# EPBD Voluntary Common EU Certification Scheme

## Definition of a Performance Scale

## Working document

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This document is a first contribution of the consortium on the definition of a performance scale. It is a support for the consultation of the relevant sectors and will be adapted according the comments received from stakeholders and EU Commission.
Practical experimentation in different MS is suggested before final adaption.



## Summary

## 1 Requirements on performance scale

The voluntary scheme has to provide an added value in comparison with the mandatory certification schemes in order to favour voluntary application. To enhance the transparency of the energy performance in the Union's non-residential property market is a major target. The needs of relevant stakeholders have been analyzed and resumed in the following requirements:

- One comparable scale for all Member States;
- One scale for all building categories;
- Identify and highlight the best performing buildings;
- To be suitable for existing buildings in the portfolio;
- To provide appropriate resolution to show improvements.

**Explanations:**

- Comparability means that the judgement introduced by the classification should have the same signification throughout Europe. There can be different comparability criteria: i.e. energy consumption, energy performance, etc. according to the objectives of comparison.
  The scale should fit for all countries. European comparability is an advantage for an international marketing strategy.
- Building categories are related to the uses (i.e. office buildings, commercial buildings). Keeping different scales based on absolute values of energy consumption do not facilitate comparability between the scales (and the performance of the buildings).
- Highlight best buildings, with outstanding energy performances, is an interest for property owners. Voluntary schemes shall be frontrunners of mandatory regulations.
- Suitability for all existing buildings is required. Retrofitting of existing buildings will be a main challenge in Europe's building sector and should be considered on the scale.
- Appropriate scale resolution is related to the possibility to change the class after renovation to highlight improvements made. Changing one or more classes should be feasible and reachable. The shape of the scale (i.e. logarithmic) should also take into account that it is more difficult to improve a high performance building than to improve a building with a bad energy performance.

## 2 Scales defined in EN 15217

The scale according to EN 15217 "Methods for expressing energy performance and for energy certification of buildings" is the only existing common European scale definition. It is based on 2 reference points (see figure 1):

$R_r$: Energy performance regulation reference (this corresponds to the minimum energy performance requirement for a new building);

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

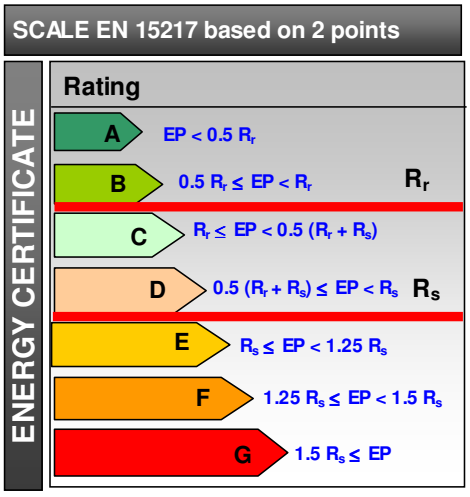


*Figure 1:* Scale based on EN 15217.

The scale according to EN 15217 is not suitable to classify high performance buildings as it provides only 2 classes below the minimum energy performance requirement. It rather focuses on the existing building stock.

# 3 Proposal for the performance scale

## 3.1 *Principle of the performance scale*

It is requested that the performance scale could be used all over Europe. In national schemes the scale is often defined in classes related to energy consumption (kWh/($m^2$a)). This type of scale using absolute values will not allow a European wide use without corrections (i.e. climate, uses, and internal gains). Even within the same countries using this type of scale requires several scales, adapted to climate zones, uses etc.

| The proposed scale is based on comparison of "real" building with a reference. |
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For the comparison a relative value will be used: the ratio of the real building energy performance to the reference:

$$EP_{(r/ref)} = \frac{EP_{real}}{EP_{reference}}$$

where: $EP_{real}$ = energy performance indicator of the real building
$EP_{reference}$ = energy performance of the reference

## 3.2 *Reference*

To develop a scale according to EN 15217, two reference points are used to set the scale. In this proposal only one explicit reference point is needed, because of the chosen shape of the scale (see hereafter).

The reference point has to take into account local conditions, like climate data, specific use patterns, the state of the art, construction and energy costs.

National minimum energy performance requirements for buildings should be defined by integrating these conditions. National minimum requirements are well known and ensure that new buildings can be placed on the scale.

| National legal requirements for new buildings have been chosen as a reference point of the scale. |
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One advantage of this choice is that it is easy to remember and to understand that if the ratio is equal or lower than 1, then the building is fulfilling the legal requirement of the country.

Classes based on a reference point in accordance with national requirements can also be used to link incentives or high performance and NZEB definitions (see "Definition of classes"). This will help to make incentives schemes and high performance and NZEB definitions more understandable and European wide comparable.

