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BSI Standards Publication

Energy Performance of Buildings — Basic Principles for the set of EPB standards

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National foreword

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A list of organizations represented on this committee can be obtained on request to its secretary.

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Energy Performance of Buildings - Basic Principles for the set of EPB standards

Performance énergétique des bâtiments - Principes fondamentaux pour la série de normes sur la performance énergétique des bâtiments

Energieeffizienz von Gebäuden - Grundlagen für das EPB-Normenpaket

This Technical Specification (CEN/TS) was approved by CEN on 10 May 2014 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (CEN/TS 16628:2014) has been prepared by Technical Committee CEN/TC 371 "Energy performance of Buildings project group", the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association (Mandate M/480, [2]).

This document supports requirements of EU Directive 2010/31/EC on the energy performance of buildings (EPBD). It forms part of a series of standards aimed at European harmonization of the methodology for the calculation of the energy performance of buildings.

Directive 2010/31/EU recasting the Directive 2002/91/EC on energy performance of buildings (EPBD) [1] promotes the improvement of the energy performance of buildings within the European Union, taking into account all types of energy uses (heating, lighting, cooling, air conditioning, ventilation) and outdoor climatic and local conditions, as well as indoor climate requirements and cost effectiveness (Article 1).

The Directive requires Member States to adopt measures and tools to achieve the prudent and rational use of energy resources. In order to achieve those goals, the EPBD requires increasing energy efficiency and the enhanced use of renewable energies in both new and existing buildings. One tool for this is the application by Member States of minimum requirements on the energy performance of new buildings and for existing buildings that are subject to major renovation, as well as for minimum performance requirements for the building envelope if energy-relevant parts are replaced or retrofitted. Other tools are energy certification of buildings, inspection of boilers and air-conditioning systems.

NOTE The use of European Standards increases the accessibility, transparency and objectivity of the energy performance assessment in the Member States facilitating the comparison of best practices and supporting the internal market for construction products. The use of EPB-standards for calculating energy performance, as well as for energy performance certification and the inspection of heating systems and boilers, ventilation and air-conditioning systems will reduce costs compared to developing different standards at national level.

The first mandate to CEN to develop a set of standards to support the EPBD (M/343) resulted in the successful publication of several EPBD related CEN standards in 2007-2008. The second mandate to CEN (M/480, [2]) was issued to review the Mandate M/343 as the recast of the EPBD raises the need to revisit the standards and reformulate and add standards so that they become on the one hand unambiguous and compatible, and on the other hand a clear and explicit overview of the choices, boundary conditions and input data that need to be defined at national or regional level. Such national or regional choices remain necessary, due to differences in climate, culture and building tradition, policy and legal frameworks. Consequently, the current set of EPBD related standards had to be improved and expanded on the basis of the recast of the EPBD. EPB-standards should be flexible enough to allow for necessary national and regional differentiation and facilitate Member States implementation and the setting of requirements by the Member States.

The set of EBP-standards should consist of a comprehensive package of Technical Specifications and European Standards that are manageable and user-friendly for regulators, product Technical Specification drafters, drafters of European Assessment Documents (EAD), producers, notified bodies and users.

The setup of a coherent set EPB-standards under Mandate M/480 was split into two phases:

— the development of (and agreement on) the underlying basic principles and detailed technical rules for drafting EPB-standards providing a coherent modular structure and an overarching EPB-standard following these rules and principles;

— on the basis of the results of phase 1: the preparation/revision of the complete set of EPB- standards.

The basic principles and technical rules were developed to ensure the necessary overall consistency in terminology, approach, input/output relations and formats in all EPB-standards. In these rules and specifications, requirements from competent national legal authorities of EU and EFTA Member States (aggregated by the CAP-EDMC liaison committee) were taken into account.

It is anticipated that during phase 2 additions or modifications of the overarching EPB-standard and/or basic principles and technical rules might be needed.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This Technical Specification has been developed to guide the revisions under M/480 phase 2 as well as all future work on EPB-standards. In order to facilitate coordination, consistency and coherence of EPB-standards the following tools are available:

a) a Technical Specification on the basic principles to be followed in drafting EPB-standards (this document);

b) a Technical Specification on the detailed technical rules to be followed in drafting EPB-standards;

c) in addition, the following TC/371 documents are available:

   1) a template for the EPB-standards, including reminders of applicable rules in the relevant clauses;

   2) a template for the EPBD Technical Reports that will accompany each EPBD standard;

   3) a spread sheet template to be used to demonstrate the correctness of the standardized calculation procedures.

All work on (intended) EPB-standards will follow the basic principles and the detailed technical rules and relate to the overarching EPB-standard, FprEN 15603.

1 Scope

This Technical Specification describes the basic principles to be followed in the development of standards intended to support the assessment of the energy performance of buildings using a holistic approach. The main goal is to obtain a set of EPB-standards that are a systematic, clear and comprehensive package for the benefit of professionals and government entities.

This Technical Specification gives general, qualitative guidance on the required quality, accuracy, usability and consistency of EPB-standards in order to provide a balance between:

— the accuracy and level of detail, and

— the simplicity and availability of input data.

Hidden complexities are also taken into account, such as the impact of differences in the overall legal frameworks on the national choices and national input data.

The basic principles are the basis for detailed technical rules and for a common overarching structure for the set of EPB-standards.

The basic principles for EPB-standards cover the following aspects:

— the standardization process, including collaborations and consultations;

— the application range of the standards;

— common general organization of each standard and the national implementation;

— the overarching structure for the energy performance assessment;

— common model(s) and editorial rules for each standard;

— common quality aspects for each standard.

2 Normative references

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

FprEN 15603:2014, *Energy Performance of Buildings – Overarching standard EPBD*

CEN/TS 16629, *Energy Performance of Buildings – Detailed technical rules for the set of EPB-standards*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in FprEN 15603:2014 and the following apply.

3.1
EPB-standard
standard being part of a set of standards providing a coherent methodology for assessing the energy performance of buildings using a holistic approach

Note 1 to entry: EPB-standards are developed and/or revised in accordance with and have to comply with the basic principles and detailed technical rules developed by CEN/TC 371 under Mandate M/480 following the Energy Performance of Buildings Directive (2010/31/EU, EPBD recast). The term EPB-standard may apply to either EN standards or to EN ISO standards.

Note 2 to entry: EPB-standards are drafted on the basis of relevant existing International, European and National standards and the work of the CEN-CENELEC Product TCs. They have to take into account EU Directives (other than the EPBD), such as the Construction Products Directive (89/106/EEC), the revised Labelling Directive 2010/30/EU, the Energy related Products Directive 2009/125/EC, the Energy End Use Efficiency and Energy Services Directive (2006/32/EC), the INSPIRE Directive (2007/2/EC) and Mandate M324 and the Boiler Efficiency Directive (92/42/EC).

4 Symbols, units and subscripts

For the purposes of this document, all symbols, units and subscripts provided in the overarching EPB-standard FprEN 15603:2014 apply.

NOTE No specific symbols are used in this Technical Specification.

5 General

EPB-standards shall be drafted according to the basic principles (the “Why”) given in this document and the actual detailed technical rules (the “How”) which are given in CEN/TS 16629.

NOTE Where relevant, this Technical Specification indicates whether the principle of the item considered is dealt with in the overarching EPB-standard (FprEN 15603), in CEN/TS 16629, and/or might need to be elaborated within National Annexes by the competent national standardization body.

It is important to position the set of standards in the whole of the assessment process. This requires an outline of the assessment processes in practice: the objective of the assessment, the crucial steps and an illustration of how the standards support these activities.

The characteristics of data acquisition also have to be addressed since this is crucial for the accuracy, sensitivity, reproducibility, practical feasibility and cost of the assessment. This is further dealt with in Clause 11. Special attention is needed for difficulties in assessing existing buildings. This relates to the availability, accessibility and quality of data, unclear partitioning, intended change in use of the building, etc.

To deal with such issues in a 'measurable' way, a set of common example cases is expected to be very useful. This is further introduced in Clause 11.

6 Central coordination during the development of EPB-standards

6.1 Set up and maintenance of EPB-standards

This CEN Technical Specification deals with aspects of the standardization process that are specific for EPB-standards. The assessment of the overall energy performance of a building is based on the holistic approach: integration and aggregation of all elements and energy services, as illustrated by the pyramid shown in Figure 1.

