



D 7.7 Relation historic buildings, EPBD and EPBD CEN Standards

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1 Introduction and abstract

This document introduces the recasted Energy Performance of Buildings Directive (EPBD), especially where it concerns old and historic buildings. The link between the EBPB and the EPBD CEN Standards is discussed and also the relation between the EPBD CEN Standards and historic buildings. Finally our suggestions regarding a CEN Standard on the energy performance of historic buildings is given. Questions, comments and suggestions on this document are welcome at: marleen.spiekman@tno.nl.

2 EPBD and historic buildings

The Recast of the EPBD (Directive 2010/31/EU) has been published in May 2010 and is a revision of the first version of the EPBD (Directive 2002/91/EC). The Member States of the EU are now in the process of implementing the recasted EPBD and because the Directive is relatively new, the interpretation isn't completely crystallised. Therefore the following summary of the requirements listed in the recasted EPBD concerning old and historic buildings is our interpretation of it.

The most important requirements that the recasted EPBD states about existing buildings are the following:

- When existing buildings undergo major renovation, the renovated building or renovated parts have to meet minimum energy performance requirements. In addition or as an alternative, requirements may be set for the renovated building elements.
- If a significant part of a building envelope is retrofitted or replaced, the energy performance of this building element needs to meet minimum energy performance requirements.
- If building systems (heating systems, hot water systems, air-conditioning systems, large ventilation systems) are installed, replaced or upgraded, system requirements shall be met. Intelligent metering should be encouraged when a building undergoes major renovation, as might be the installation of active control systems.
- Energy performance certificates are required when a building is constructed, sold or rented out to a new tenant and for all buildings bigger than 500m² which are occupied by a public authority and frequently visited by the public (in the latter case, the certificate also needs to be displayed).
- Large heating and air-conditioning systems need to be inspected regularly.

In principle these requirements are applied to historic buildings as well, but there are exceptions. Except for the system inspections, Member States may decide not to apply the requirements listed above to (among other things) "buildings officially protected as part of a designated environment or because of their special architectural or historical merit, in so far as compliance with certain minimum energy performance requirements would unacceptably alter their character or appearance" and "buildings used as places of worship and for religious activities".

For all minimum requirements goes that differentiation between new and existing buildings will take place and they are only applied in so far as they are technically, functionally and economically feasible. Individual countries/regions need to set the requirements based on calculated cost optimal levels.

Note that the level of the requirements is set by the individual Member States and therefore will differ from country to country. Also the methodology to determine the energy performance of a building or building element can differ per country. With the revision of the CEN EPBD Standards in the upcoming years, it is expected that the methodology used in the Member States will be further harmonised, but complete harmonisation can't be expected in the upcoming years.

3 EPBD and EPBD CEN Standards

The EPBD is a European Directive that obliges The Member States of the EU to implement various energy saving and energy efficiency regulations. The EPBD sets the framework of this legislation and the Member States individually fill in the details. The CEN EPBD Standards are developed mainly to facilitate the implementation of the EPBD in the Member States and describe calculation (and some measurement) procedures to assess the energy performance level of a building or building part. To facilitate the implementation, the CEN EPBD Standards do not prescribe a single methodology to derive the energy performance of buildings, but give a limited number of options. On national level one or more of these options can be selected and implemented. Another goal of the CEN EPBD Standards is to harmonise the methodologies developed in the individual countries.

The EPBD CEN Standards focus on:

- energy needs for heating and cooling and energy use for space heating, cooling, ventilation, domestic hot water heating and lighting, inclusive of system losses and auxiliary energy
- ways of expressing energy performance (for the energy certificate) and ways of expressing requirements (for regulations) and content and format of energy performance certificate
- boiler and air-conditioning inspections

It is important to realise that the EPBD CEN Standards only provide calculation procedures (formula structures, measurement procedures, etc). Boundary conditions and input parameters (such as national climate data, general product/material/system data, user behaviour patterns, etc) are filled in nationally, as are the requirement levels. Also note that the EPBD CEN standards are aimed at calculating and checking the energy use of a building. They are not aimed to be design tools which provide a optimisation assessment between for instance energy saving and comfort or health.

For more information on the EPBD CEN Standards see the Umbrella Document (CEN/TR 15615:2008). In the upcoming two years the EPBD CEN Standards will be revised to take the harmonisation a step further.

4 Historic buildings and CEN EPBD Standards

The calculation procedures in the EPBD CEN Standards are based on physics and are therefore generally valid, so in principle the calculation of the energy performance of historic buildings is covered within the scope of the CEN EPBD Standards.

Some questions/discussing points regarding historic buildings and EPBD CEN Standards might be:

- Does the EPBD CEN method take into account dynamic effects of moisture flows on the energy use?

Answer: No, but if required a correction per month or season on the U-value is possible, or flexibility could be provided to use the adjusted U-value, based on in situ measurements.

- Does the EPBD CEN method take into account thermal mass?