For example:

- NZEB: 0.50 min requirements
- Major renovation: 1.40 min requirements
- Incentives for major renovation: 1.15 min requirements

The disadvantage of this choice is that the performance is linked to the countries definition of the minimum energy performance level. If the legal requirements are low, then highest performance can more easily be reached.

Therefore the link with article 5 of recast EPBD (comparative methodology framework for calculating cost-optimal level of minimum energy performance requirements) is important, in order to avoid significant discrepancies among the Member States.

**Expression of the reference point**

Different possibilities are used in the Member States to define minimum requirements. The requirement for overall energy performance in kWh/$m^2$a of primary energy (Art. 4 and Annex I) are expressed as:

- absolute values related to the energy consumption and climatic zones ;
- values taking into account building geometry, climatic zones, etc ;
- description of the Mirror Baseline Buildings (MBB) including the description of the recommended / required properties of the building envelope and of the technical systems.

The expressions are going from the simplest description to a more detailed one. The more detailed the description is, the more comparable is the evaluation of the performance, because the reference point will take better into account the real possibilities of each specific building.

As the national requirements are often defined by using a national calculation method, the most accurate approach is when the energy performance of the real building and of the reference point is determined by using the same calculation procedures, with the same boundary conditions.

The reference point of the scale can be adapted to all of these definitions and inputs (i.e. absolute value, MBB, etc). But the comparability and the information about the potential energy performance will be different. For example if the minimum requirement is expressed in kWh/($m^2$a) of primary energy it would be useful to give some additional information about the assumptions used in the determination of the requirement, in order to adjust the calculation method and the minimum requirements (i.e. primary energy conversion factor).

## 3.3 *Shape of the scale*

The shape of the scale should take into account that it is more difficult to improve an already high performance building than to improve a building with a very bad energy performance.
A linear scale, with equal classes does not fit under this requirement.

| Geometric series are chosen to express the limits of the energy classes. |
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Upper limits of energy classes proposed for common EU certification scheme are calculated as geometric series with a quotient $\sqrt{2}$ expressed by function:

$$y = \sqrt{2}^{(n-n_0)}$$

Where:
$n$ is the position of energy class on the scale;
$n_0$ is the position of the energy class for reference point on the scale.

Non-linear scales are better adapted to cover all buildings, from the existing building stock to NZEB, and to provide sufficient resolution.

It should be remembered that also some subsidies schemes are related to the improvement of classification.

## 3.4 *Definition of classes*

The definition of the energy classes is based on the following considerations:

- voluntary schemes are often used to underline high quality ahead of legislation (see Figure 2). Voluntary certification schemes are also used by public authorities to push the legislative boundaries;
- conclusions and comparison of existing concepts and standards for high performance buildings published by

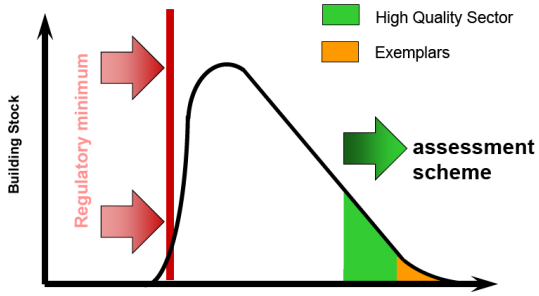


*Figure 2: Voluntary schemes: frontrunners of mandatory schemes*

BPIE in November 2011 (Principles for nearly Zero-Energy Buildings), show that the energy consumption of high performance buildings will be approximately in a range between 25% - 50% of in force regulation requirements.

- EN 15217 places mandatory minimum legal requirements on the limit of classes 2 and 3.

| It has been decided to place the reference point on the limit of classes 5 and 6 ($n_0$ = 5) |
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Based on this choice and the shape of the scale, the definition of intervals for energy classes has been calculated and presented in Figure 3.

**Groups (see Figures 3, 4)**

The whole scale is divided in three easy to remember groups:

- high performance buildings (HPB) > high performing buildings (class 1-3);
- state of the art (SOA) > buildings fulfilling legal requirements for new buildings (class 4,5);
- traditional (Trad) >buildings not fulfilling legal requirements for new buildings (class 6,7);

and an outstanding group: the positive energy buildings (PEB).

The proposed scale highlights best buildings. Three of the seven classes are related to HPB.
There is no specific class limit reserved to "national" NZEB because the definitions are not available.