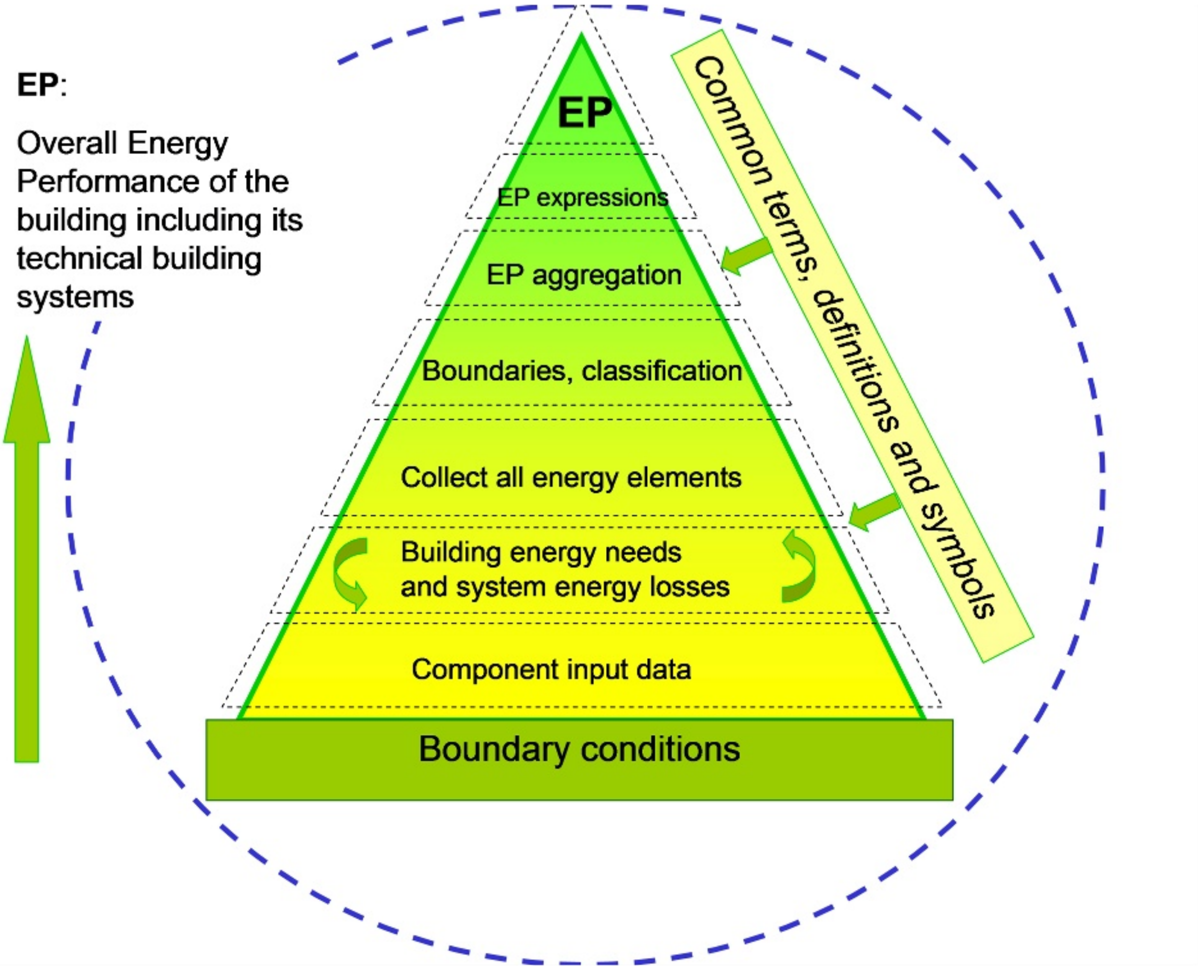


Figure 1 – Pyramid, illustrating the holistic approach of the set of EPB-standards

All EPB-standards are developed in a coordinated manner and (for the assessment of the energy performance of buildings) none of these standards is to be used stand-alone: any practical calculation or application requires that a number of these standards are used in combination.

All EPB-standards (either revised, existing or new) share common technical rules, a common format and a common structure to be part of an integrated standardization and assessment package.

To guard the coherency of EPB-standards, central coordination by CEN/TC 371 is required combined with active involvement and commitment of the five parallel CEN/TCs who have the technical expertise and competence regarding specific technological fields under the holistic approach (TC 89, TC 156, TC 169, TC 228 and TC 247).

The modular structure for EPB-standards, the overarching EPB-standard (FprEN 15603), as well as the basic principles and detailed technical rules for the development of other EPB-standards, is developed by CEN/TC 371.

Parallel CEN and/or ISO TCs are responsible for the (technical) content of these EPB-standards. Consequently the revision/drafting of standards considered relevant within the modular structure of EPB-standards shall be supervised by the competent CEN and/or ISO TCs.

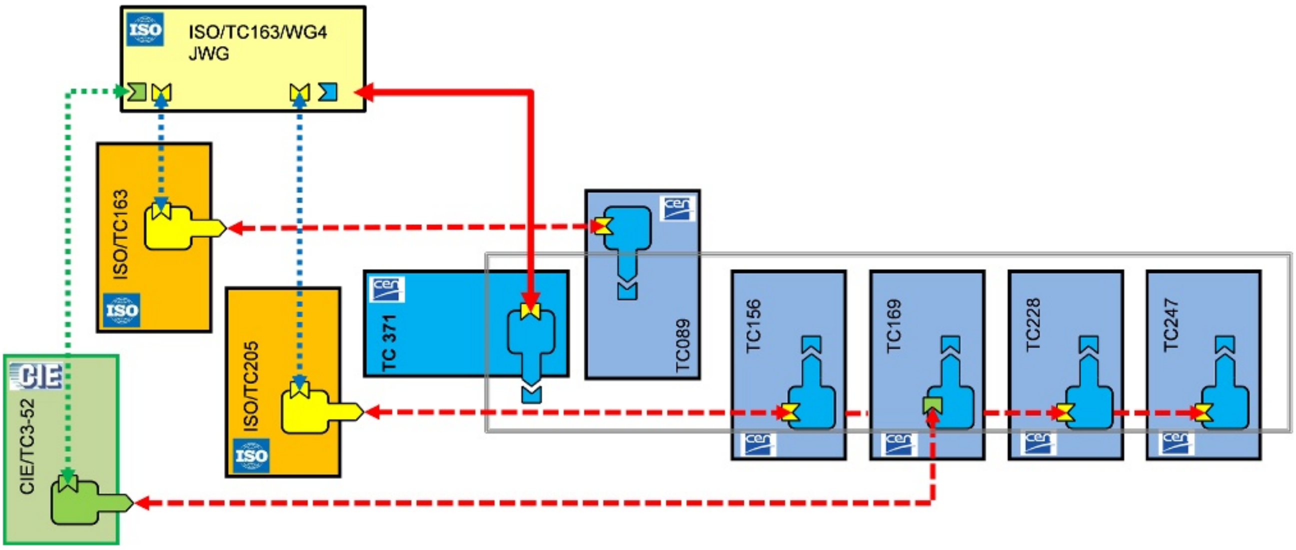


Figure 2 – Cooperation between CEN and ISO TCs dealing with EPB-standards

NOTE 1 The role of CIE in relation to ISO/TC 163 may require an update.

CEN/TC 371 is the overall responsible coordinating committee for checking whether EPB-standards comply with the guidelines for EPB-standards.

Both CEN/TC 371 and the parallel TCs competent with respect to the technical content of standards share responsibility on coherence of standards within the set of EPB-standards. They shall ensure that the same or similar standardization procedures (as adopted during the development) are agreed upon after completion of the set, to be in force for review and/or future updating of the standards.

In order to ensure that work on (possible) EBP-standards complies with EPB requirements set by CEN/TC 371 and the technical requirements set by the competent TCs, team leaders of groups of experts revising or drafting EPB-standards are preferably appointed as formal liaison experts by the associated “parallel” TC to CEN/TC 371. Their task is to ensure that the contribution from the competent TC complies with the EPB requirements and to report on any differences and considerations and by encompassing the respective decisions to the competent TC and CEN/TC 371.

Where relevant, for the revision and/or set up of EN ISO standards relevant to the modular structure of EPB-standards, co-operation will be sought with the competent ISO/TCs.

NOTE 2 The ISO/TC 163/WG 4, Joint Working Group TC 163 and TC 205, since 2009 co-ordinating the work on the energy performance of buildings under the responsibility of the two ISO parent TC's, adopted in its draft strategy document (2010) the major recommendations for improvement of the set of EPB- standards. The members of this coordinating group are also aware of the current discussions in the EU on the requirements for a second generation and in this context, they have confirmed that it is important to take these requirements into account very seriously, because common EN ISO standards are the goal.

Specific practical modes of operation also seem appropriate for the co-operation between CEN and ISO on these standards, based on the Vienna Agreement ([10]) between CEN and ISO on co-operation in the development of standards.

According to the Vienna Agreement, the revision of EN ISO standards is under ISO lead. If agreed by the CEN and ISO technical bodies, and specifically by the non-European members of the ISO technical body, the lead can however be assigned to CEN. Whenever feasible, combined EN ISO EPB-standards should be published.

The preparation of a set of international standards on the energy performance of buildings at the ISO level is assigned to ISO /TC 163/WG 4, Joint Working Group of ISO TC 163 and TC 205 on energy performance of buildings using a holistic approach. This co-operation aims to avoid serious duplication of work, to avoid incompatibilities in (input) product data, procedures and (output) energy performance data.

If the CEN and ISO relevant technical bodies were to decide not to work under the Vienna Agreement, it is expected that the International EPB-standards would soon strongly diverge from the corresponding European EPB-standards. The importance and benefits of common International standards would then be lost, and the high quality standardization work taking place in Europe, due to the strong support by European policy decisions, would not be available outside Europe. Having different European and International standards would harm both CEN and ISO members as well as the users of the standards. Therefore, the utmost will have to be done to solve problems and difficulties that might be at hand in order to continue the parallel work.

Practical solutions for taking into account divergences between ISO and CEN (if unavoidable) within one combined EN ISO standard, are specified as part of the detailed technical rules (see CEN/TS 16629:2014, 6.2.3 for further details).

NOTE 3 If all options to solve problems in developing a EN ISO standard have failed, developing separate standards is possible. The Vienna Agreement on the co-operation between CEN and ISO ([10]) leaves the possibility open to go separate ways at any moment, for each individual work item, if necessary.

6.2 Dynamic interaction with national authorities

CEN/TS 16628 (Basic Principles), CEN/TS 16629 (Detailed Technical Rules) and EN 15603 (the overarching standard) are made available as draft versions to a Liaison Committee for consultation (evaluation and feedback) from the Member States perspective. For them, these documents are of great importance since they function as a starting point to provide guidance to the developers regarding usability of all individual standards and the set as a whole.

This is a dynamic and iterative process. The Member States' expectations have to be translated into basic principles and (from there) into detailed technical rules and overarching energy performance assessment procedures. Already this process will lead to compromises and choices.

It is expected that during phase 2, adjustments of the overarching standard and basic principles and technical rules might be necessary as well. This may again affect the Member States' expectations. Therefore, a regular information exchange is necessary.

6.3 National implementation of the EPB-standards

The modular structure provided by the overarching EPB-standard maximises the possibilities for step-by-step based implementation on a national level considering requirements set by competent legislator bodies at regional level, by using either of the following:

— The provided structure within national standards: To adopt first the overall modular structure, followed by a step-by-step implementation of individual modules or individual standards. A clear identification of inputs and outputs as well of boundary conditions will facilitate temporary inclusion of national modules in the general EN structure.

— A national structure combined with the implementation of specific EPB-standards: To adopt specific individual EPB-standards together with (temporary) national rules how to connect these to the current national standards or codes.

