i>	thermal envelope area	m ²
<i>C</i>	classification indicator	-
<i>EP</i>	energy performance indicator	*)
<i>f</i>	factor	
<i>R</i>	reference ; benchmark	*)

*) The unit depends on the indicator chosen. See Clause 6.

Table 2 — Subscripts

r	requirement of regulation
C	conditioned
s	building stock
0	zero energy
E	envelope

5 Energy performance indicators

5.1 Indicators

The energy performance of a building is represented by a global indicator that is the weighted sum of the delivered energy per energyware determined according to prEN wi 4

This indicator can represent:

- a) Delivered energy

NOTE 1 The choice of the weighting factors has a key impact on the comparison of different techniques. For example, if unweighted delivered energy (all weights equal to 1) a direct electric heating system will be more efficient than a gas heating system since generation and distribution losses are not taken into account. A simple option to avoid this is to use a conventional weight of 2,5 for electricity and 1 for all other energy wares.

- b) Primary energy
- c) CO₂ emissions
- d) Total energy cost

This global indicator can be complemented by other indicators. For example thermal performance of the building envelope.

NOTE 2 See Annex D.

5.2 Indicator basis

The indicators shall be based on one of the two types of ratings defined in prEN wi 4:

- asset rating;
- operational rating.

5.3 Normalization of energy performance

In order to enable a comparison of buildings of different size, the indicator shall be divided by the total conditioned area A_C .

The type of dimensions used to calculate A_C : internal dimension, external dimension or overall internal dimension shall be specified.

NOTE 1 The type of dimension used has a high impact on the indicator obtained after normalization. For a house of 10 m × 10 m, the indicator obtained using internal dimensions could be 20 % larger than the one obtained with external dimensions.

6 Expression of energy requirements

6.1 General

This clause includes:

description of ways to express energy requirements;

options to define global requirements on the energy performance;

adaptation of the requirements to specific cases such as renovation and extension of existing buildings.

In addition to this clause informative annex provides ways to define requirements on the characteristics of the building envelope and on system components.

6.2 Ways of expressing the requirements

The two main types of requirements are:

- a) Global energy performance requirement in accordance with 6.3;
- b) Specific requirements based on
 - 1) energy use for one specific purpose (e.g.: heating, cooling, lighting);
 - 2) characteristics of the building itself or of its systems installed considered as a whole (e.g. heat transfer coefficient of the building envelope, heating or cooling system efficiency).
 - 3) characteristics of the building envelope or systems components (e.g. thermal transmittance of walls, efficiency of boilers).

Information on possible specific requirements are given in Annex D.

The indicators used can be different for:

- a new building;
- renovation of an existing building;
- an extension to an existing building.

For new buildings and large renovations the requirement shall include one global energy performance requirement expressed according to 6.3.

For partial renovation of existing buildings and for extension to an existing building where global requirements can be difficult to apply, simplified approaches based on specific requirements can be used. When specifying these requirements consideration shall be given to the following important energy uses:

- space heating;
- space cooling;
- ventilation;
- hot water;
- lighting (at least in non residential buildings);
- energy production in particular by renewable sources and co-generation.

6.3 Global energy requirements

6.3.1 Expression of global requirements

The global energy requirements shall be an upper limit value of one of the following indicators defined according to prEN wi 4:

- a) delivered energy;
- b) primary energy;
- c) CO₂ emission.

The requirement shall be based on an asset rating as defined in prEN wi 4.

When issuing a building permit the performance is based on a design rating but the final approval shall be based on an asset rating.

A global indicator may be combined with specific requirements. Reasons for doing that include:

- to avoid too large tradeoffs between the performance of the building envelope and the performance of the equipment;
- to avoid technical or discomfort risks;
- to stimulate market transformation.

The indicator shall be normalized in accordance with 5.3.

The requirement can be written

$$EP \leq EP_r \tag{1}$$

where

- EP is the performance indicator;
- EP_r is the value which defines the requirement.

6.3.2 Modification of the impact of certain parameters

The requirements can be written so as to modify (e.g. reduce or neutralize) the impact of some parameters. These parameters can include those in Table 3.

Table 3 — Parameters with reduced or neutralized impacts

Parameter	Possible reason
Climate	To adapt the level of technologies requested to the climate
Building function	To adapt the requirements to the different design, occupation and feasible technologies
Energyware	For national energy policy regarding the possible use of different energy sources, or to take into account the availability of specific energy sources in specific locations
Building size and/or shape	To avoid unduly onerous requirements on detached houses and too low requirements on large compact buildings
Ventilation rate	To prevent too costly requirements for building/occupation which requires a high ventilation rate
Illumination level	To prevent too costly requirements for building/occupation which requires a high illumination level

The impact of a parameter can be modified either by specifying particular values or procedures for the data used in the calculation of EP , or by adjustment of the energy performance requirement EP_r .

