Handled by, phone
Margareta Andersson, +46 40 16 10 80
E-mail
margareta.andersson@sis.se

Revised prEN 15217, Energy performance of buildings – Methods for expressing energy performance and for energy certification of buildings

GTR Work item 00089110

This document contains prEN 15217 revised on the basis of the comments received in the CEN Enquiry.

Document CEN/TC 89 N 1085 contains the comments received in the Enquiry with the replies of CEN/TC 89/WG 4, Energy use of buildings.

Documents CEN/TC 89 N 1085 and N 1086 are submitted to CEN/TC 89 requesting approval to submit prEN 15217 to CMC for Formal Vote. The CEN Members are kindly requested to approve draft resolution 387 (below) by returning the ballot paper (document CEN/TC 89 N 1087) by 16 September 2006. In parallel to this ballot the CEN/TC 89 Editing committee will review the draft standard.

***Draft* RESOLUTION number 387 taken by CEN/TC 89 by correspondence on 2006-09-16**

Subject : Decision on the future of prEN 15217 after CEN enquiry

CEN/TC 89, *Thermal performance of buildings and building components,*

- considering the table of decisions and the formal written proposals as distributed after the comments resolution meeting;
- considering the CEN/CENELEC Internal Regulations - Part 2, clause 11.2.3;
- considering Resolutions BT 34/2002, BT 42/2003 and related document BT N 6962 concerning timeframes for the development of ENs;

decides

to launch the formal vote on prEN 15217, Energy performance of buildings – Methods for expressing energy performance and for energy certification of buildings (target date stage 45.00: 2006-10)

The decision was taken by *unanimity or simple majority with N positive votes, N negative vote(s) and N abstention(s).*

CEN/TC 89/ WG4

Date: 2006-08

prEN 15217

Secretariat: SIS

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

Energieeffizienz von Gebäuden – Verfahren zur Darstellung der Energieeffizienz und zur Erstellung des Gebäudeenergieausweises

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

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Contents

Page

Foreword

This document prEN 15217 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 Formal Vote.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/343), and supports essential requirements of EU Directive 2002/91/EC on the energy performance of buildings (EPBD).

Introduction

Expression of the energy performance of buildings is needed:

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

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

This standard provides methods to express 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 a procedure for building energy certification;

— by building authorities setting minimum requirements on the energy performance;

— by 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) Overall indicators to express the energy performance of whole buildings, including heating, ventilation, air conditioning, domestic hot water and lighting systems. This includes different possible indicators

b) Ways to express energy requirements for the design of new buildings or renovation of existing buildings.

c) Procedures to define reference values

d) Ways to design a procedure for building energy certification.

The standard can be applied to a group of buildings, if they are on the same lot, if they are serviced by the same technical systems and if no more than one of them has a conditioned area of more than 1000m^2.

This standard provides different options at different levels. When this standard is used to set up national or regional methods for expressing energy performance and/or for energy certification of buildings, the choices between the options shall not be made by the individual user, but by authorized national or regional bodies.

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 ISO 7345, *Thermal insulation –Physical quantities and definitions*

prEN 15203/15315, *Energy performance of buildings —Overall energy use, CO_2 emissions and definition of ratings*

3 Terms and definitions

For the purposes of this European Standard, terms and definitions given in prEN 15203/15315 and in EN ISO 7345 and the following apply.

3.1
energy certification
procedures enabling to produce an energy certificate

3.2
energy certificate
certificate recognised by a member state or a legal person designated by it, which includes the energy performance of a building

NOTE The meaning of the terms “certificate” and "certification" in this standard differ from that in EN ISO 17000, *Standardization and related activities – General vocabulary*.

3.3
energy class
easy to understand metric (e.g. A to G) for scaling the energy efficiency of a building

3.4
reference value
standard legal or calculated value against which an energy indicator is compared

3.5
energy requirement
minimum level of energy performance that shall be achieved to obtain a right or an advantage: eg right to build, lower interest rate, quality label…

3.6
calculated energy rating
energy rating based on calculations of the energy used by a building for heating, cooling, ventilation, domestic hot water and lighting

NOTE 1 National bodies decide whether other energy uses resulting from occupants' activities such as cooking, production, laundering, etc. are included or not. If included, standard input data shall be provided for the various types of building and uses. Lighting is always included except (by decision of national bodies) for residential buildings.

NOTE 2 The calculated energy rating can be termed "tailored energy rating" when calculated with actual building, climate and occupancy data.

3.7
standard calculated energy rating
energy rating calculated with actual data for the building and standard use data set

NOTE 1 It represents the intrinsic annual energy use of a building under standardised conditions. This is particularly relevant to certification of standard energy performance.

NOTE 2 It can also be termed "asset energy rating".

3.8
design energy rating
energy rating with design data for the building and standard use data set

NOTE It represents the calculated intrinsic annual energy use of a designed building under standardised conditions. This is particularly relevant to obtain a building permit at the design stage.