NOTE In case present national or regional legal requirements on the energy performance of buildings are not compatible with the EN standards, it could be justified to allow time to adapt the legal requirements.

7 The application range of the EPB-standards

7.1 General

The application range of EPB-standards is related to the applications as required by the EPBD (see 7.2) and related to the variety in types of buildings, energy services and/or technologies (see 7.3).

7.2 Requirements for EPB-standards

EPB-standards shall be designed to cover:

— Energy performance assessment for new buildings or building units. The subject is the new building or building design as a whole. The purpose is to ensure a certain minimum energy performance (EP-) level and take also alternative systems (such as thermal solar systems, combined heat and power systems (CHP), photo voltaic systems (PV)) into consideration. Compliance with the requirements is obligatory and, subject to national regulations, may be most likely required to get a permit to construct or use the building. The assessment is typically performed by professionals participating in the design process. The enforcement is typically performed by governmental entities or by independent experts or institutions on behalf of these authorities. The requirements have direct design and economic consequences for the building.

— Energy performance assessment for existing buildings or building units. The subject is the existing building in case of major renovation; requirements are set for the building as a whole, or building elements that form a part of the envelope. Furthermore, technical building systems (e.g. heating, hot water, air conditioning, ventilation and lighting systems) are subject to EP-requirements when newly built, replaced or upgraded. The purpose is to ensure a certain minimum EP- level. Compliance with the requirements is obligatory and might be necessary to get a permit to renovate the building or to use the renovated building. The assessment is typically performed by professionals participating in the renovation process or specially trained assessors. The enforcement might be actively executed by governmental entities or passively based on a reporting mechanism. The requirements have direct design and economic consequences for the building.

— Energy certification of new and existing buildings or building units. The subject is the building or building unit as a whole when sold or rented out. The purpose is to inform the market about the energy performance of the building or building unit and recommend feasible and beneficial measures to improve that energy performance. Compliance with the obligation for EP- rating when the building or building unit is sold or rented out. The assessment is typically performed by specially trained assessors. The enforcement might be actively executed by governmental entities or passively based on a reporting mechanism; Member States shall set-up an independent control system. The requirements have no direct design and economic consequences for the building (possibly: indirect economic consequences).

— System inspection of existing buildings. The subjects are the accessible parts of heating systems (over 20 kW) as a whole and air conditioning systems (over 12 kW). The purpose is to assess current performance (regarding energy) and provide recommendations for cost effective improvements by informing the building owner/tenant by means of an inspection report. Inspection shall be executed with a certain frequency to be decided upon by the Member States. The inspection is typically performed by specially trained inspectors. The enforcement might be actively executed by governmental entities or passively based on a reporting mechanism.

Nations respecting the EPBD shall set up an independent inspection system. The EPBD offers two options regarding inspection systems:

a) Lay down measures to establish a regular inspection (EPBD art. 14.1, 2 and 3; EPBD art 15.1, 2 and 3);

b) Alternative option: to take measures to ensure the provision of advice to users with an equivalent impact to the first option (EPBD art. 14 point 4; EPBD art. 15 point 4).

These requirements have no direct design and economic consequences for the building.

NOTE 1 Indirect economic consequences are possible.

Where possible, the same assessment procedures shall be used for different EPB-requirements. If the procedures need to be different, a maximum of similarity and consistency shall be maintained.

A new building becomes an existing building as soon as it has been completed. It would be quite confusing for the market if the calculated energy performance of the new building changes significantly as soon as it has become an existing building.

On the other hand, the method for new buildings is primarily set up for judging compliance with the legally required energy performance indicator. The method for existing buildings is primarily set up for the informative certificate.

It is therefore possible that in case of checking compliance with the minimum energy performance requirements (national or regional), default input values are more conservative than the default input values for the certificate (see 11.3).

More generally, coherence is required for the energy performance assessment, system sizing, energy certification and inspection stages.

EXAMPLE Any new building will be designed (sized), checked against energy performance legal requirements and finally provided with an energy certificate. As an existing building, it will undergo inspection and energy certification.

It is obviously beneficial that many aspects such as the description of the building and calculation method are consistent in all the phases of the process.

In existing buildings, special attention is needed for the availability, accessibility and quality of data, unclear partitioning, intended change in use of the building, etc. This is further dealt with in Clause 11.

NOTE 2 The requirements given above comply with the requirements following the EPBD-recast. An overview of the EPBD requirements covered by the set of EPB-standards is shown in Figure 3.

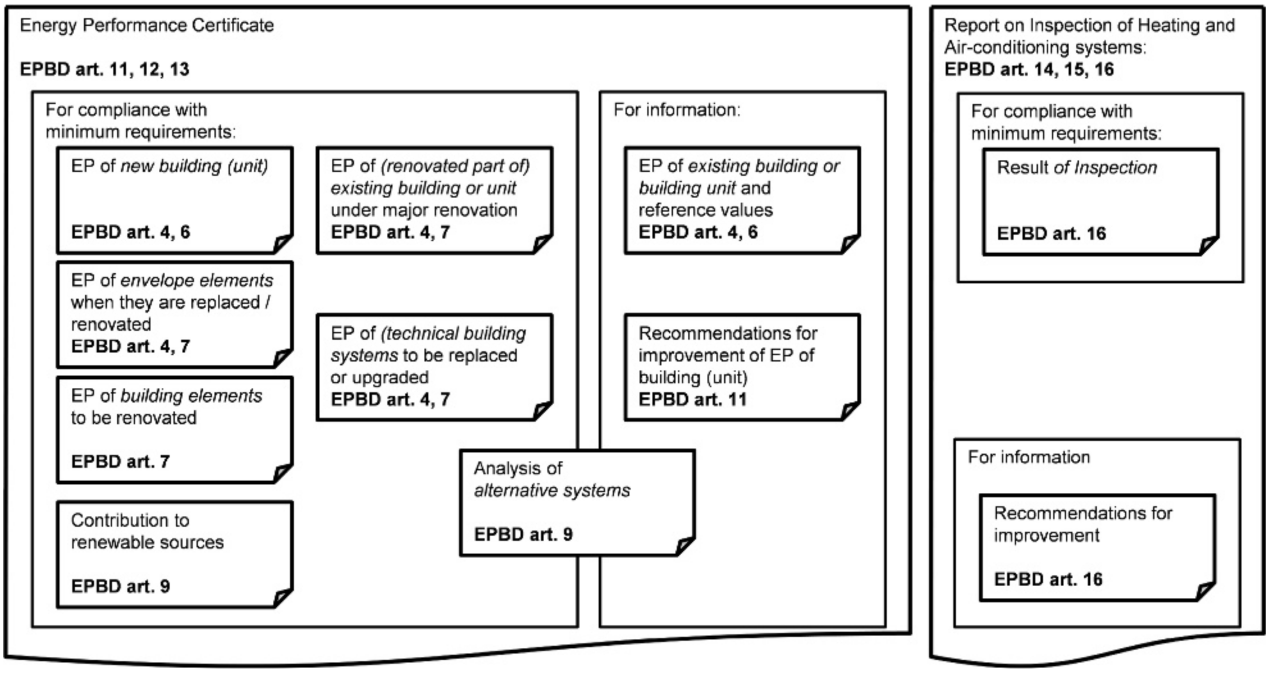


Figure 3 – Overview of EPB-requirements relating to the EPBD to be supported by EN-EPB-standards

7.3 Support on energy performance requirements

EN-EPBD standards are meant to support regulation needs. EPB-standards shall include definitions of numerical indicators that may be referenced as legal requirements (i.e. efficiencies, U-values, …) and the procedure to calculate them to support energy performance compliance check (regulation needs).

The set of standards shall specify boundary conditions and options for the practical application of the defined indicators including possible options. The accompanying Technical Reports shall include information on the rationale for the options.

The EPB-standards shall not contain explicit or implicit energy performance requirements.

The setting of requirements is the sole responsibility of EU and EFTA Member States.

Some provisions within the standards could have an impact on this assignation: absence of methods or tabulated values to appreciate certain common technologies are a form of implicit energy performance requirements and so are implicit preconditions (e.g. a precondition within the calculation method that the heating system has to be balanced).

Where the use of certain techniques or products is prohibited at European level, these techniques may be ignored.

7.4 Energy services

EPB-standards shall cover the energy services indicated in the EPBD Directive:

— heating;

— ventilation;

— cooling;

— domestic hot water;

— lighting.

NOTE EPBD article 2, definition 4: ‘energy performance of a building’ means the calculated or measured amount of energy needed to meet the energy demand associated with a typical use of the building, which includes, *inter alia*, energy used for heating, cooling, ventilation, hot water and lighting”.

The list of services may be refined for the purpose of a consistent and transparent overall modular structure; for instance by explicitly adding (de-)humidification.

Due to improvement in energy performance of buildings, other services that are recognized as essential for the use of buildings may become in the near future significant and therefore included in primary energy requirements. For example, people internal transport systems (lifts, elevators).

Therefore, rules shall be provided for reporting and on the impact on the energy performance if in specific EU Member States or regions, other services are included in the energy performance.

7.5 Building categories

NOTE 1 The list of building categories given below complies with the list given in EPBD Annex I – Clause 5.

The following building categories shall be included:

— Residential:

  - single-family houses of different types;
  - apartment blocks;
- Non-residential:
  - offices;
  - educational buildings;
  - hospitals;
  - hotels and restaurants;
  - sports facilities;
  - wholesale and retail trade services buildings;
  - other types of energy-consuming buildings.

Many buildings contain spaces consisting of different categories.

NOTE 2 For instance: an office building may contain restaurant spaces, education spaces, sport facilities.

If the energy performance has to be assessed on the building or part of the building with more than one building category, the calculation procedures shall take into account possible differences in the assumed use and operation schedules depending on the building category. In addition, harmonized rules are needed to attribute the energy performance to the individual categories, to enable to check compliance with minimum requirements and comparison against benchmarks.

Rules shall be provided for reporting and on the impact on the energy performance if in specific countries or regions other building categories are included in the energy performance.