- d) Conventional values to be used in the calculation of EP can be specified. These values are independent of the specific characteristic of the building. This can be done for
- 1) Climate, e.g. the same meteorological data are used for a whole country or region;
 - 2) Ventilation rate;
 - 3) Illumination level;
 - 4) Internal heat gains resulting from occupancy and equipment.

NOTE 1 Examples of conventional values for ventilation rate and internal gains are given in prEN wi 4.

NOTE 2 This approach can lead to an inaccurate assessment of the impact of a given component on the energy performance, e.g. the impact of a heat exchanger calculated with a conventional value of ventilation rate.

- e) EP_r can be made dependent upon the parameters whose impact is to be reduced. In this case EP_r may be defined by either:
- 1) The formula approach wherein EP_r is defined by a simple formula e.g.: $EP_r = f(\text{climate, building function, etc.})$; or
 - 2) The notional building approach wherein EP_r is the value of EP calculated for a building having the same location, building function, size, etc. but with parameters such as insulation level, heating system efficiency, etc. replaced by reference values.

6.3.3 Impact of building shape

The building shape is characterised by the building shape factor:

$$f = A_E / A_C \quad (2)$$

where

A_E is the thermal envelope area, in m^2 ;

A_C is the conditioned area, in m^2 .

The impact of the building shape can be reduced by introducing the building shape factor in the formula expressing EP_r .

6.4 Specific cases

6.4.1 Renovation of existing buildings

When setting requirements for the renovation of existing buildings different cases shall be differentiated.

In case of a minor renovation, dealing with the change of one single component or subsystem e.g. window, boiler, artificial lighting installation, it can be more appropriate to set requirements at the component or subsystem level instead of setting requirements on the global energy performance.

In case of large renovation, attention should be paid to the unchanged elements.

EXAMPLE Provisions could be made to require higher values of EP_r .

When the notional building approach is used this can be done by setting the performance of the unchanged elements at their actual value in the calculation of EP_r .

6.4.2 Extension of existing buildings

In case of extension of an existing building, attention shall be paid to the elements which are common to the existing building and extension: e.g. a common boiler.

When the notional building approach is used this can be done by setting the performance of the existing components at their actual value in the calculation of EP_r .

7 Reference values and benchmarks

7.1 Types of references values and benchmarks

Reference values and benchmarks are used to compare the energy performance of a given building to the energy performance of similar buildings.

Different reference values shall be defined for classes of buildings having different building function (e.g. single family houses, apartment blocks, offices, education buildings, hospitals, hotels and restaurants, sport facilities, wholesale and retail trade service buildings, other types).

The following references can be used:

- R_r : Energy performance regulation reference/benchmark. This corresponds to the limit value that should be expected of new buildings in conformity with national or regional Energy Performance Regulation in 2006
- R_s : Building stock reference/benchmark. This corresponds to the value that should be expected to be reached by approximately 50 % of the national or regional building stock in 2006
- R_0 : Zero energy reference/benchmark: This correspond to a building that produces as much energy as it uses.

NOTE 1 Definition of R_r : Energy Performance Regulations do not necessarily assign exactly the same limit value to different buildings (see 6.3.2). R_R can be an estimate of this limit value for a set of buildings.

NOTE 2 Definition of R_s : The building stock value can be difficult to assess precisely due to an insufficient knowledge of the performance of the building stock. A rough estimate of it could be obtained by collecting energy consumption of a small subset of the building stock.

When a given building has different functions (e.g. education + sport) one shall either:

define a reference for each building function;

define the reference values as a weighted average of the reference values for each building function.

7.2 Content of reference values and benchmarks

The use of energy considered when defining the reference values/benchmarks shall be the same as the use of energy considered when establishing the rating.

If the rating used is an asset rating, the reference will be obtained with the same assumptions as the asset rating regarding use patterns and internal and external climate.

If the rating used is an operational rating, it shall be corrected for the external climate according to prEN wi 4.

A procedure may be defined to adapt the benchmark to a specific use of the building. This can take into account a particular specification of internal climate.

NOTE This can be used for example to differentiate between buildings which are used 5, 6 or 7 days a week, or buildings having different occupation densities.

7.3 Documentation of reference values and benchmarks

One shall document for each reference value/benchmark:

- the type of reference value/benchmark : R_r , R_s , R_0 ;
- the building function;
- the energy flows considered;
- the assumptions regarding internal and external climate;
- the assumptions regarding use patterns;
- the procedure to adapt the benchmark.