3.9
standard use data set
standard input data for internal and external climates, use, and occupancy

NOTE 1 This set may also include information on surroundings (such as shading or sheltering by adjacent buildings).

NOTE 2 Such data sets are defined at national level.

3.10
measured energy rating
energy rating based on measured amounts of delivered and exported energy

NOTE 1 The measured rating is the weighted sum of all energywares used by the building, as measured by meters or other means. It is a measure of the in-use performance of the building. This is particularly relevant to certification of actual energy performance.

NOTE 2 Also known as "operational rating".

3.11
energy indicator
energy rating divided by the conditioned area

3.12
measured energy indicator
measured energy rating divided by the conditioned area

3.13
standard calculated energy indicator
standard calculated energy rating divided by the conditioned area

3.14
building
construction as a whole, including its envelope and all technical building systems, for which energy is used to condition the indoor climate

NOTE The term can refer to the building as a whole or to parts thereof that have been designed or altered to be used separately

3.15
new building
building at design stage or under construction or (for measured energy rating) too recently constructed to have reliable records of energy use

3.16
existing building
building that is erected and (for measured energy rating) for which actual data necessary to assess the energy use are known or can be measured

3.17
technical building system
technical equipment for heating, cooling, ventilation, domestic hot water, lighting and electricity production

NOTE A technical building system is composed of different subsystems

3.18
internal dimension
length measured form wall to wall and floor to ceiling inside each room of a building

3.19
overall internal dimension
length measured on the interior of the building, including interruptions by internal partitions

3.20
external dimension
length measured on the exterior of the building

3.21
heated space
room or enclosure which for the purposes of the calculation is assumed to be heated to a given set-point temperature or set point temperatures

3.22
cooled space
room or enclosure which for the purposes of the calculation is assumed to be cooled to a given set-point temperature or set point temperatures

3.23
conditioned space
heated space or cooled space

3.24
unconditioned space
room or enclosure which is not part of a conditioned space

3.25
conditioned area
floor area of conditioned spaces excluding non-habitable cellars or non-habitable parts of a space, including the floor area on all storeys if more than one

NOTE 1 The precise definition of the conditioned area is given by national authorities.

NOTE 2 Internal, overall internal or external dimensions can be used. This leads to different areas for the same building.

NOTE 3 Some services, such as lighting or ventilation, might be provided to areas not included in this definition (e.g. a car park).

NOTE 4 Conditioned area can be taken as the useful area mentioned in the Articles 5, 6 and 7 the EPBD[1)] unless it is otherwise defined in national regulations.

3.26
thermal envelope area
total area enclosing completely a conditioned space, it could include indirectly conditioned spaces. The respective areas of the building envelope may be weighted with a (nationally fixed) reduction factor in case of e.g. unheated adjacent spaces and ground floor."

NOTE 1 The term “indirectly conditioned space” can be defined on national or regional level in line with the local context

NOTE 2 Concerning the weighting factors: If a building's envelope has a significant portion with reduced thermal transmission (adjacent unheated spaces, ground floor, …), then a neutralisation for the heat loss area based on the unweighted envelope area may lead to unintended underestimates of the energy indicator."

3.27
energy carrier
substance or phenomenon that can be used to produce mechanical work or heat or to operate chemical or physical processes [ISO 13600:1997].

NOTE The energy content of fuels is given by their gross calorific value.

3.28
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 Examples are oil, gas, coal, grid electricity, district heating. Energywares form a proper subset of energy

carriers. The set of energy carriers is open. Solar radiation is an energy carrier that is not an energyware.

3.29
energy need for heating or cooling
heat to be delivered to or extracted from a conditioned space by a heating or cooling system to maintain the intended temperature during a given period of time, not taking into account the technical building systems

NOTE 1 The energy need is calculated and cannot easily be measured.

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1) Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings

NOTE 2 The energy need can include additional heat transfer resulting from non-uniform temperature distribution and non-ideal temperature control, if they are taken into account by increasing (decreasing) the effective temperature for heating (cooling) and not included in the heat transfer due to the heating (cooling) system.

3.30
delivered energy
total energy, expressed per energyware, supplied to the building through the system boundary from the last market agent, to satisfy the uses taken into account (heating, cooling, ventilation, domestic hot water, lighting, appliances etc.)

NOTE 1 For active solar and wind energy systems the incident solar radiation on solar panels or the kinetic energy of wind is not part of the energy balance of the building. The losses resulting from the transformation of these renewable energy carriers into heat or electricity are also not taken into account. Only the energy delivered by the generation devices and the auxiliary energy needed to supply the energy from the source (e.g. solar panel) to the building are taken into account in the energy balance and hence in the delivered energy.

NOTE 2 Delivered energy can be calculated for defined energy uses or it can be measured.

3.31
exported energy
energy, expressed per energyware, delivered by the building through the system boundary to a market agent and used outside the system boundary

NOTE Exported energy can be calculated or it can be measured.