7.6 Different levels of complexities

EPB-standards shall be applicable and appropriate for the whole range of buildings from existing buildings with high energy use, to nearly zero energy buildings.

EPB-standards shall be suited to deal with both buildings with simple architectural design and/or technical building systems, as well as buildings with complex architectural design and/or technical building systems.

Following the EPBD recast, in Europe, the requirements for new buildings have to meet the level of “Nearly Zero Energy Buildings” from 2020 for all new buildings and already from 2018 for buildings occupied and owned by public authorities.

7.7 Flexibility

7.7.1 General

EPB-standards shall include provisions to facilitate:

- the inclusion and promotion of innovative solutions;
- the inclusion of future needs;
- usability and the inclusion of added values and added societal benefits.

7.7.2 Innovation and equivalent solutions

7.7.2.1 Assessment

EPB-standards for the assessment of energy performance shall as much as possible make it technically possible to apply the principle of equivalence, in particular for innovative technologies that are not yet covered by the standard procedures via the following options:

— Building and system elements should preferably be characterized in a way that equivalent procedures can be used for (innovative) elements that cannot be characterized by the standard procedures.

— The accompanying Technical Reports shall contain the rationale and the assumed conditions of the assessment procedures, to be taken into account in case of application of the principle of equivalence.

NOTE 1 EU Member States may have national or regional legal provisions for the “principle of equivalence” including conditions and limitations for their application and procedures to save-guard the quality.

The modular structure shall provide as many connection points as feasible for custom modules to cover innovative technologies.

NOTE 2 The preparation of a European Assessment Document (EAD) could be another option, requiring substantive effort.

7.7.2.2 Inspection

EPB-standards on inspection procedures should allow inclusion of innovation and equivalent solutions via the following options:

— the inspection approach should provide guidance on how to deal with systems and system components that are not described in the given standard (e.g. old traditional systems, advanced systems);

— standards should point out how equivalent solutions can be integrated in the inspection and outline a procedure (national) how the quality can be assessed and justified.

NOTE As result of the dynamic process, more items may be added in the next version.

7.7.3 Flexibility and adaptability to future needs

EPB-standards should allow for adaptation for future needs, such as.

— tightening the EP-requirements;

— include complementing aspects in the calculation (e.g. comfort, CO_2, health, ventilation);

— addition of additional indicators (e.g. comfort indicators);

— incorporate new solutions (e.g. proven innovative solutions).

NOTE See FprEN 15603 and CEN/TS 16629 for further details. As result of the dynamic process, more items may be added in the next version.

7.8 Added values to the market

7.8.1 General

EPB-standards should facilitate broadening their usability to enhance their added value, considering:

— Towards assessment:

- Designers: connect to the stages in the design process and the related level of detail;
- Industry: connect to the way products are characterized and performance is expressed;
- Building users: insight in the breakdown of the energy use of and improvement options;
- Building/facility managers: insight in the breakdown of the energy use and usability for maintenance and improvement plans.

Apart from the simple purpose to prove compliance with the requirements, the assessment can also provide additional benefits for actors in the market. Such benefits can be:

  - not just to check compliance with the EP-requirement level but also to express higher performance levels in an adequate way;
  - compare the Energy Performance of buildings of different size, to judge their quality independent of the size;
  - compare the expected energy use under typical user conditions of different buildings;
  - compare the Energy Performance of a building that can be used for different purposes (education, offices, retail);
  - get insight in the fraction of renewable energy to cover the overall energy use of the building.

This added value for the market might contribute to the societal acceptance of the methodology.

- Towards inspection:
  - Industry: connection to the way products are qualified;
  - Building users: insight in the energy performance and improvement options;
  - Building/facility managers: usability for maintenance and improvement plans.

  Apart from the main purpose to provide and report an inspection of a system, it could also be important to provide other benefits to the building owner, the society or the market.

7.8.2 Procedures for tailored rating

The calculation procedures should be written in such a way to facilitate application for tailored rating. A tailored rating is the rating where the standard use and standard environment and operating conditions are replaced to come closer to the actual situation. The purpose of the calculation shall always be clearly declared.

Specific calculation elements may also be replaced by methods better tailored to the situation.

Although the aim is to facilitate tailored rating by the set of EPB standards, if the standards are used for tailored rating, the results are not valid for formal building energy performance assessment and rating, unless explicitly allowed to be so by the competent national legal authorities for specific applications and under specific conditions, laid down in appropriate national annexes.

NOTE When a standard procedure is adapted (tailored) for such purpose, the procedure is no longer in line with the standard procedure which includes (national or regional) standard use and standard environment and operating conditions.

7.8.3 Procedures for building and system design

NOTE This paragraph may be updated in the next version.

8 National implementation and adaptation

8.1 National or regional choices: National Annexes

The national or regional context (climate, culture and building tradition, building typologies, policy and legal frameworks, as explained in more detail here below) will necessitate specific choices at different levels, depending on the application.

Rules and formats shall be developed for the separation of harmonized procedures and choices and input at national or regional level in a common frame.

Regional differences in climate, building tradition and user behaviour will have an impact on the calculation procedures, the input data and consequently on the energy performance. These differences will also lead to different accents in the balance between accuracy and simplicity.

In addition to that, national policy considerations play a role, for instance with respect to:

— Costs for building inspections (EP certificate): this is typically a function of building type and function (use) and also depends on (combined) other initiatives leading to shared costs or shared benefits.

— Weighting factors to convert the use of gas, oil, electricity and other energy carriers to calculated primary energy use and/or CO_2 emission.

— Level of minimum EP requirements: the more strict the national minimum EP requirements, the higher the need for reproducibility (small band width) and unambiguity in the calculation results; this may depend on the function (use) of the building.

EPB-standards shall provide room for such national or regional differences.

The overarching modular structure shall enable the differentiations that are necessary to account for such national or regional differences. The overall common modular structure shall ensure that, despite these choices, the calculation of the overall energy performance will always be possible and transparent and produce sensible results that can be used to unambiguously determine energy performance indicators and requirements.

The common format shall contain common rules:

— to enable clear recognition of these options, and

— to facilitate international comparison of chosen option and input data.

The instrument used for the common format is a National Annex to each standard.

NOTE The following description of a National Annex (from the Eurocode system) might also appropriate for the EPB-standards:

A National Annex” is a generic term for national choices etc. published in

— an annex in the national standard transposing the European Standard;

— a separate annex published by the NSB;

— regulations, published by the competent national authority.

The rationale of different options given in the standards shall be presented, providing a balance between accuracy and level of detail, on one hand, and simplicity and availability of input data, as function of the application (e.g. a simple old building versus a new and complex innovative building), on the other (see also Clause 11). Hidden complexities shall also be taken into account, such as the impact of differences in the overall legal frameworks on the national choices and national input data.

8.2 National implementation

EPB standards require (where needed) uniform and easily accessible National Annexes, containing the national or regional choices from options provided, and/or boundary conditions and input data.

NOTE Uniform and easily accessible National Annexes enable the provision of an overview of differences between the options chosen in different regions as illustrated in Figure 4.

Informative national application documents might be a practical way to accommodate the need for a national all-in-one document (see Figure 5). Such documents shall consist of a consolidated version of the adopted EPB-standards including the National Annexes, re-edited so as to provide only the default options provided by the EN(-ISO) standard that has been chosen (as listed in the national annexes), combined with the national input data (as listed in the National Annexes as well). Such national application documents will serve as informal guides for practical application, while the set of EPB standards plus National Annexes remain the formal documents.

It has to be checked if this is consistent with 11.2.6.2 of Part 2 of the Internal Regulations which states that "Options in an EN are options for the user of the standard, but are not options from which the CEN/CENELEC national member may make a selection in the national standard implementing that EN". If the intended choice at national level (via a National Annex) is incompatible with the PNE, would the CEN BT need to approve a derogation from this rule?

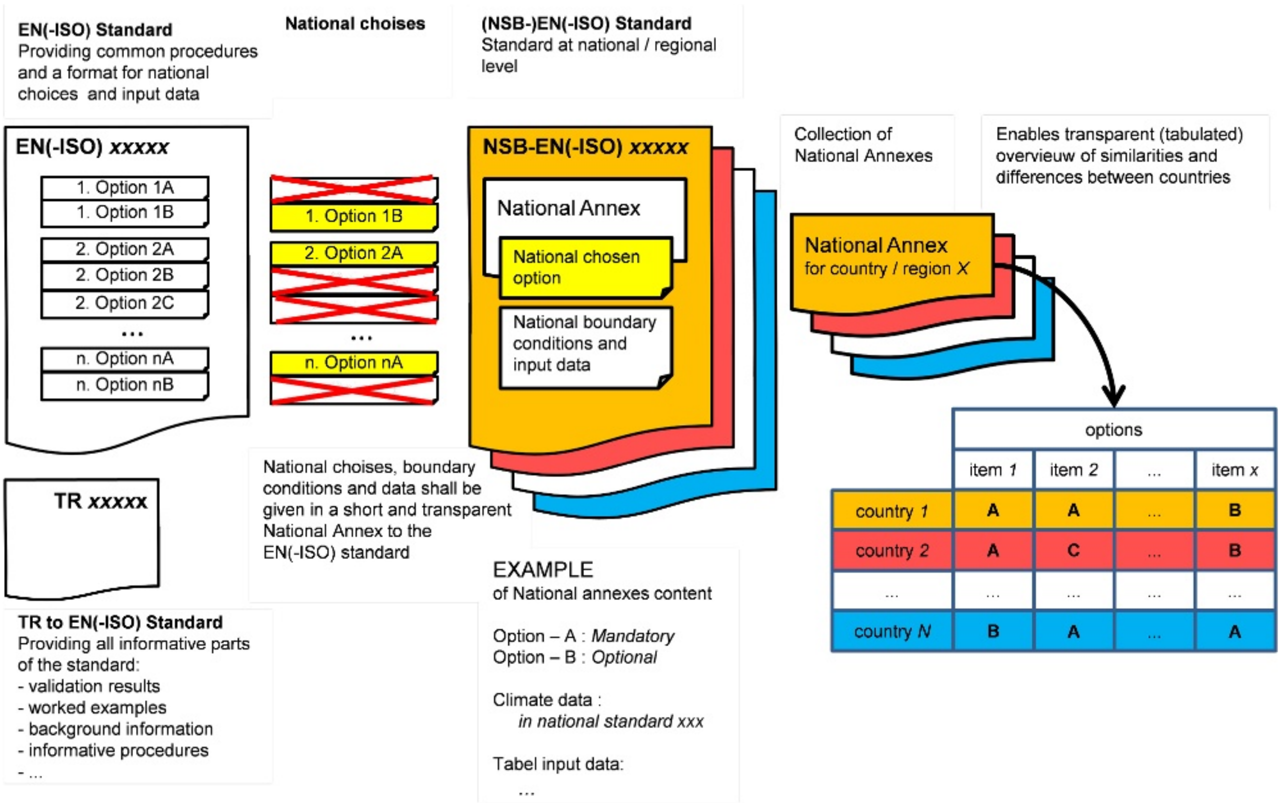


Figure 4 – Common structure of National Annexes enabling comparison of different approaches