8 Certification scheme

8.1 General

This clause includes:

- 1) the content of a certification scheme;
- 2) options to select the main indicator which is used for a certification scheme;
- 3) description of a performance scale;

- 4) classification of recommendations to be put on the certificate.

In addition to this clause annexes provide a way to describe a certification scheme, an informative procedure to classify buildings and two examples of certificate format.

8.2 Certification scheme content

A certification scheme shall define at minimum:

- a) The type of building or part of building to which it applies;

The main type of buildings considered are for example: single family houses, apartment blocks, offices, education buildings, hospitals, hotels and restaurants, sport facilities, wholesale and retail trade service buildings, other types.

- b) The cases where the certification scheme applies: sales, rent, new building after construction, display in a public building, etc... The content of the certificate as described below;

The certificate shall contain at least:

- a) Administrative data

- 1) Reference to the certification scheme;
- 2) Name of person responsible for issuing the certificate;
- 3) The coordinates of the building the certificate was issued to;
- 4) The date of validity;
- 5) Reference to the supporting evidence of the energy certificate;

- b) Technical data:

- 1) One global indicator representing the energy performance as defined in 5.1.
- 2) Reference values as defined in Clause 6;
- 3) The energy performance class presented on a scale as defined 8.4;
- 4) Information on the energy performance of main building and system components;
- 5) Recommendations for cost effective improvement of the energy performance separated between modernisation measures (building envelope, technical systems) and measures of property management as defined in 8.5.

Other indicators may be added.

When the certification scheme is set up, information on the choices done are documented in a "certification scheme documentation" which includes at least the information defined in Annex A.

Examples of certificate format are given in Annex C.

8.3 Energy performance indicator

The certification scheme shall describe the type of indicator to report on the certificate for each context.

The indicator chosen can represent an asset rating, an operational rating, or both. A clear indication of the type of rating used shall be stated on the certificate.

When applicable, the presentation of both ratings enables differentiation between:

- the intrinsic potential of the building represented by the asset rating, and
- the impact of building management and actual properties of the building and its installations (including control), whose effects are included in the operational rating.

The selection of the relevant indicators shall take into account the followings points:

- For new buildings the operational rating is not available;
- The utilities which collect data on energy consumption may not be authorised to disclose them for privacy reasons;
- An operational rating will no longer be valid following a change of building occupier or of the pattern of use of the building. For existing buildings which are rented or sold the way the building is managed could change and the operational rating could change as a result;
- Defining an asset rating includes the collection of data on the building (insulation, heating system, etc.) which will be useful to give advice on the improvement of its energy performance;
- When the certificate is displayed in an existing public building, the operational rating can be a measure of the quality of the management and can be used to motivate building operators and users;
- For managers of buildings an operational rating can be easily obtained from data often stored in their information systems (energy bills, areas, etc.);
- Operational rating and asset rating do not include the same energy uses.

8.4 Performance scale

In addition to the numerical indicator *EP*, the certificate shall contain energy classes.

If sufficient information is not available for a given type of building (e.g. prisons) to define the boundaries of classes, the use of classes may be postponed until sufficient data becomes available.

The energy class for a given building shall be based on the value of the energy performance indicator.

A procedure to neutralize or reduce the impact of certain parameters on the energy class can be used, by modifying some parameters used in the calculation of *EP* as described in 6.2.2..

The energy class for a given building can be based on the values of $\frac{EP}{R_f}$ and $\frac{EP}{R_s}$.

NOTE 1 Annex B (informative) provides a procedure for building classification.

Unless differently defined by the developer of the certification scheme (e.g. a national body):

- The performance scale should range from A (buildings of highest energy performance) to G (buildings of lowest energy performance);

— The "Energy Performance Regulation reference" R_r should be placed at the boundary between classes B and C;

The "building stock reference" R_s should be placed at the boundary between classes D and E;

The "zero energy reference" R_0 should be placed at the top of class A

NOTE 2 This means that for a given country or region and a given building type, most buildings completed from 2006 onwards should be in classes A and B, approximately 50 % of the buildings will be in classes between A and D, approximately 50 % of the buildings will be in classes E, F and G.

The certification scheme shall describe the limits of each class.

NOTE 3 Annex C (informative) provides example descriptions of a certificate.

8.5 Recommendations

The certificate shall contain recommendations dealing with:

- a) modernisation measures (building envelope, technical systems);
- b) measures of property management (improvement of the operation of building and technical systems).

The assessment of the impact of possible measures shall be done according to prEN wi 4.