3.32
net delivered energy
delivered energy minus exported energy, both expressed per energyware

NOTE A balance of the delivered and exported energyware can be performed only if the same primary energy factors and/or CO_2 coefficients apply to the delivered and exported amounts of that energyware.

3.33
primary energy
energy that has not been subjected to any conversion or transformation process

NOTE 1 Primary energy includes resource energy and renewable energy. If both are taken into account it can be called total primary energy.

NOTE 2 For a building, it is the energy used to produce the energy delivered to the building. It is calculated from the delivered and exported amounts of energy carriers, using conversion factors.

4 Symbols and abbreviations

Table 1 — Symbols and units

Symbol	Quantity	Unit
A	area	m²
A_C	conditioned area	m^2
A_E	thermal envelope area	m^2
EP	energy performance indicator	weighted energy/m2/year*) J/(m^2.a), Wh/m^2a) CO_2/(m^2a) €/(m^2a)
f	factor	
R	reference	*)
*) The unit depends on the indicator chosen. See Clause 5.		

Table 2 — Subscripts

r	requirement of regulation
C	conditioned
s	building stock
e	envelope

5 Energy performance indicators

5.1 Indicators

The energy performance of a building is represented by an overall indicator *EP* that is the weighted sum of the delivered and exported energy per energyware determined according to clause 5 of prEN 15203/15315, normalized according to 5.3

EP can represent:

a) Primary energy (E_p)

b) CO_2 emissions (m_{CO2})

c) Net delivered energy weighted by any other parameter defined by national energy policy (e.g. delivered energy, E_p or Cost)

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

5.2 Indicator basis

The indicators shall be based on one of the two types of ratings defined in prEN 15203/15315:

— standard calculated energy rating

— measured energy rating.

The calculated energy rating can be calculated either for planned buildings or for actual buildings.

If the indicator is based on standard calculated energy rating it is called: standard calculated energy indicator.

If the indicator is based on measured energy rating it is called: measured energy indicator.

5.3 Normalization of energy rating

The overall indicator EP is the rating defined in prEN 15203/15315 divided by the 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.

NOTE 2 Usually the choice is the same as for the calculation of the transmission heat transfer (see EN ISO 13789); in addition, there is a direct correlation with input parameters that are related to the conditioned area (e.g. conventional hot water demand, minimum ventilation, lighting, ..).

NOTE 3 An estimate of A_c can be obtained from the conditioned volume and mean floor height

6 Expression of energy requirements

6.1 Ways of expressing the requirements

Two main types of requirements can be defined:

a) Overall energy performance requirement in accordance with 6.2;

b) Specific requirements based on

   1) energy use for one specific purpose (e.g.: heating, domestic hot water, cooling, lighting, ventilation);

   2) energy need for heating domestic hot water and cooling

   3) characteristics of the building itself or of its technical building systems considered as a whole (e.g. heat transfer coefficient of the building envelope, heating, hot water or cooling system efficiency,).

   4) characteristics of the building envelope or technical building systems components (e.g. thermal transmittance of walls, efficiency of boilers, insulation of heating and hot water pipes, lighting power density (W/m^2), specific fan power).

Information on possible specific requirements is given in Annex D.

An overall indicator may be combined with specific requirements.

NOTE Reasons for doing that include: 1) to avoid too large tradeoffs between the performance of the building envelope and the performance of the technical systems; 2)to avoid technical health or discomfort risks; 3) to prevent components with low performance to be put on the market. See Bibliography [1] for more background information on the advantages and disadvantages of additional requirements.

The indicators used can be different for:

— a new building;

— renovation of an existing building;

— an extension to an existing building

— different types of buildings.

For new buildings and major renovations the requirement shall include one overall energy performance requirement expressed according to 6.2.

For partial renovation of existing buildings and for extension to an existing building where overall 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:

— thermal characteristics of the building envelope

— heating installation and hot water supply

— air conditioning installation (including dehumidification)

— ventilation (including humidification);

— built in lighting installation

— passive solar heat sources and solar protection

— energy production in particular by renewable sources and co-generation.

6.2 Overall energy requirements

The overall energy requirement EPr shall be a limit value the overall energy performance indicator EP defined in 5.3.

The requirement is written

$$EP \leq EP_{\mathrm{r}} \tag{1}$$

where

EP is the overall performance indicator;

EP_{r} is the limit value which defines the requirement.

When a given building has different functions *k* (e.g. education + sport) with different requirements $EP_{\mathrm{r},k}$, procedures shall be defined to weight the different requirements. Unless other procedures are specified, the following procedure applies:

$$EP_r = \frac{\sum_{k=1}^{n} A_{c,k} \cdot EP_{r,k}}{A_c} \tag{1a}$$

where

k represents the functions: *k* = 1, 2, .., *n*.

The conditioned area of a space that is commonly used for more than one building function shall be proportionally divided over the conditioned areas of these building functions.

