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Energy performance certificates

EN 15217 "Energy performance of buildings - Methods for expressing energy performance and for the energy certification of buildings"

This paper gives information about the Energy performance certificates according to the EPBD requirements and the CEN standards for the EPBD.

Energy performance certificates will have to be available when buildings are sold or rented and will be displayed in public buildings. It is expected that this will have a major impact by increasing the awareness of building owners and users of the energy performance of their buildings. In France for example, 2 million certificates will be issued every year. It will probably play a key role in activating the improvement of existing buildings, which is a major challenge in reducing building CO2 emissions.

This information paper explains how the CEN (EPBD)-standard: EN 15217 "Energy performance of buildings - Methods for expressing energy performance and for energy certification of buildings" complements the directive.

1 > The EPBD requirements(directive 2002/91/EC)

Energy performance certificate

Article 7 of the EPBD stipulates the information that an energy certificate must contain.

Art.7/§1 indicates the **situation and the point in time** when a certificate shall be available for a **building** or an **apartment**. The certificate shall be made available "...when buildings are constructed, sold or rented out ...".

Art.7/§2 gives some information about the content of the certificate. The certificate:

- > "shall include reference values such as current legal standards...",
- > "shall be accompanied by recommendations for cost-effective improvements of the energy performance".

Member States shall take measures to ensure that for buildings with a total usable floor area over 1000 m², occupied by public authorities and by institutions providing public services to a large number of persons and therefore frequently visited by these persons, an energy certificate, not older than 10 years, is placed in a prominent place where it is clearly visible to the public.

The range of recommended and current indoor temperatures and, when appropriate, other relevant climatic factors, may also be clearly displayed.

The requirements of Article 7 are very general. More details are provided in other Articles of the EPBD.

Definitions

Article 2 defines the term "energy performance " in Article 7.

Art.2/§3 states that an energy certificate of a building is "...the energy performance of a building calculated according to a **methodology** based on the **general framework** set out in the **Annex**."

It should be noted that:

- > the energy performance is **calculated**, (legally even a calculation based on energy bills can be considered as a calculation.)
- > the energy performance is evaluated according to a **methodology** that is based on the **general framework** in the Annex of the directive.



Improvement of the building?

How should the energy performance of a building be expressed?

Art.2/§2 states that "*the energy performance of a building is the amount of energy actually consumed or estimated to meet the different needs associated with a standardised use of the building This amount shall be reflected in one or more numeric indicators that have been calculated taking into account ...*"

Annex "General framework for the calculation of the energy performance of buildings (article 3)"

The annex defines the content of the certificate more rigorously.

Annex/§1 states that the methodology **shall** include at least the following aspects:

- > the **building shell**
thermal characteristics,
position and orientation,
passive solar systems and solar protection,
etc.
- > the **technical building systems and uses**
heating installation,
hot water supply,
air-conditioning installation,
ventilation,
natural ventilation,
built-in lighting.

Annex/§2 states that the **positive influence** of the following aspects **shall** be taken into account;

- > **Innovative systems**
active solar systems,
other heating and electric systems that use renewable energy sources,
electricity produced by CHP.
- > **Large scale systems** (local community systems)
(energy systems situated outside the building),
district or block heating and cooling systems.

Taking into account systems situated outside the building emphasises the primary energy approach in the certificate.

2 > En 15217 "Energy performance of buildings - Methods for expressing energy performance and for the energy certification of buildings"

EN 15217 provides methods that are required to express the energy performance (EP) of buildings.

The certificate can be based on either the measured or the calculated rating. Both indicators have their pro's and con's.

A calculated rating highlights the intrinsic potential of the building while a measured rating makes it possible to take into account the impact of building management.