Annex A (normative)

Certification scheme documentation

A.1 Purpose of the certification scheme documentation

This annex is intended to be used by national bodies setting up a certification scheme to document this scheme. It will be used to compare the different certification schemes.

The documentation of a certification scheme shall describe in the manner set out in this annex the options chosen when defining the certification scheme.

It can be used:

- by authorities setting up a certification scheme to document their scheme;
- by authorities setting up a certification scheme to compare their scheme to the schemes set up by other authorities;
- by people comparing certificates issued in different member states to understand the meaning of the different certificates.

A.2 Content

A.2.1 General

A document defining the content of the certification scheme shall be written by the body setting up the scheme.

This document shall contain the information in A.2.2 to A.2.7.

A.2.2 Application domain of the scheme

The scheme apply to the following building types

- | | | |
|---|--|---|
| <input type="checkbox"/> Single family houses | <input type="checkbox"/> Apartment block | <input type="checkbox"/> Other residential buildings |
| <input type="checkbox"/> Offices | <input type="checkbox"/> Education buildings | <input type="checkbox"/> Hospitals |
| <input type="checkbox"/> Hotels and restaurants | <input type="checkbox"/> Sport facilities | <input type="checkbox"/> Wholesale and retail trade service buildings |
| <input type="checkbox"/> Industrial buildings | <input type="checkbox"/> Storage | <input type="checkbox"/> Other types: give details |

For apartments or units within buildings designed for separate use the certification is based on the assessment of :

- the apartment or unit a common certification of the whole building
- another representative apartment or unit in the same building

It can be applied in the following situations

- Rent Sales New buildings after construction Display in public buildings

A.2.3 Basis of the rating

The following uses of energy are taken into account in the certification scheme

Energy uses

- | | | | |
|--|--------------------------------|-----------|--------------------------|
| Space heating | <input type="checkbox"/> | Hot water | <input type="checkbox"/> |
| Mechanical ventilation | <input type="checkbox"/> | Lighting | <input type="checkbox"/> |
| Space cooling | <input type="checkbox"/> | | |
| Energy production, in particular by renewable sources and co-generation. | <input type="checkbox"/> | | |
| Other: | <input type="checkbox"/> | | |

The indicator used represents

- Weighted delivered energy Primary energy CO2 emission Cost

the weightings for each energy carrier are:

.....

The rating is an:

- Asset rating Operational rating

The dimensions used are

- Internal dimensions External dimensions Overall internal dimensions

A.2.4 Reference values

The reference values used are the following

Reference type	Value of the reference (with unit)
Energy performance regulation	<input type="checkbox"/>
Building stock	<input type="checkbox"/>
Zero energy	<input type="checkbox"/>
Other (provide explanation)	<input type="checkbox"/>

A.2.5 Classification

The energy performance classes are described in the following way:

- According to Annex B Following another procedure

If Annex B is not used describe the classification procedure and the limits of the classes.

A.2.6 Certificate format

The format of the certificate is

Based on Annex C: Yes No

Describe the details of the certificate.

A.2.7 Recommendations

The certificate includes recommendations chosen among the following:

a list shall be given here by the authorities setting up the certification scheme.

Annex B (informative)

Procedure for buildings classification

B.1 Introduction

This annex provides a simple procedure to define the limits of the classes of energy performance.

The procedure enables the definition of classes that are consistent for all building types.

It can be applied to asset ratings, to operational ratings and to any of the indicators defined in 8.3.

To apply the procedure to a given type of building it is necessary to define the values of the reference/benchmark R_r and R_s for the building type concerned.

The procedure involves a classification indicator C which is used to define the limits of classes.

B.2 Classification procedure

The steps of the procedure to determine the performance class of a given building are the following.

- a) Define the type of the building (e.g. office building).
- b) Select the “Energy Performance Regulation” reference R_r and the “Building Stock” reference R_s corresponding to this building type.
- c) Define the value of the energy performance of the building EP :

$$\text{Calculate } \frac{EP}{R_r}$$

$$\text{Calculate } \frac{EP}{R_s}$$

- d) Determine the classification indicator C with the following rules.

$$1) \quad \text{If } \frac{EP}{R_r} \leq 1 \quad \text{take} \quad C = \frac{EP}{R_r}$$

In this case the Energy Performance of the building, EP , is better than the Energy Performance Regulation Reference, EP_r .

$$2) \quad \text{If } 1 \leq \frac{EP}{R_s} \quad \text{take} \quad C = 1 + \frac{EP}{R_s}$$

In this case the Energy Performance of the building, EP , is poorer than the Building Stock Reference, EP_s .