6.3 Modification of the impact of certain parameters

The requirements can be written so as to modify (e.g. reduce, neutralize, correct or normalise) the impact of some parameters. These parameters can include those listed 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 (e.g. gas/ electricity), 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. To adapt the requirements to buildings with different sizes and shapes.
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 (see a), or by adjustment of the energy performance requirement EP_r (see b).

a) Conventional values for climate and occupant related input are defined as described in prEN15203/15315 §7.3.2

b) 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 a defined by a simple formula e.g.: $EP_r = f$ (climate, building form and 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, activity schedules, internal heat gains etc. replaced by reference values.

NOTE See Bibliography [1] for more background information on different reasons and ways to neutralise the impact of certain parameters and the consequences.

6.3.1 Impact of building shape

The building shape is characterised by the building shape factor:

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

or the compactness ratio

$$c = A_E / V_C \quad (3)$$

where

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

A_C is the conditioned area, in m^2;

V_c is the conditioned volume, in m^3.

The impact of the building shape is taken into account by introducing the building shape factor or the compactness ratio in the formula expressing EP_r.

NOTE For example : $EP_r = EP_o\ (a + b*f)$ with a and b non-dimensional coefficients

6.3.2 Evolution of the requirements

The requirements can be modified throughout time by writing EP_r in the following way:

$$EP_r = \alpha . EP_{r,date} \quad (3)$$

where

α is a strengthening factor between 0 and 1, which evolves with time

$EP_{r,date}$ corresponds to the value of EPr at a given date

6.4 Renovation of, and extensions to existing buildings

In case of a minor renovation or extension, dealing with few single components or subsystems e.g. windows, boilers, artificial lighting installation, the requirements are set at the component or subsystem level.

In case of large renovation the overall energy performance indicator shall be used but higher values of EP_r can be stated.

In case of large extension the overall energy performance indicator shall be used but distinct values of EP_r can be stated for the existing part and the new part.

When the notional building approach is used, the performance of the unchanged elements are set at their actual value in the calculation of EP_r.

7 Reference values

7.1 Types of reference values

Reference values 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 functions (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. . This corresponds to the value typical of the requirements of energy performance regulations for new buildings,

— R_s : Building stock reference. This corresponds to the energy performance reached by approximately 50 % of the national or regional building stock (median value).

The reference values are defined at the national or regional level .

A procedure to neutralize or reduce the impact of certain parameters on the reference values can be used, by modifying some parameters used in the calculation of R_r and R_s as described in 6.3 for EP_r.

NOTE 1 For example : $R_r = R_{r,o}\ (a + b*f)$ where a and b are non-dimensional coefficients

If the indicator used is a measured energy indicator, alternative definitions can be adopted for R_r until sufficient data on the operational performance of buildings completed according to the regulations becomes available.

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.

NOTE 3 A minimum of 5 years between changes in the values of the references is recommended.

NOTE 4 National policy can decide whether to keep the same value for R_r even if the regulations are changed.

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

— define a reference for each building function;

— define the reference value as an area weighted average of the reference values for each building function.

7.2 Content of reference values

The uses of energy considered when defining the reference values shall be the same as the uses of energy considered when establishing the energy performance indicator.

If the indicator used is a standard calculated energy indicator, the reference will be obtained with the same assumptions as the standard calculated energy indicator regarding use patterns and internal and external climate.

A procedure may be defined to adapt the reference value 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

One shall document for each reference value:

— the type of reference value: R_r, R_s;

— the building function;

— the energy flows considered;

— the assumptions regarding internal and external climate;

— the assumptions regarding use patterns;

— the procedure to adapt the reference value.

8 Procedure for building energy certification

8.1 General

This clause includes:

1) the content of the procedure for building energy certification;

2) the content of an energy certificate

3) options to select the overall energy performance indicator EP which is used for the procedure for building energy certification;

4) description of a performance scale;

5) description of types of recommendations to be put on the energy certificate.

In addition to this clause Annexes A, B and C provide a way to describe a procedure for building energy certification, an informative procedure for buildings classification and three examples of an energy certificate format.

8.2 Content of procedure for building energy certification

A procedure for building energy certification shall define at minimum:

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

The main type of buildings considered are: 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 procedure for building energy certification applies: sale, rent, new building after construction, display in a public building, etc…

c) The content of the energy certificate as described in the next paragraph.

When the procedure for building energy certification is set up, information on the choices done are documented in a "procedure for building energy certification documentation" which shall include at least the information defined in Annex A.

NOTE The responsible party for the procedure for building energy certification may secure that the data obtained from the energy certificates describing the building stock are stored in an organised way and in a central place (one database).

8.3 Content of the energy certificate

The energy certificate shall contain at least or be accompanied by:

a) Administrative data:

1) Reference to a specific procedure for building energy certification, including its date;

2) Name of person responsible for issuing the energy certificate;

3) The address of the building the energy certificate was issued to;

4) The date on which the energy certificate was issued and its limit of validity;

b) Technical data:

1) One overall indicator representing the energy performance as defined in 5.3;

2) The type of indicator used.