In the selection of relevant indicators, the following points should be taken into account:

- > For new buildings, a measured energy indicator is not available, so a calculated rating based on design data is the only practical means of assigning an indicator.
- > A measured energy indicator will no longer be valid after a change of building occupant or a change in the pattern of use of the building.
- > In existing public buildings where there is no change in ownership, the measured energy indicator can be a measure of the quality of the facility management and can be used to motivate building operators and users.
- > A standard calculated energy indicator requires the collection of data on the building (insulation, heating system, etc.), which will be useful for giving advice on the improvement of its energy performance.
- > For managers of buildings, a measured energy indicator can often be easily obtained from the data that is already available in their information systems (energy bills, areas, etc.).
- > Measured energy indicators and standard calculated energy indicators are not necessarily based on the same uses of energy.

In the following sections the chapters of the standard that are related to certificates will be discussed.

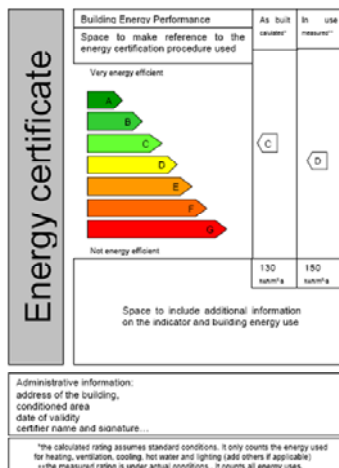
"Energy performance indicators"

Chapter 5 of EN 15217 states that "*the energy performance of a building is represented by an overall indicator EP determined according to EN 15603*". The overall indicator is related to the conditioned floor area A_c in order to facilitate the comparison of the energy performance between buildings.

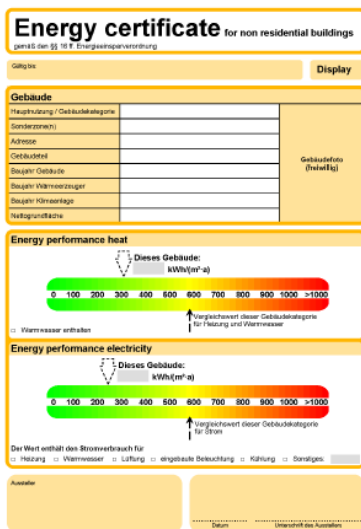
- Different indicators can be used on a certificate

The certificate shall contain an easy-to-understand global indicator of the energy consumption of the certified building. Different forms of energy can be delivered to a building: e.g. gas, electricity, wood... The indicator will be a weighted sum of these delivered energies. Depending of the weight chosen, the indicator can represent either:

- > Primary energy
- > CO2 emissions
- > Total energy cost
- > A weighted sum of the net delivered energy weighted by any other parameter defined by national energy policy.



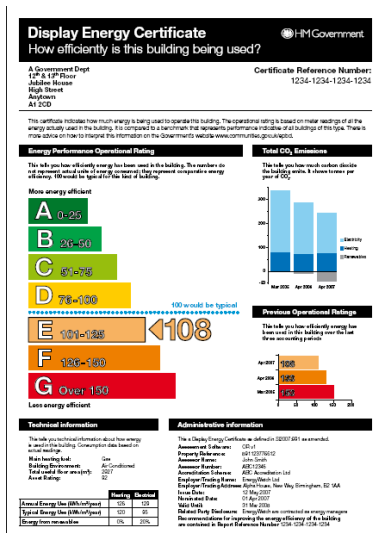
Example of an Energy certificate according to EN 15217



Energy certificate based on measured energy use displayed in public buildings in Germany



Energy certificate based on calculated energy use for non-residential buildings in the Netherlands.



Energy certificate based on measured energy use displayed in public buildings in the UK

- Conditioned area A_c

The type of dimensions used to calculate AC is not standardized yet because there are many different conventions in the member states. Therefore

- > internal dimensions,
- > external dimensions,
- > overall internal dimensions

may still be used.

According to EN 15217 the type of dimensions shall be specified in the certification procedure.

The type of dimensions has a high impact on the indicator EP. For a single-family dwelling of 10 x 10 m, the indicator obtained using internal dimensions could be 20 % higher than the one obtained using the external dimension of the same house.