- 3) In the other cases take $C = 1 + \frac{EP - R_r}{R_s - R_r}$

In this case the Energy Performance of the building, EP , is between the Energy Performance Regulation Reference, EP_r , and the Building stock reference, EP_s .

e) The performance class is determined with the following rules:

- 1) Class A if $C < 0,5$
- 2) Class B if $0,5 \leq C < 1$
- 3) Class C if $1 \leq C < 1,5$
- 4) Class D if $1,5 \leq C < 2$
- 5) Class E if $2 \leq C < 2,5$
- 6) Class F if $2,5 \leq C < 3$
- 7) Class G if $3 \leq C$

The value of C is computed only to enable the classification and is not necessarily reported on the certificate.

The value of C can be used when generating the certificate to define precisely the position of the actual building in reference to the overall performance scale.

B.3 Additional steps

For operational rating it can be appropriate to apply two additional procedures.

- a) The value of EP should be modified to take into account a possible difference between the actual climatic data and the reference climatic data used to define the values of R_r and R_s . This modification is done in accordance with prEN wi 4.
- b) The values of R_r and R_s should be adjusted if the actual use of the building is different from that assumed to define the values of R_r and R_s for that building type (e.g. building open 7 days a week and R_r and R_s corresponding to building open 5 days a week).

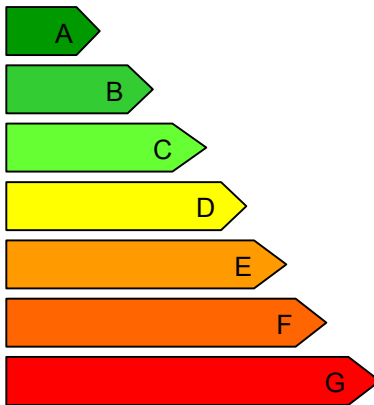

Annex C (informative)

Certificate format

This annex provides two examples of an energy certificate format. These examples are provided for illustration only and do not show all the details needed for a certificate. In particular, ways to present recommendations for improvements as well as ways to present the supporting evidence of the certificate are not presented.

Many other solutions are possible.

Example 1 with one single rating

Energy certificate	Building Energy Performance	As built
	Space to make reference to the certification scheme used	Asset rating
	Very energy efficient  Not energy efficient	
	Name of the indicator used Unit	calculated 130
	Space to include additional information on building energy use	

Administrative information:
 address of the building,
 conditioned area
 date of validity
 certifier name and signature...

Example 2 with two ratings

Energy certificate	Building Energy Performance	As built	In use
	Space to make reference to the certification scheme used	Asset rating C	Operational rating D
	Very energy efficient		
	Not energy efficient		
	Name of the indicator used unit	calculated	measured
	130	170	
Space to include additional information on building energy use			
Administrative information: address of the building, conditioned area date of validity certifier name and signature...			

Annex D (informative)

Requirements on the characteristics of the building envelope and system components

D.1 General

This annex provides examples on the way to define requirements on the characteristics of the building envelope and systems components.

In all cases different requirement levels could be set for different building types.

D.2 Thermal transmittance

D.2.1 Thermal transmittance of the building envelope

Requirements can be expressed in terms of a maximum mean thermal transmittance of the building envelope calculated in accordance with prEN ISO 13789:2005.

The requirement can be set as a function of the building shape with a procedure similar to the one described in 6.3.3.

D.2.2 Thermal transmittance of building components

Requirements can be expressed in terms of a maximum thermal transmittance of the component, calculated in accordance with prEN ISO 6946:2005.

The requirement can be set at different levels for different building components (wall, roof, floor, window, door).

D.2.3 Thermal bridges

Requirements can be expressed in terms of a maximum linear thermal transmittance for junctions between building components. Values of linear thermal transmittance can be obtained by any of the methods set out in prEN ISO 14683:2005.

The requirement can be set at different levels for different types of junctions (wall/floor, window jamb, etc).

D.3 Automatic control

Requirements can be expressed in terms of a minimum level of control. This level can be defined according to the list of control functions given in prEN wi 22.

D.4 Heating and domestic hot water

Requirements can be expressed in terms of:

- a minimum efficiency of the heat generation system;
- minimum insulation of pipes, ducts and tanks.

D.5 Metering

Requirements can be expressed in terms of a minimum level of metering.

D.6 Solar protection

Requirements can be expressed in terms of a solar factor of the combined glazing and solar protection device g_{tot} in accordance with EN 410 and prEN 14501 .

D.7 Fan power

The requirement on the specific fan power of the ventilation system can be defined according the categories defined in EN 13779.