If the energy certificate is based on standard calculated energy indicator a note stating that it is based on standard conditions and a note stating whether it is based on design data or on data from the actual building.

If the energy certificate is based on measured energy indicator a note stating that it is based on actual conditions.

If the certificate is based on measured energy indicator some information about the actual conditions in the building could be added.

NOTE The energy certification procedure may identify the characteristics of the building which should be reported, for example, the conditioned area, the number of conditioned floors, the year or period of construction and the year or period of the last major refurbishment.

3) Reference values as defined in Clause 7;

4) Information on the energy performance of main building and system components;

5) Recommendations for cost effective improvements as defined in 8.6.

6) Optionally: The energy performance class presented on a scale as defined in 8.5;

7) Other indicators may be added.

— Examples of energy certificate formats are given in Annex C.

8.4 Overall energy performance indicator

The procedure for building energy certification shall describe the type of indicator EP to report on the energy certificate.

The indicator chosen can be a standard calculated energy indicator, a measured energy indicator, or both as defined in 5.1. A clear indication of the type of indicator used shall be stated on the energy certificate.

NOTE When applicable, the presentation of both indicators enables differentiation between: The calculated intrinsic potential of the building represented by the standard calculated energy indicator, and the impact of building management and actual properties of the building and its installations (including control), whose effects are included in the measured energy indicator.

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

— For new buildings the measured energy indicator is not available;

— The utilities which collect data on energy consumption may not be authorised to disclose them for privacy reasons;

— A measured energy indicator 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 measured energy indicator could change as a result;

— Defining a standard calculated energy indicator 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;

— In existing public buildings where there is no change in ownership, the measured energy indicator can be a measure of the quality of the management and can be used to motivate building operators and users;

— When the energy certificate is displayed in an existing public building, the operational indicator can be a measure of the quality of the management and can be used to motivate building operators and users;

— For managers of buildings a measured energy indicator can be easily obtained from data often stored in their information systems (energy bills, areas, etc.);

— Measured energy indicator and standard calculated energy indicator do not necessarily include the same energy uses;

— for new buildings a design indicator may be the only practical means of assigning a indicator.

8.5 Performance scale

In addition to the numerical indicator EP, the energy certificate may contain energy efficiency classes.

If sufficient information is not available for a given type of building 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 6.3

Unless differently defined by the developer of the procedure for building energy certification (e.g. a national body):

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

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

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

— A building with a net delivered energy equal to 0 shall be placed at the top of class A

— Subclasses can be defined in order to subdivide the classes. E.g. class A can be split between A*, A**, A***.

The procedure for building energy certification shall describe the limits of each class.

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

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 building stock will be in classes between A and D, approximately 50 % of the building stock will be in classes E, F and G.

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

8.6 Recommendations

The energy certificate shall contain, if applicable, recommendations dealing with:

a) modernisation measures (building envelope, technical systems);

b) measures of property management (improvement of the operation and control of building and technical systems).

The assessment of the impact of possible measures can be done according to prEN 15203/15315.

Bibliography

[1] VAN DIJK, H.A.L and SPIEKMAN, M.E. *Energy Performance of Buildings; Outline for Harmonised EP Procedures*. Final report of EU ENPER project, Task B6. Contract SAVE 4.1031/C/00-018. TNO Building and Construction Research, Delft, The Netherlands, June 29, 2004y

Annex A
(normative)

Procedure for building energy certification documentation

A.1 Purpose of the procedure for building energy certification documentation

This annex is intended to be used by national bodies setting up a procedure for building energy certification to document this procedure. It will be used to compare the different procedures for building energy certification.

The documentation of an energy certification procedure shall describe in the manner set out in this annex the options chosen when defining the procedure for building energy certification.

It can be used:

— by authorities setting up a procedure for building energy certification to document their energy certification procedure;

— by authorities setting up a procedure for building energy certification to compare their energy certification procedure to the energy certification procedures set up by other authorities;

— by people comparing energy certificates issued in different member states to understand the meaning of the different energy certificates.

A.2 Content

A.2.1 General

A document defining the content of the procedure for building energy certification shall be written by the body setting up the procedure.