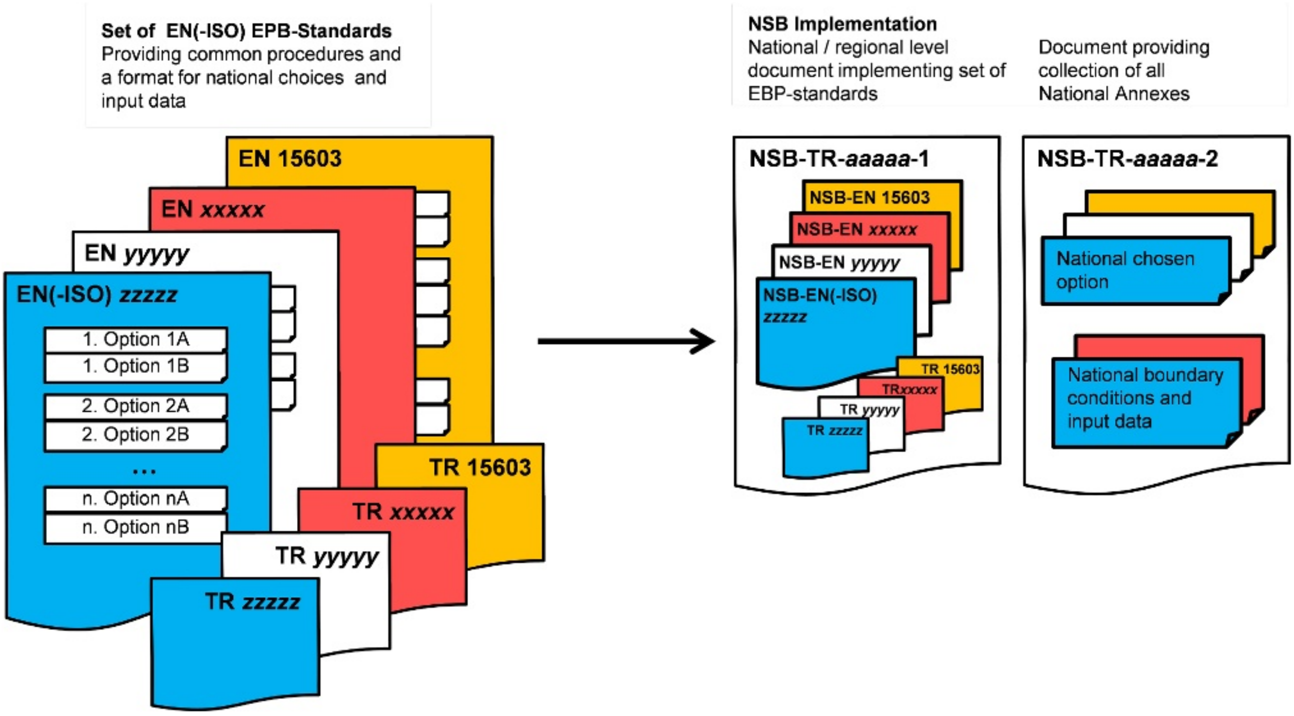


Figure 5 – Implementing EPB-standard in a national application document

9 The overarching modular structure for the energy performance assessment

9.1 General

The overarching modular structure for the energy performance assessment shall comprise:

— common terms, definitions and symbols;

— common overarching structure, including transfer of input/output between modules;.

— common assessment boundaries;

— common partitioning rules;

— list of relevant technologies to be covered by the set of EPB standards;

— matching time steps;

— common rules on the quality of input values and assumptions;

— common operating assumptions;

— common overarching output.

NOTE Most of these elements are given in FprEN 15603.

9.2 Common terms, definitions and symbols

The overarching modular structure provides a set of common terms, definitions and symbols for terms and variables to be used in all EPB-standards, to ensure maximum consistency, simplicity and transparency in the whole EPB-set. These common terms, definitions and symbols apply to all EPB-standards.

NOTE Common terms, definitions and symbols are given in FprEN 15603.

In translated versions and in national application documents, symbols and subscripts shall be kept the same as in the English version of the standard.

EPB-standards shall provide transition / transposition rules for definitions, symbols and subscripts that may be consistent in the context of supporting non-EPB standards, but are not in line with those provided by FprEN 15603.

EXAMPLE In a lower level standard producing output in non-common terms for EPB-standards a tabulated transposition of non-common terms to EPB common terms will be provided.

9.3 Common overarching modular structure

To facilitate the coherence within the set of EPB-standards, an overarching modular structure shall be developed. The modular structure enables checking the interaction of an individual EPB-standard with related EPB-standards (using an accompanying software tool).

Using the modular structure, each individual EPB-standard shall be given a coherent modular number identifying its position within the modular structure.

When using subscripts to symbols used in EPB-standards, the order of the subscripts shall (where possible) be in line with the modular structure.

NOTE Details on the use of the modular numbering system are provided in CEN/TS 16629. FprEN 15603:2014, Clause 6 defines for each main module (Overarching, Building, Heating, Ventilation, ….) only one sub-level (General, Needs, …, Storage, …, Generation, …, Inspection, …).

If considered essential for positioning EPB-standards within a specific sub-module, a second sub level may be agreed upon in coordination with CEN/TC 371. Such second level sub-modules have to be defined in the EPB-standard(s) covering the general aspects of the main module concerned.

The overarching modular structure allows for different levels of complexity, ensuring that, despite the complex and detailed structure that is unavoidable for certain types of buildings or applications, the overall structure is easily comprehended.

The interactions between the various energy elements, mutually and with the operating assumptions and environment conditions, shall be specified in an unambiguous way. This implies that the structure shall include equations governing the exchange of data (input – output) between the modules, including interactions.

9.4 Common assessment boundaries

Consistent assessment boundaries are needed. The assessment boundary definition shall include:

— definition of energy balance limits;

— definition of conversion factors.

The assessment boundary definition shall enable national or regional legislator bodies to make their choices in a transparent and traceable manner.

9.5 Common partitioning rules

Common rules for partitioning the building into zones for the assessment (calculation or inspection) shall be given, taking into account differences in building use, differences in technical building systems and where applicable) differences in building response. The partitioning can be different for (for instance) different energy services. Therefore, rules shall also be made for the transfer of data from and to zones (splitting and merging).

These rules shall take into account that, for a balance between accuracy and simplicity, the number of zones shall be kept as low as possible (see 11.3).

This is closely linked to the overarching modular structure and shall therefore be described in the overarching standard.

9.6 List of technologies to be covered

At the overarching level (in CEN/TR 15615, Technical Report accompanying FprEN 15603), a list is set up of technologies that are relevant from the holistic EPB perspective and consequently need to be covered by the set of EPB-standards. For each technology, the place or places in the modular structure shall be identified.

Techniques can relate both to technical building systems and the building structure like the envelope elements and any possible (dynamic) interaction.

9.7 Matching time steps

The use of different time steps in specific elements of the overall calculation is possible, but shall be justified. In this case, rules shall be set-out for the adaptation of any data to be transferred between calculation parts with different time step.

In line with the modular structure (FprEN 15603), the coherence of calculation time steps (or time intervals) between modules shall be ensured when drafting of the individual standards to modules.

NOTE 1 See also CEN/TS 16629:2014, 10.1.8

The choice of the basic time step for the overall calculation procedures shall be based on a balance between the required accuracy and transparency of the calculation, the required application range, and the required effort by the user to acquire the necessary input data.

NOTE 2 Because of the statistical nature of “standard use” and “standard environment and operating assumptions” a smaller time interval is not necessarily more accurate, but could make the description of dynamic interactions in highly varying indoor and/or outdoor conditions more direct and transparent.

9.8 Common rules on input values and assumptions

Each building (including system) element property value (i.e. *U*-value, efficiency, …) may be available in different qualities:

— nominal, rated or tested value;

— probable average value in operation;

— minimum guaranteed value;

— ….

The same applies to default values that can be proposed in the absence of actual data. They can be average, good practice, worst case, legal minimum etc.

In the evaluation of specific techniques (products or elements), there might be several depreciation factors:

— Prior to operation:

  — bad construction (e.g. thermal insulation, ventilation equipment, ..) or installation (e.g. system tuning);

  — …

— During operation:

  — ageing;

  — bad maintenance;

  — improper use;

  — modifications;

  — …

In order to have a level playing field for comparing different techniques, all EPB-standards shall follow the same principle: which data quality is required as input and whether and to what extent these depreciation factors are to be taken into account in the standard assumptions in the procedures and input data. This is because certain techniques will be favoured compared to others in cases of significant difference.

These principles have to take into account the following considerations:

The drawbacks of an optimistic assumption are:

— Good practice cannot be rewarded and bad practice cannot be penalised. This hinders the promotion of techniques or processes that are more robust against bad practice and it hinders innovation.

— The calculated energy performance will not match real energy performance.

The drawback of a too pessimistic assumption is:

— There is no bottom in how bad maintenance or improper use can be (e.g.: you should not assume that all windows will be widely opened by the occupants during mid-winter).