**Awards**

The same scale is used for new buildings and existing buildings.
To distinguish between new and existing building the common scale is awarded differently.
HPB can reach the "podium" of the best performing buildings. The "podium" is underlined by an additional medal (gold, silver, bronze).
An outstanding class is reserved for net zero-energy and positive energy buildings and awarded by a laurel wreath. The change from "metal "to "laurel" underlines the breakthrough in energy performance.
To distinguish between new buildings and existing building the awards of existing building are lowered by one class because the legal requirements for major renovation are lower than for new buildings. For example in Germany it is 140 % of the requirements for new buildings.

| **Award new buildings** | **Award exist. buildings** | **Common EU scheme** | **Common EU scheme** | **Groups** |
|---|---|---|---|---|
| **Laurel** | **Laurel** | **Outstanding** | **EP < "positive "** | **PEB** |
| | | | | |
| Gold | Gold | **Class 1** | EP **<** 0.25 Ref | **HPB** |
| Silver | Gold | **Class 2** | 0.25 Ref ≤ EP < 0.35 Ref | **HPB** |
| Bronze | Silver | **Class 3** | 0.35 Ref ≤ EP < 0.5 Ref | **HPB** |
| | Bronze | **Class 4** | 0.5 Ref ≤ EP < 0.71 Ref | **SOA** |
| | | **Class 5** | 0.71 Ref ≤ EP < **Ref** | **SOA** |
| | | **Class 6** | Ref ≤ EP < 1.41 Ref | **Trad** |
| | | **Class 7** | 1.41 Ref ≤ EP | **Trad** |

*Figure 3:* Proposed scale with ranking and intervals of classes

The graphical presentation of the limits of the classes is in Figure 4:

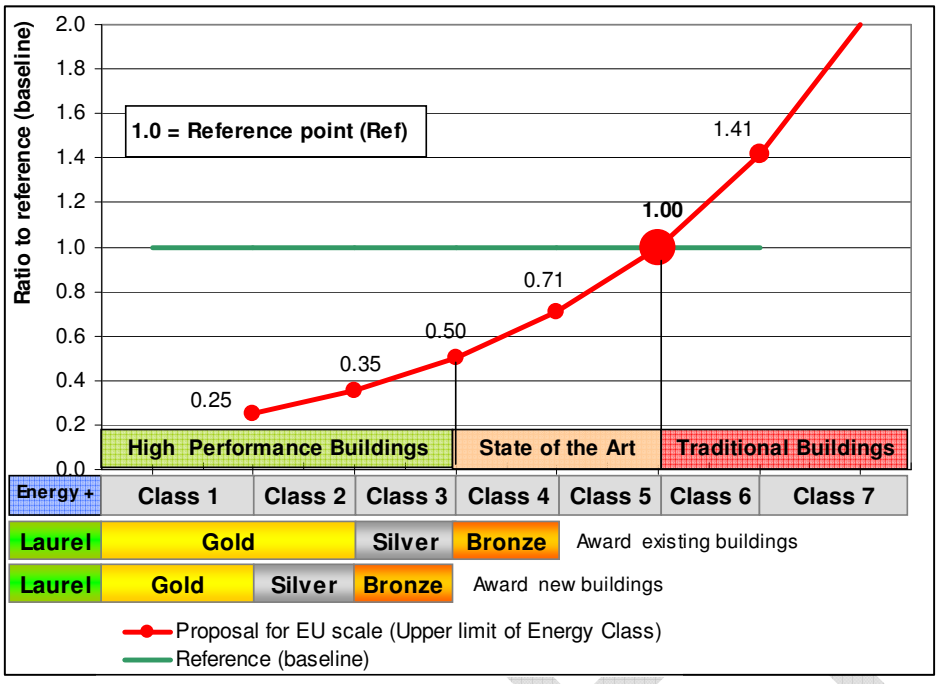


*Figure 4: Limits of proposed energy classes (ratio real/ reference)*

## 4 Conclusions

The principles of an easy understandable, flexible and comparable performance scale has been developed and applied to the EPBD voluntary certification scheme.

The performance scale takes into account other articles of recast EPBD like:

- the minimum energy performance requirements (art. 4);
- the calculation of cost-optimal levels of minimum energy performance requirements (art. 5);
- the nearly zero-energy buildings (art. 9);

and provides a coherent whole.

The ratio based scale and the national legal requirements as a reference point show a possible way towards more European wide harmonization. It could be a possible support to transparent subsidies schemes.

The principles of the scale can also be used for mandatory schemes and up taken by the Member States, for example by simply change the position of the reference point to another class limit.

An experimental phase is needed for the fine tuning of the performance scale.

### Questions

1. Does this scale fit your needs?
2. Should the scheme be applied on all existing buildings (also on buildings not undergoing major renovation) enable comparison all buildings in portfolio (e.g. all hotel buildings)?
3. Do you consider as necessary to have a separate award for existing buildings (see fig. 3)?
4. Is it acceptable that buildings classified in class 5 or more will have no award, just class will be presented (see fig. 3)?
5. What would be the best symbol for expression of class (number, letters, stars, ...)?
6. Are you interested to participate in the test run?