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

A.2.2 Application domain of the procedure

The procedure applies to the following building types

☐ Single family houses	☐ Apartment block	☐ Offices
☐ Educational buildings	☐ Hospitals	☐ Hotels and restaurants
☐ Sport facilities	☐ Wholesale and retail trade service buildings	☐ Other types: give details

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

☐ the apartment or unit ☐ a common energy 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 ☐ Display in public buildings ☐ Large renovation

A.2.3 Basis of the performance indicator

The following uses of energy are taken into account in the procedure for building energy certification

Energy use			
Space heating	☐	Domestic hot water	☐
Mechanical ventilation	☐	Lighting	☐
Space cooling	☐		
Energy production, in particular by renewable sources and co-generation	☐		
Other:	☐……		

The indicator used represents

☐ Primary energy ☐ CO_2 emission ☐ other Policy weighted energy

The weightings factors or coefficient used for each energy carrier when applying prEN 15203/15315 §8 are the following:

	C1	C2	C3
	Delivered energy		
	Energy carrier 1	Energy carrier *i*	
Primary energy factor	$f_{prim,del,1}$	$f_{prim,del,2}$	
CO2 emission coefficient	$K_{del,1}$	$K_{del,2}$	
Policy factor	$F_{pol,del,1}$	$F_{pol,del,2}$	
	Exported energy		
	thermal	electrical	
Primary energy factor	$f_{prim,ex,1}$	$f_{prim,ex,2}$	
CO2 emission coefficient	$K_{ex,1}$	$K_{ex,2}$	
Policy factor	$f_{pol,ex,1}$	$f_{pol,ex,2}$	

where

$f_{prim,del,i}$ is the primary energy factor for the delivered energycarrier *i*;

$f_{prim,ex,i}$ is the primary energy factor for the exported energycarrier *I;.*

$K_{del,I}$ is the CO_2 emission coefficient for delivered energy carrier *i*

$K_{ex,i}$ is the CO_2 emission coefficient for the exported energy carrier *I;*

NOTE These two coefficients can be the same.

$f_{pol,i}$ is the policy factor for energycarrier *;*

$f_{pol,ex,i}$ is the policy factor for exported energy.

The indicator is a:

☐ Standard calculated energy indicator ☐ Measured energy indicator

If calculated:

☐ based on design data

☐ based on actual data (asset 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	☐
Building stock	☐
Other (provide explanation)	☐

A.2.5 Classification

A classification procedure is used:

☐ Yes ☐ No

If a classification procedure is used 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 Energy certificate format

The format of the energy certificate is

Based on Annex C: ☐ Yes ☐ No

Describe the details of the energy certificate….

A.2.7 Recommendations

The energy certificate includes recommendations chosen among the following:

A list can be given here by the authorities setting up the procedure for building energy certification.

Annex B
(informative)

Procedure for building energy performance classification

B.1 Introduction

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

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

It can be applied to standard calculated energy indicators, to measured energy indicators and to any of the indicators defined in 5.1

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

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) Determine the values of the energy performance of the building EP:

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

1) Class A if $EP < 0{,}5\ R_r$
2) Class B if $0{,}5\ R_r \le EP < R_r$
3) Class C if $R_r \le EP < 0{,}5(R_r + R_s)$
4) Class D if $0{,}5(R_r + R_s) \le EP < R_S$
5) Class E if $Rs \le EP < 1{,}25\ Rs$
6) Class F if $1{,}25.\ Rs \le EP < 1{,}5.Rs$
7) Class G if $1{,}5.\ Rs \le EP$

B.3 Additional steps

For a measured energy indicator 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 15203/15315.

b) The values of R_r and R_s should be adjusted or the indicator has to be modified 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).

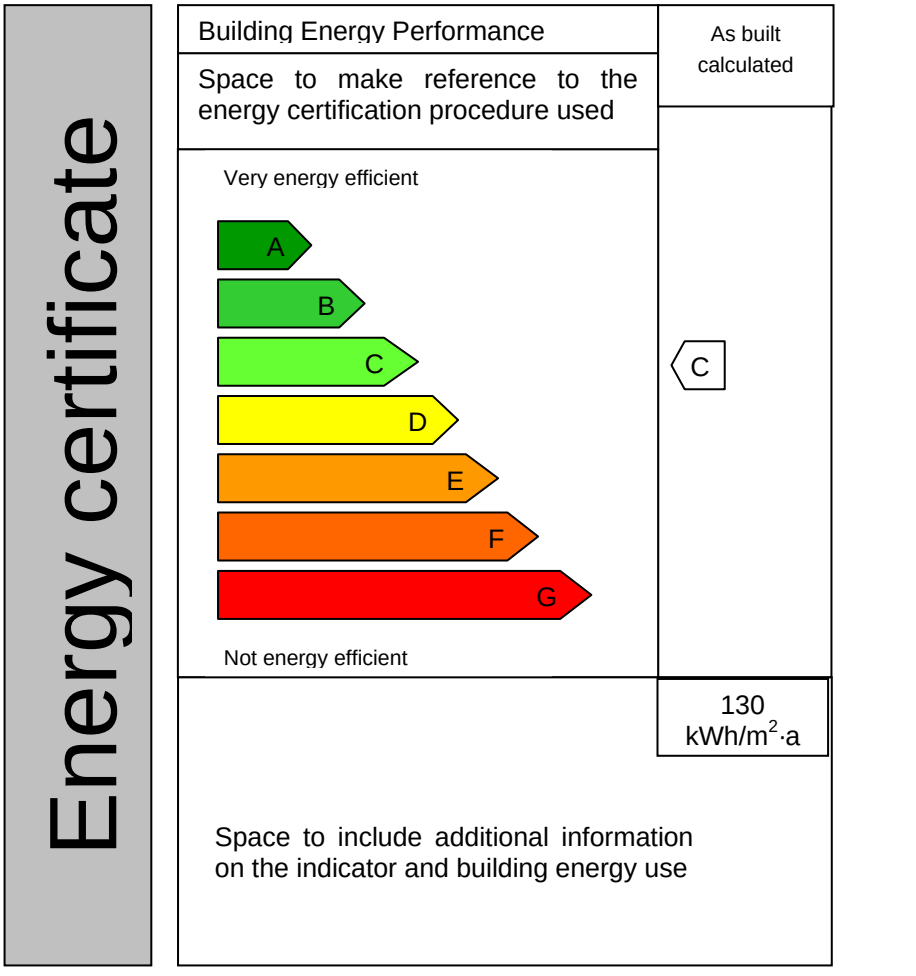
Annex C
(informative)