NOTE 1 Additional principles may be worked out in the next version of this Technical Specification.

Points of attention:

— What is “always conservative” in case of two opposing effects (e.g. heating and cooling)?

— Not “always conservative” in case of existing buildings with no specific information (= > default = representative value)?

NOTE 2 As a result of the dynamic process, this paragraph may be updated in the next version, in particular: which consequences.

EXAMPLE 1 The level of care adopted in the construction of the building and its technical systems as well as in the tuning of the technical systems (e.g. hydraulic balancing) may have a significant effect on the energy performance. If the national choice is to assume that the standardized use in the calculation procedures is 'good practice', then –obviously– little can be gained in the calculated energy performance by proving good practice, while 'bad practice' cannot be penalised. On the other hand, assuming that 'bad practice' is the standard and allowing the user to prove otherwise, requires unambiguous rules on how to prove the better practice, in order to maintain reproducibility, robustness and verifiability. Depending on the technology, such rules may not be so easy to develop.

Closely related to this issue: the assessed energy performance should, where possible, be based on how it is realized, rather than on how it is designed. If direct information indicating such a gap cannot be easily obtained, a certain gap might be estimated as function of measures taken to decrease the risk of such a gap.

NOTE 3 E.g. application of quality ensuring schemes or commissioning.

EXAMPLE 2 In case of real versus design control data the difference between design and actual could for instance be shown via a difference in assumed operating conditions, such as a higher number of occupancy hours than assumed for design.

9.9 Common operating assumptions and environment conditions

Because many operating assumptions affect more than one module or cluster of modules in the assessment, common variables that define the operating assumptions shall be specified at overarching level.

EXAMPLE The number of occupants in a building or building part, user patterns, operation schedules, (interacting) controls, etc.

This is also the case for indoor comfort conditions, such as indoor air quality, thermal environment, lighting and acoustics (where applicable).

Furthermore, assumptions with regard to environment conditions, such as outdoor weather data and the (assumed or real) characteristics of the building surroundings (e.g. terrain, buildings, city or countryside, ...) shall be consistent between different (clusters of) modules.

NOTE The values are prescribed at national or regional level.

9.10 Common overarching output

To promote a clear overall insight in the results, also for cases where the calculation itself may have become quite complex, common reporting procedures (output) shall be developed:

— which key (calculation) results to be reported;

— at which different levels in the modular structure;

— how aggregated in space (building zones);

— how aggregated in time (time periods/ time steps);

— how aggregated according to services (heating, cooling, …);

— how aggregated by energy sector;

— …

10 Common model(s) and editorial rules for each standard

10.1 General

This clause covers:

— separation of normative and informative contents;

— common structure of each standard (priority for calculation procedures);

— common structure of each accompanying Technical Report;

— common editorial rules;

— software proof requirements;

— modular proof requirements.

10.2 Normative standards and informative accompanying Technical Reports

The correct understanding and application of EPB-standards requires extensive informative clarification such as:

- reason for the choices made in selecting methods;
- intended use of the different methods;
- correct evaluation of data input;
- information to those responsible for national implementation.

If the informative content is mixed with the normative content, the standards may become confused and heavy to read. Therefore, clear separation between normative and informative content is recommended whenever possible.

Only normative content shall be kept in the standard. Informative content should be moved to an accompanying Technical Report, with the exception of short Notes and Examples. This will significantly reduce the length of the standards and strengthen their focus, thus facilitating the adoption (including translation) in national/regional regulations.

Rules and formats shall be developed for an informative Technical Report, accompanying each standard, according to a common structure, comprising at least the results of internal validation tests (such as spread sheet calculations for testing and demonstrating the procedures), examples and background information.

10.3 Common structure of an EPB-standard

The common structure of EPB-standards, detailed out in CEN/TS 16629, aims to ensure that EPB-standards are transparent, unambiguous and software proof. This common structure applies to all EPB-standards, however it may be adapted if required from the standards purpose. These adaptations will also be provided at central level (CEN/TC 371) based on feedback from the standard writers.

The common structure aims to facilitate checking on mutual consistency and consistency with the overall modular structure. The standards shall be concise and complete, that can be easily referenced in legislation and deal with (from output (top) to input (down)) the following aspects:

- The output produced by the standard will be presented first, followed by procedures and input needed for that procedure. This will facilitate the presentation of different options producing the same output. It will also facilitate the development of procedures for innovative or alternative solutions that produce the same output, but require a different procedure and (therefore possibly) different input.
- Each standard (or group of standards) shall facilitate:
  - a clear and comprehensive specification of the output that is intended to provide the energy performance assessment results, the related data necessary for their proper interpretation and use, and all relevant information documenting the relevant boundary conditions and calculation or measurement steps;
  - a clear and comprehensive specification of the input data, also indicating the source of the data (e.g. another standard or equation or table in the same standard); including units, range of values, time period (hourly value, monthly, …);
- The possibility of a cascading or nested structure:
  - cascading structure: a chain of successive, clearly distinguishable procedures;

— nested structure: a procedure consisting of more than one clearly distinguishable sub-procedure.

- The principle of rounding rules: only rounding of input from sources external to the combined set of procedures: “external” to be specified in the detailed technical rules (e.g.: from tests).

10.4 Common structure of the Technical Report accompanying an EPB-standard

The common structure of Technical Reports applies to all Technical Reports accompanying EPB-standards, however it may be adapted if required from the standards purpose. As far as can be foreseen, these adaptations will also be provided at central level.

The common structure involves detailed rules to assist that the associated standard is transparent, unambiguous, software proof and internally and externally consistent. It shall also contain rules on reporting on the application range (see Clause 7) and on the common quality aspects (see Clause 11).

10.5 Common technical and editorial rules for each standard

CEN/CENELEC Internal Regulations [9] give the common technical and editorial drafting rules for standards. In addition are complementary to the CEN internal, ensuring that the standards are unambiguous and software proof. These rules shall also comprise details on the hierarchy between simplified and detailed procedures, taking into account the following considerations. In general, default values or simplified procedures shall always lead to more conservative results.

NOTE 1 See of CEN/TS 16629:2014, 10.4, for additional editorial rules for EPB-standards.

NOTE 2 For International standards, Part 2 of ISO/IEC Directives applies.

10.6 Software proof

The calculation rules in each of the standards shall be “software proof” in order to ensure the required unambiguity of the procedures. Details are worked out in the CEN/TS 16629.

NOTE Detailed technical rules for ensuring software proofness are given in CEN/TS 16629:2014, 11.3

10.7 Modular proof Detailed Technical Rules

EPB-standards have to fit in the modular structure. This implies that it has to be guaranteed that procedures from the individual modules can be combined with:

- coherent inputs / outputs (no missing data);
- a coherent time calculation time step.

Rules and verification procedure of the package are to be specified to guarantee for each module in the calculation and considered time step, the right connecting modules exist and can be identified.

Examples shall be provided to resolve any residual ambiguities.

11 Common quality aspects

11.1 General

Common quality aspects comprise among others:

- validation and demonstration;
- relevance, sensitivity and balanced accuracy;

— transparency.

11.2 Validation and demonstration

The applicability of EPB- standards shall be proven and demonstrated by representative worked examples.

For calculation procedures this means validation by a calculation method such as a spread sheet program, applied on a variety of representative test cases.

The program used for the validation shall be made available to national standards writers.

These shall be reported in the accompanying Technical Report.

NOTE See CEN/TS 16629:2014, 11.1.

11.3 Relevance, sensitivity and balanced accuracy

11.3.1 Introduction

As part of the development of each standard, studies shall be performed (and reported in the accompanying Technical Report) to verify the relevance of the developed procedure:

— Is the level of accuracy consistent with the overall accuracy?

— Is the required input justified by the impact on the energy performance (cost-effective)?

In this context, it shall be taken into account that the procedures shall apply to a variety of possible typologies and conditions. This may imply that, e.g. a specific input is not relevant in a conventional case, but highly relevant in a special case (special low cost, high architectonic value, innovative, etc.).

In the end, the input data of the developed procedures are crucial. Input data should be:

— unambiguous (when selecting and when judging),

— distinctive (in energy performance),

— measurable,

— verifiable, and

— maintainable (to guarantee performance over many years).

The following subclauses provide some general considerations with respect to accuracy and reproducibility.

Subclause 11.5 introduces the use of a set of common example cases to deal with issues such as listed above in a more or less 'measurable' way.

11.3.2 Accuracy

11.3.2.1 Definition of accuracy

Accuracy is defined in the following way:

For assessment: Accuracy means the deviation between the assessment result and reality assuming the same internal and external conditions, building use and operation.

NOTE 1 A high accuracy may be desirable (e.g. in the case of a nearly zero energy building (NZEB)) but a high accuracy can have a strong impact on the costs of calculation, on the set of input data needed and on the needed knowledge and skills of the experts involved. See also 11.3.2.2.

In case of requirements set on the level of envelope elements or technical building systems, the accuracy is related to that specific part of the assessment that corresponds to the element or the system.

In case of the national building approach, this question relates to the assessment of equivalent solutions.

For inspection: Accuracy is defined as the deviation between the inspection result and reality.

NOTE 2 A high accuracy may be desirable but a high accuracy can have a strong impact on the costs of the inspection, on the set of input data needed and on the needed knowledge and skills of the expert involved.

EXAMPLE 1 2 % deviation is, e.g. for a boiler with an actual efficiency of 89 % a calculated efficiency between 87 % and 91 %.

EXAMPLE 2 20 % deviation is, e.g. for an AC with an actual COP of 3,40 a calculated COP between 3,20 and 3,60.

11.3.2.2 Accuracy in calculation or in actual energy use

It is important that the EPB-standards address the deviation between the calculated and actual energy use and how to deal with it.

The calculated energy use is typically based on standard user patterns and climate conditions. In general, due to a lack of knowledge about user behaviour, the standard user patterns cannot automatically be taken as representing the average reality.