Answer: Yes, temporary storage of heat which is released at a later stage is taken into account via the utilisation factor of the heat gains, based on the heat capacity of the construction materials.

- Does the EPBD CEN method take into account thermal bridges?

Answer: Yes, but note that the focus of the calculation procedure is energy use only and not condensation risk.

- Does the EPBD CEN method take into account alternative energy saving regimes, like closing heavy curtains which prevents draught and gives extra insulation?

Answer: Yes, the EPBD CEN Standards provide formula structures in which all kinds of user behaviour can be taken into account as input data. Note that on national level input data can be restricted, leaving no room (yet) for alternative energy saving regimes. The reason behind this is that national legislation often is restricted by principles of controllability and verifiability. What building elements are constructed can be checked, but user behaviour cannot be verified and can easily differ from user to user. So related to building regulations user behaviour strategies often cannot be taken into account as energy saving measures. Which doesn't mean that in practice this might not be a good solution.

- Does the EPBD CEN method take into account traditional materials?

Answer: Yes, in the sense that the EPBD CEN Standards provides the formulas in which the physical parameters of traditional materials needs to be filled in. But note that the EPBD CEN Standards don't provide databases with input data of any material (not of modern material either).

- Does the EPBD CEN method give proper advice on energy saving measures related to historic buildings?

Answer: Giving advice on energy saving measures is out of the scope of the CEN EPBD Standards. The Standards provide the procedures to calculate the energy performance of a building, but does not advice which measures to take (not for new buildings either). The method can be used though to determine current energy and estimate energy use reductions for several sets of saving measures.

- Does the EPBD CEN method give component requirements or requirements for the building as a whole?

Answer: The EPBD CEN Standards do not give requirements at all. Requirements are set on national level. It is a national choice whether requirements for existing buildings are set on component or building level.

(Note that in renovation situations setting requirements on building level is not always evident: a requirement should be set at a realistic level, but what is realistic when only the insulation of a house is replaced versus a situation in which both insulation and heating system are replaced? This might lead to unrealistic high insulation levels in the first case or much less than possible insulation in the second case. Therefore Governments might choose to set requirements on component level only.

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Also note that requirements are only a way of control. It doesn't discharge anyone of his duty to thoroughly think through a renovation design.)

5 Our suggestions on energy performance calculations for historic buildings

Based on the above we have the following suggestions (note that these suggestions are suggestions from TNO and were not discussed with the EPBD CEN working groups):

- There are several reasons why we'd advise against developing a separate CEN Standard with a complete calculation procedure for the energy performance of historic buildings:
 - Developing energy performance procedures is complex and involves a lot of different subjects and expertises. Within the CEN EPBD working groups there have been (and are) dozens of technical experts working on the development of general energy performance standards (see the Umbrella Document: CEN/TR 15615:2008). It seems a waste of resources to start this process again especially for historic buildings, while the existing standards are in principle (maybe with some additions) valid for historic buildings as well.
 - Realise that historic buildings which are not officially recognised as such need to follow the EPBD requirements. This means that the official national tools need to be used. Guidance and tools that build upon these official methods prevent double work. Also building upon these tools is much more transparent for the local authority/builder/owner than developing different ones autonomously.
- Instead of a complete specific energy performance method for historic buildings, additions to the existing EPBD CEN Standards are more evident, if indeed necessary.
- Evaluating the CEN EPBD Standards integrally (instead of e.g. only the insulation Standard) is a must for this, to prevent corrections which are already taken into account in other parts of the calculation procedure. To prevent this consultation between the Technical Committees of the CEN working groups involved is essential.
- Based on our experience with developing energy calculation tools for non-energy experts: be careful with complex tools. Dynamic calculations might seem necessary for achieving a certain amount of accuracy, but
 - a) you need an expert to make such calculations because non-experts easily (no offence, since it is not their expertise) make mistakes which cancel out the accuracy and worse.
 - b) dynamic/complex calculations often require many detailed input parameters which often are unknown. The accuracy gained on one aspect might be counterbalanced by the arbitrary choices made for these unknown parameters.

The trade-off among calculation accuracy, risk of mistakes, inevitable arbitrary input, verifiability and transparency learned us that choosing complex method over simple methods is not evident.

- Since the CEN EPBD Standards leave many aspects to the national methods (like input data of user behaviour, material data, etc) providing guidelines and examples how national annexes can include historic buildings within the implementation of the CEN EPBD Standards on national level might be very useful. As are guidelines how to improve the energy performance of historic buildings.
- If aspects or gaps in the CEN EPBD Standards are detected which make them unusable to historic buildings, the upcoming period is a good period to start a dialog with the working groups of the CEN EPBD Standards, because they'll become active due to the planned update of the Standards by the EU.

6 References

CEN/TR 15615:2008 Explanation of the general relationship between various European standards and the Energy Performance of Buildings Directive (EPBD) - Umbrella Document

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

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (recast)