Energy certificate format

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

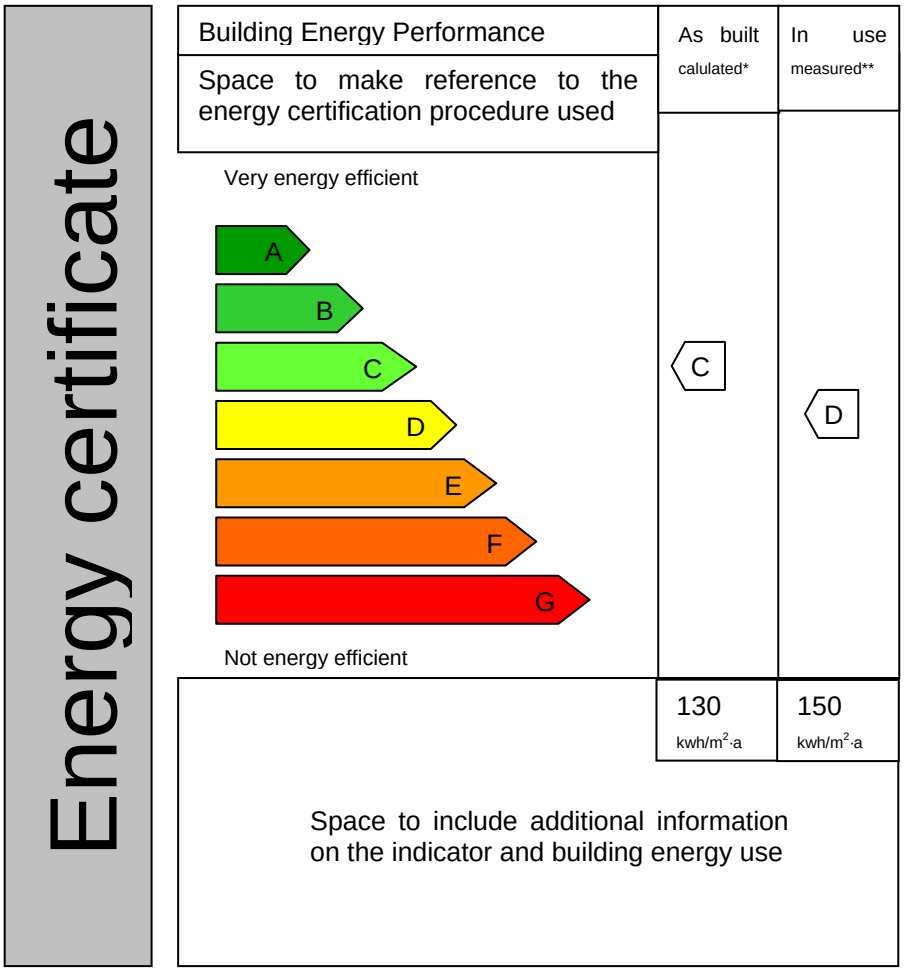
Many other solutions are possible.