Moreover, if the focus is too much on obtaining a high accuracy for a specific standard situation, the large variations in practice (e.g. in hourly and weekly user patterns and e.g. fluctuations in actual weather data) are ignored. These variations could make the standard situation less representative than suggested.

For the same reason, also default values used in the calculation method might deviate from practice.

It may be important to address this deviation and present an approach how to deal with it in a rational way in the standards, while keeping the focus on the quality of the building itself.

Finally, a distinction has to be made between higher accuracy in the calculation procedures that:

— leads to more energy efficient solutions;

— only benefits the more cunning person considering EP-calculations.

EXAMPLE If it is, in a certain country or region, common practice to avoid certain types of thermal bridges and the calculation procedures provide conservative default values for those thermal bridges, this will force the calculator to perform detailed thermal bridge calculations (to avoid the conservative default value), but it will not change the (already good) practice and therefore not lead to energy saving.

11.3.3 Reproducibility

Reproducibility is defined in the following way:

For assessment: Reproducibility means the possible deviation of results obtained by different experts using the assessment method on the same building.

NOTE 1 A good reproducibility ensures easy enforcement, but also reduces the freedom of the expert to introduce his own opinion about the different influences in the process. A bad reproducibility may afflict the acceptance of the method.

For inspection: Accuracy is defined as the deviation between the inspection results obtained by different experts using the inspection method on the same building.

NOTE 2 A bad reproducibility may afflict the acceptance of the method.

EXAMPLE 1 2 % deviation is, e.g. for a boiler that one expert estimates an efficiency of 89 % and the next expert estimates an efficiency between 87 % and 91 %.

EXAMPLE 2 20 % deviation is, e.g. for an AC that one expert estimates a COP of 3,40 and the next expert estimates a COP between 3,20 and 3,60.

For sizing:

EXAMPLE 3 20 % deviation is, e.g. that the actual needed size of a boiler is 65 kW and the calculated needed size is between 52 kW and 78 kW.

11.3.4 Simplicity

There are several aspects to be distinguished with regard to simplicity:

— Simplified input data. The procedures shall be written in such a way that input data are easy to understand and easy to assess, e.g. by product databases produced according to product standards (without giving in on unambiguity and the need to be legally secure: no favouring of specific brands or types). For different applications, related to probable availability/unavailability of data, different options may have to be provided.

— Simplification in the methods. The procedures shall be transparent, reproducible and robust (without losing too much on accuracy).

— Simplification by providing guidance on the procedures. The common format shall contain common ways to introduce the procedures, for instance with flow charts showing the position in the overall modular structure and flow charts showing the main elements of the procedures itself.

— Simplification by providing (the basis for) user friendly software tools.

— Simplification by providing insight in the results. The procedures shall produce output in such a way that it gives insight in the process (physics); for instance in which components or systems are the main energy losses and gains; how do these compare to other elements in the modular system; differentiation in time (where relevant: seasons, day/night, during/outside occupation hours).

11.3.5 Accuracy versus cost-effectiveness

It is a challenge in the development of the calculation procedures to find the right balance between the need for simple input on one hand (e.g. not too many input variables) and on the other hand to stimulate better technologies: to give enough distinction in the output between “good” and “better” products or technologies: to reward and thus stimulate the application of the latter.

EXAMPLE 1 A too simple input would be to make only a distinction between single and double glazing; this input would not be enough to stimulate the application of high performance glazing and insulating edges and frames. In another field: a too simple input would be: 'is a heat recovery unit in the ventilation system present or not'; this input would not stimulate better quality of the heat exchanger, effects of a by-pass, an energy-efficient frost protection.

The most detailed input is not the most accurate if more detailed input means more risk to mistakes or to lack of information, which in particular is the case for existing buildings. Consequently, a balance is needed between the number of input data and the required accuracy and required distinction.

EXAMPLE 2 Distinction between thermally insulated and un-insulated pipes or not (e.g. not if hidden behind construction); or distinction between thickness of pipe insulation and pipe lengths; or distinction between appendices properly insulated or not, ...).

On the other hand, a detailed input may still be desired to make the method sufficiently 'distinctive': The method should be able to reward also relatively small cost-effective measures, if these are effective.

In order to take into account measures and or techniques in the EP-assessment process, the competent TC shall consider that unlimited inclusion of measures/techniques in the method may lead to excessive effort in the assessment process (in particular: extra input data) without adding relevant quality to the outcome of the assessment.

A measure may also be a cluster of measures.

EXAMPLE 3 System distribution heat losses: length of pipes and/or thermal insulation of pipes.

EXAMPLE 4 Auxiliary energy of high performance (condensing) gas boilers: energy use by electronics and fan and gas valve from tests instead of default values.

Assessment time includes the collection of data, preparation and the actual calculation.

Inspection time includes the preparation, collection of data in the building, calculations, recommendations and reporting. Transportation is to be excluded from the indication.

In particular in case of inspection of 'old' existing buildings, if or where gathering the full required input would be too labour-intensive for the purpose, related to cost-effectiveness of gathering the input, national default values (or default simplified procedures) have been or may need to be defined.

EXAMPLE 5 For instance: for U-values and thermal bridges for old walls and roofs, efficiency of (old) boilers. On the other hand, the input should be sufficiently distinctive to see the effect of improvements in the energy performance.

Actual data can be derived from inspection, measurements and regular data recorded by e.g. building management systems.

Quality control and enforcement EPB-standards shall facilitate effective quality control and enforcement.

<u>For assessment:</u>

— facilitate quality control and enforcement through drawings, building design, descriptions/construction plans (data on paper);

— facilitate quality control and enforcement of constructed buildings (data from practice);

— facilitate quality control in software certification;

— facilitate quality control regarding input variables (input sources);

— tuning quality control and enforcement mentioned under ‘a’ (on paper) and ‘b’ (in practice);

<u>For inspection:</u>

— facilitate quality control and enforcement of the measured data;

— facilitate quality control and enforcement of the validity of input from documents and drawings);

— facilitate quality control and enforcement of feasibility and quality of the recommendations.

11.4 Transparency aspects

Considering the transparency of the process of EP assessment:

— distinguish between the major parts of the calculation (building envelope, heating, ventilation, cooling);

— distinguish between and clarification of the applicability of the parts of the calculation (e.g. design, minimum requirements, certification, global costs calculation);

— allow for the possibility to partly introduce the results from other sources (e.g. calculated air tightness/ measured air tightness / efficiencies of technical building systems, national default values);

— give clear definitions of variables, system boundaries and connections between the various standards and parts thereof;

— give a common set of symbols, indices and vocabulary (same wording for the same things);

— when appropriate, elaborate the approach for determining default values (background and main conditions for which the default values have been chosen), explained in standards or Technical Reports.

Considering the transparency of requirements focusing on building envelope elements, provide:

— a clear calculation model with an unambiguous standardized approach concerning aspects like inhomogeneous composition of building elements, material properties to take into account;

— a clear description how to incorporate whole elements or parts thereof that are represented through measured characteristics;

— clear definitions of variables, system boundaries and connections between the various standards and parts thereof;

— a common set of symbols, indices and vocabulary (same wording for the same things);

— when appropriate elaborate the approach for determining default values (background and main conditions for which the default values have been chosen), explained in standards or Technical Reports.

Considering the transparency of inspection of systems (e.g. heating and AC systems), make clear choices with respect to:

— a clear and unambiguous standardized approach for inspection concerning the measurements / assessment of the technical building system and its components;

— the assessment of the system efficiency which should be independent of the building itself, although this is physically a simplification (independency avoids that improving the insulation level as such will change the system efficiency);

— contrary to the option above, the EP-efficiency should be dependent on the characteristics of the building (there is an interaction between building and system that should be reflected in the calculation);

— a clear description on how to incorporate system components or subsystems that are represented through product characteristics provided by industry;

— clear definitions of the systems and their components and how they relate to the various standards (e.g. calculation methods).

11.5 Common example cases

The aim is to analyse and evaluate the usability of the standards, which will make the quality of the standards explicit and provide the right mindset during the development.

The main aspects related to usability are:

— effort/cost;

— reproducibility;

— accuracy;

— consistency/transparency;

— sensitivity (to distinct better technologies).

The example cases will help the standard writers to be aware of what problems occur in practice, what should be dealt with in the standards and what the effect is for the overall accuracy, reproducibility and effort/cost.

At the same time, the necessity of including complexity or detail in the CEN standards can be explained to the national authorities more easily by illustrating the effect using the example cases.

Since it is not likely that the ultimate example cases can be fully defined in advance, it is expected that these might evolve during the development process (building system option might be added, occupant behaviour could be varied, et cetera). This is not a problem as long as the adjustment of the cases is clearly discussed, explained and communicated.

These example cases will serve two different purposes:

a) For the developers of the standards, regarding the quality and usability, the examples will serve as:

   1) a practical starting point;

   2) a basis for evaluation of the performance of individual standards and the set of standards as a whole.

b) The examples will make the standards less abstract and facilitate the discussion and communication with the national authorities, by illustrating:

   1) the way the CEN standards work out in practice (for instance regarding accuracy and reproducibility);

   2) the necessity of including complexity or detail in the CEN standards (for instance regarding overall consistency or the distinctivity between technologies).

Ad a) 1):

The example cases provide an opportunity to make the developers of the CEN standards aware of the application field of the individual standards in the context of the set of standards as a whole. It lines up the development from the beginning, with a focus on usability.

Moreover, the role of the standards in the overall assessment process can become more explicit.

Discussion within CEN on the relevance of the content of the various standards from the usability perspective is made easier by referring to the example cases.

Ad a) 2):

The CEN standards will be evaluated during development regarding the quality and usability.

To perform this evaluation in a consistent way and to position the evaluation of the individual standards in the whole system of standards, a set of common example cases is necessary. The evaluation can be performed in a more holistic way, as the standards aim for a holistic approach.

Apart from the evaluation in terms of an overall check, the example cases also provide the opportunity of sensitivity studies on specific aspects with a view on usability. By using, as a basis, the same example cases for this purpose, these specific sensitivity studies are connected to the broader evaluation of the standards.