The type of dimensions used in the calculation has an impact not only on the indicator EP but also on the values calculated for the heat transfer, the hot water demand, lighting, etc. This should be remembered when choosing the type of dimensions and also when setting up the calculation methods to be used when including these building services.

It should be noted that heat losses are not directly proportional to the conditioned floor area, because buildings with different shapes may have different heat losses even if they have the same conditioned floor area . Using only the conditioned area introduces distortions in the comparison between buildings, because it is easier for a larger building to improve its performance.

"Reference values"

According to the requirements in the directive, EN 15217 specifies that "reference values shall be defined for classes of buildings having different functions (e.g. single family houses, apartment blocks, office buildings, educational buildings, hospitals, hotels and restaurants, sports facilities, wholesale and retail trade service buildings, other types)."

The **function** refers to the different building services that are required (heating, domestic hot water, air-conditioning), different specifications for the internal climate and different occupant densities and occupancy schedules (buildings used 5, 6 or 7 days a week).

The **current legal status** (e.g. required EP, minimum EP for new buildings) and the **building stock** must be used as references.

The reference values shall be **documented**, not on the individual certificate but in a report that can be easily consulted (e.g. one that is available on a website), taking into account the following aspects:

- > type of reference value,
- > building function,
- > uses considered,
- > assumptions regarding internal and external climate,
- > assumptions regarding use patterns,
- > procedure to be used to select the correct reference value.

Procedure for building certification

In addition to the requirements of the directive, EN 15217 indicates that the energy certificate may contain **energy classes**.

The performance scale **shall range from A** (buildings of highest energy performance) **to G** (buildings of lowest energy performance). The current legal status shall be placed at the boundary between classes B and C, while the building stock reference shall be placed at the boundary between classes D and E.

Certificate shape

The format of the certificate is very important to enable an easy understanding by non specialists. The CEN standard offer three examples of certificate layout which can be used as a basis by Member States:

- > the first example includes a calculated rating and energy classes,
- > the second includes a calculated and a measured rating,
- > the third includes a continuous scale instead of energy classes.

Energy classes, already used for household appliances, **facilitate** the comparison between buildings, because terms like primary and final energy are not familiar to many people. But they can also be a **source of false interpretation** as their content is different (e.g. because conditioned floor area and different uses are taken into account).

The figures that appear in the column to the left of the present text show examples of different ways to display the energy performance rating and classification that are used in the Member States.

3 > How the directive and Standard EN 15217 complement each other

Compared to the directive, EN 15217:

- > provides **more precise reference values** (values per building class, energy classes) and **recommendations** (management),
- > expresses the indicator in a form that is normalised by the **conditioned floor area**. Note that the conditioned area could be defined differently in different Member States.

The indicator is calculated according to EN 15603.

EN 15217, and especially the normative Annex A "Procedure for building energy certification documentation", can be used by authorities for setting up a procedure for building energy certification. It can contribute to reducing costs, if used as an alternative to developing separate energy certification procedures at the national level.

4 > FAQ

The requirements of the directive are subject to some interpretation at the national level. What are the main differences of between these interpretations?

The main differences between the Member States are:

- > The application of the certificate either to the whole building, or to a part of a building (e.g. to a single flat). This means that a certificate is issued only if the whole building is sold or rented. This reduces the number of certificates and the information that is available. The revised version of the EPBD specifies that the certificate must also be available when any part of the building is sold or rented.
- > The choice of the rating indicator. Most of the Member States use the primary energy and/or CO₂ emissions, but some countries use only the final energy. This could lead to false interpretation, as indicated in P150 (Numerical indicator for the energy performance based on primary energy use and CO₂ emissions). The revised version of the directive requires the use of primary energy in an indicator but not for the energy rating (it should be remembered that the rating is not a requirement of the EPBD).
- > The evaluation methods. Most of the Member States developed national evaluation methods even though European Standards were available. Some methods are very detailed, some are very simplified. In some methods even generation losses are not taken into account. It is therefore impossible to compare the results between Member States.

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