Example 1 with one single indicator and classes



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

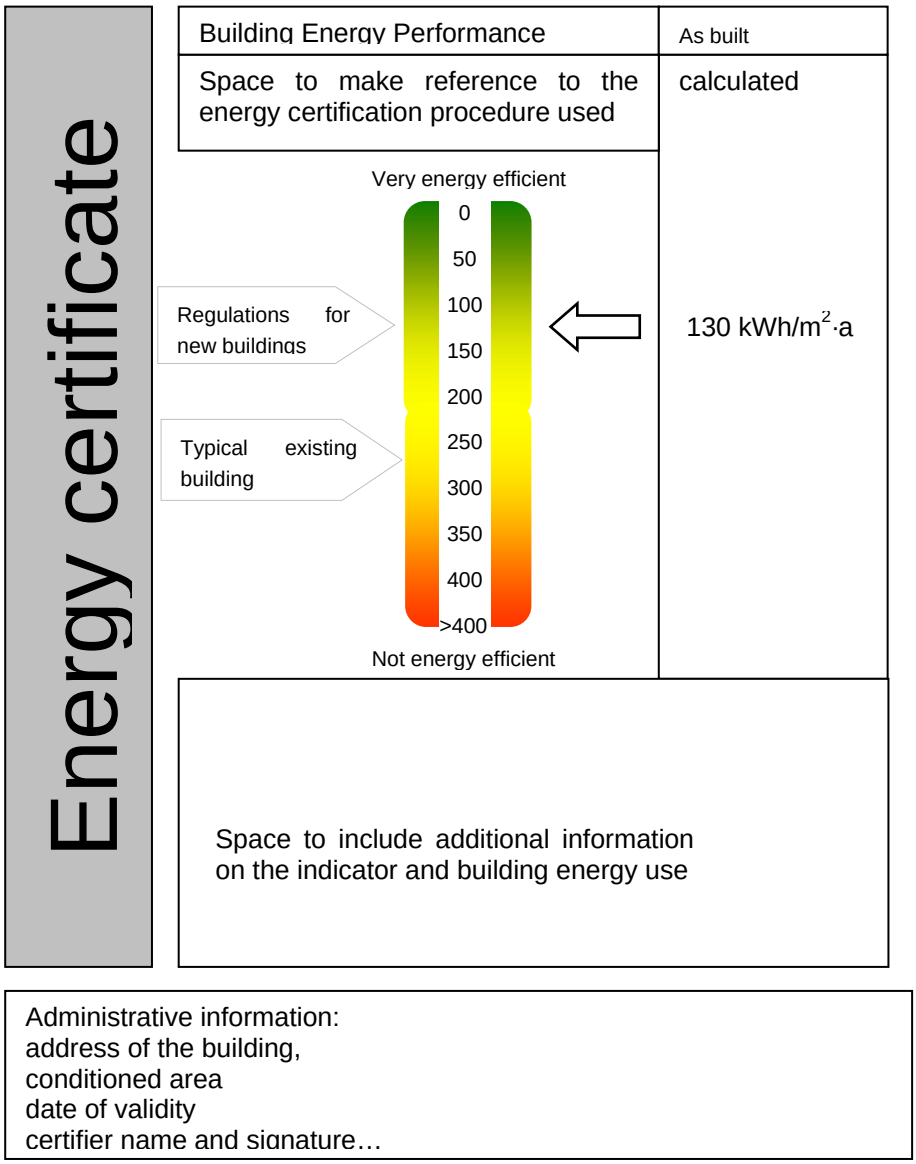
Example 2 with two indicators and classification



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

*the calculated rating assumes standard conditions. It only counts the energy used for heating, ventilation, cooling, hot water and lighting (add others if applicable)
**the measured rating is under actual conditions . It counts all energy uses.

Example 3 with 1 indicator without classification



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 References

EN 308, *Heat exchangers – Test procedures for establishing performance of air to air and flue gases heat recovery devices*

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

EN 14501, *Blinds and shutters – Thermal and visual comfort –Performance characteristics and classification*

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

EN 13829, *Thermal performance of buildings – Determination of air permeability of buildings – Fan pressurization method (ISO 9972:1996, modified)*

prEN 15193-1:2005, *Energy performance of buildings – Energy requirements for lighting – Part 1: Lighting energy estimation*

prEN 15232, *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 13790:2005, *Energy performance of buildings – Calculation of energy use for space heating and cooling*

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

D.3 Thermal transmittance

D.3.1 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 6.3.1.

NOTE To avoid that the mean thermal transmittance is too much flattering in case the building's envelope has a significant portion with reduced thermal transmission due to adjacent unheated spaces, ground floor, and such, the corresponding areas of the building envelope may be weighted with a (nationally fixed) reduction factor.

D.3.2 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.3.3 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.3.4 Air tightness

Requirement can be expressed in terms of a maximum value of air permeability measured according to EN 13829**.**

D.4 Heating and domestic hot water

Requirements can be expressed in terms of:

— a maximum value of energy use for heating as obtained according to prEN ISO 13790;

— a maximum value for the energy need for heating as obtained according to prEN ISO 13790;

— a minimum efficiency of the heat generation system;

— minimum insulation of pipes, ducts and tanks.

D.5 Cooling

- energy use for cooling as obtained according to prEN ISO 13790;

- energy need for cooling as obtained according to prEN ISO 13790;

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 EN 14501 .

D.7 Ventilation

The requirement can be expressed as the efficiency of heat recovery units according to EN 308.

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

The requirement can be expressed as the energy need for ventilation.

D.8 Lighting

The requirement on artificial lighting can be defined according to prEN 15193-1.

Requirement can also be set in term of minimum level of daylight.

D.9 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 15232.

D.10 Metering and monitoring

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