Ad b) 1):

By using the example cases as described under a) 1) and a) 2) it becomes easier to communicate the quality of the standards to the national authorities.

Ad b) 2):

Certain decisions and compromises made during the development can also be explained more easily by using the example cases as illustration/explanation. The expectation is that the analyses and evaluations performed under a) 2) should provide already sufficient illustrations for the communication with the national authorities with regard to the necessity of including complexity or detail in the CEN standards.

The set up of the examples has to be done at central coordinating level, but in a dynamic way. The starting point will be a set of common example cases for the overarching standard.

The set up of common example cases will be specified in CEN/TS 16629.

Annex A
(normative)

Parallel routes in normative references

CEN members are bound to adopt European Standards at national level. They can only make reference to these even in case where there is a corresponding ISO standard.

A normative annex with a tabulated overview can be added to each standard if relevant, to indicate the cases where different standards exist at CEN and ISO level.

Template for such an annex:

This International Standard contains specific parallel routes in referencing other International Standards, in order to take into account existing national and/or regional regulations and/or legal environments while maintaining global relevance.

The standards that shall be used as called for in the successive clauses are given in Table A.1.

In the case of EN ISO standards, where there is a difference between the ISO and the EN ISO version, the EN ISO version shall be used within the CEN area.

Table A.1 — Normative references

Clause (in this Technical Specification)	Subject	CEN area [a]	Elsewhere

Such an annex may also be needed for this Technical Specification if this TS is further developed as an EN ISO standard under the Vienna Agreement.

For the CEN area, Figure A.1 gives an outline of the calculation procedure and its links with other EPB-standards.

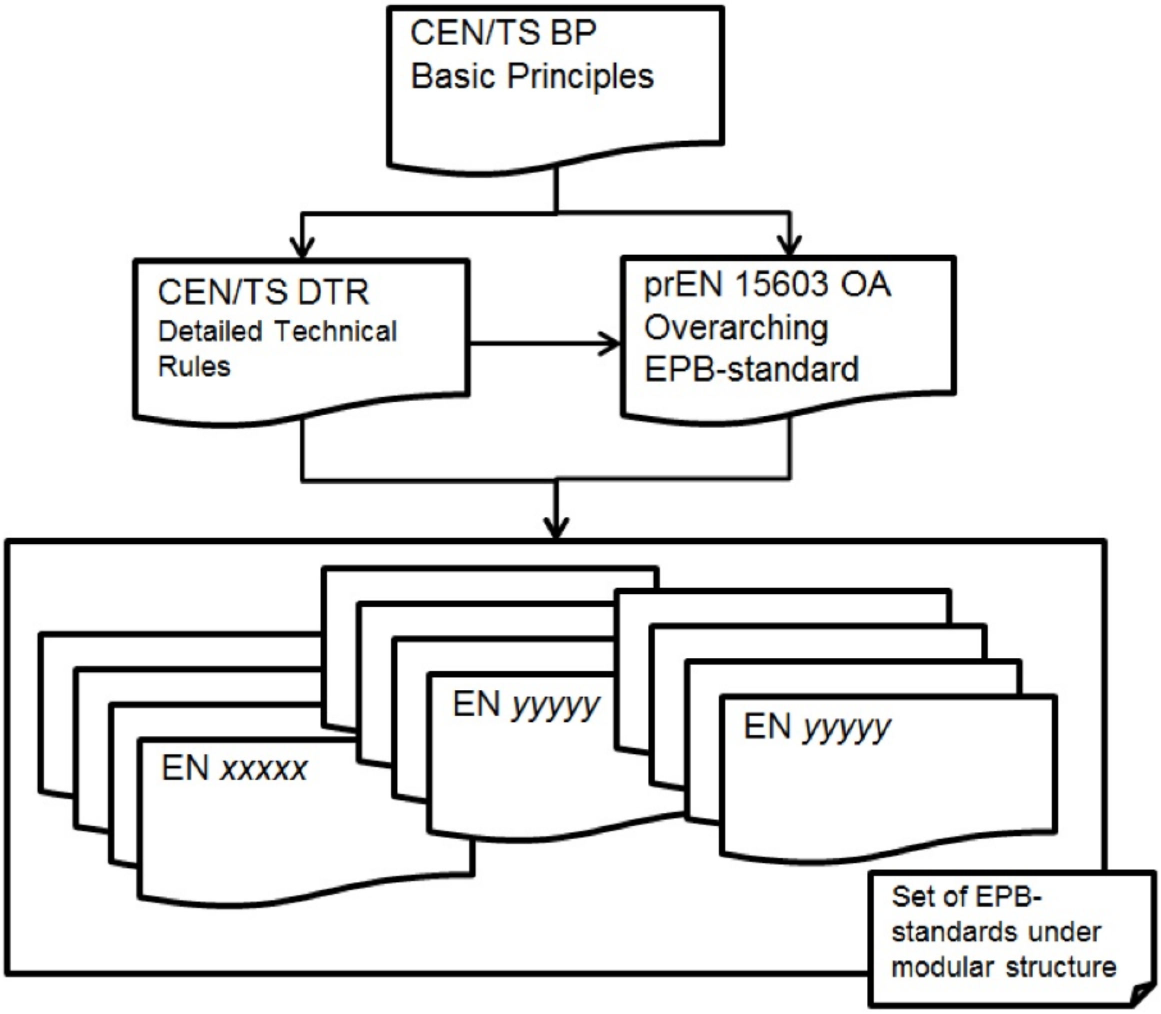


Figure A.1 – Position related to other EPB-standards

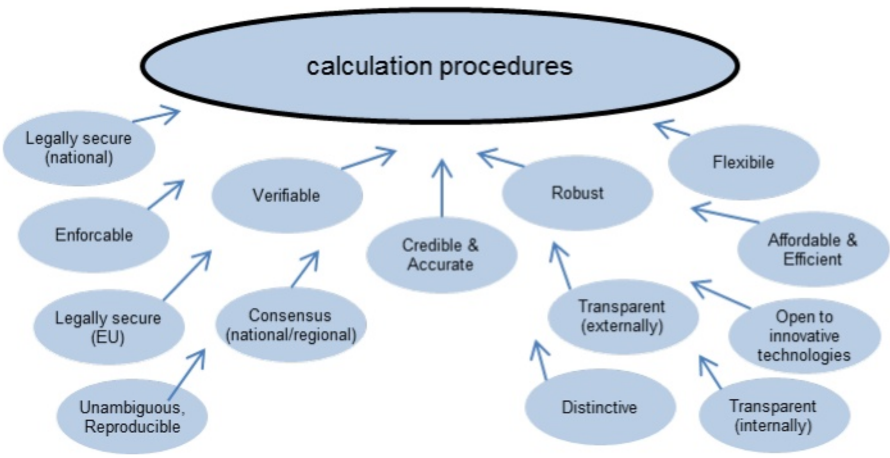
Annex B
(informative)

Overview of relevant quality aspects

Figure B.1 shows a brief overview of the most relevant quality aspects that can be identified for the calculation procedures in the context of the EPBD. Depending on the application and objectives, each aspect is less or more important.

NOTE Figure B.1 originates from Buildings Platform Information Paper P26, "*Energy performance calculation procedures for the EPBD (2). Quality*" for purpose February 6, 2007. Available at www.buildup.eu

Some of the quality aspects go hand in hand: e.g. 'unambiguous', 'transparent' and 'robust'. Other quality aspects may be more or less contradictory, e.g. 'unambiguous' versus 'flexible', 'accurate' and 'distinctive' versus 'affordable'. For those aspects, a balance needs to be found, depending on the application and objective of the calculation.



Key

Legally Secure (EU)	Method is in accordance with European free trade rules. Method is in agreement with EPBD.	Distinctive	A relevant improvement in design or technical provision should have a visible effect on the calculated EP.
Legally secure (national)	Method is in accordance with national/regional regulations (e.g. in scope: excluding effect of household appliances; respect legal principles on rights and duties with respect to adjacent buildings); Method provides a level playing field for different solutions.	Transparent (internal)	The persons responsible for the methodology should be able to keep track of each step in the calculation procedure. This is achieved, if the method is clearly described as a set of equations and parameters, limited in size and complexity, with clear rules when and how these shall be applied. The term transparency may be interpreted as “containing no parameter values with unknown background”. This goes hand in hand with the quality aspect “robust”.
Unambiguous, Reproducible	For a specific case the method leads to the same result; independent of subjective or arbitrary choices, independent of the user. All interested parties agree on the input, applied method and results. This requires that all options be specified in a concrete and unambiguous way, with no open ends.	Transparent (external)	The market parties, the users and the competent national legal authorities should be able to understand the overall result and the results at components level, to understand and accept the effect of choices (input) on the calculation result.
Enforceable	The features (input) that have led to the calculated energy performance should not easily or quickly deteriorate, e.g. by short lifetime (bad quality) or by user interventions (bad maintenance or replaced by worse performing provision or by control adjustments due to comfort complaints).	Robust	Robustness means that the method can handle a wide variety of situations, with perhaps loss of accuracy, but without going out of control. This is achieved by the transparency in combination with ensuring that the set of equations have a physical basis, are basically non-dimensional (thus valid from small home to large building), with parameters that are ‘intrinsically safe’ (e.g. a non-dimensional reduction factor with value between 0 and 1). NOTE Robustness is a term that also applies to the energy saving provisions: the performance of a more robust provision is less dependent on e.g. user and/or control aspects.
Verifiable	All interested parties can check the input and applied method. All input data should be available for verification at appropriate time.	Affordable and Efficient	The method should be affordable for the user: the costs (easy to acquire and learn, easy on the input) should be in balance with the benefits.
Consensus (national/regional)	The method (including any default values on input variables) is accepted by (or enforced upon) all involved parties.	Open to Innovative technologies	The method should not hinder the implementation of (proven) innovative design and technologies.
Credible and Accurate	The method should have sufficient accuracy, in order to produce results that are fair and objective for different solutions and close to the reality (if applicable: for standardised use).	Flexible	The method should be able to cope with non-standard input data.

Figure B.1 – Illustration of various quality aspects for EPBD related calculation procedures

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