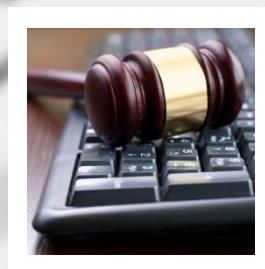
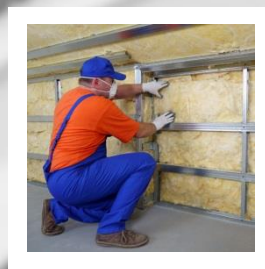
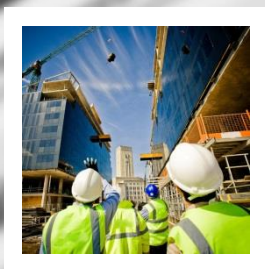


Source book for improved compliance of Energy Performance Certificates (EPCs) of buildings

DRAFT



*Draft report for discussion with stakeholders, 4 March 2016
(A final report, including information from other experiences and feedback from stakeholders,
is planned to be published in February 2017)*

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1. Introduction

Within the context of the EPBD, new buildings as well as the existing building stock must become much more energy efficient. The Energy Performance Certificate (EPC) is a key element in this process and aims to give an indication of the energy performance of a given building determined according to the national legislation. Similar identifiers exist in voluntary schemes.

This source book aims to act as a guidance and support for persons and organisations who want to know if a better enforcement of the EPC is needed. Moreover, if it is indeed needed or relevant, what are the possibilities and points for attention to implement a compliant Energy Performance Certificate framework, based on compliant and easily accessible input data.

In this report, we analyse reasons for EPC-related compliance and non-compliance to answer the following question:

How to make sure that the Energy Performance Certificate of a building is compliant, and consequently that the minimum energy performance requirements are met and/or that the consumer is well informed?

In this regard, the focus of analysis is on input data for calculation, but not on the calculation method as such.

The EPBD imposes demanding energy performance requirements on the one hand, creating a strong need for the elimination of thermal bridges in the building envelope, for airtight construction, and for energy efficient ventilation systems, and the nZEB concept on the other hand, requiring the installation of on-site producing renewable energy systems. Therefore, also in this report focus of analysis will be on the technical areas mentioned above. It is important to address the quality of input data related with these technical areas (transmission characteristics, ventilation and air tightness, sustainable summer comfort technologies, renewables in multi-energy systems) in detail, in order to ensure compliance at the level of energy performance minimum requirements. Compliance is demonstrated by fulfilling defined minimum requirements at different levels, e.g. maximum allowed specific heat transmission losses, maximum U-values of the envelope elements, maximum annual heat demand for space heating and for cooling, maximum primary energy for operation of building systems (HVAC and lighting), with an EPC determined according to the existing rules. Compliance requires also that the declared energy performance is correct according the agreed EPC calculation, i.e. there is a compliance issue even if the legal requirements are met but if the EPC is too optimistic.

In order to achieve good compliance, societal support is important, meaning that stakeholders understand and accept the need for energy efficiency requirements, the need for compliance and the need to check and enforce compliance.

A three-step approach (figure 1) has been identified how to achieve good compliance:

- There should be clear procedures explaining what must be done in order to determine EPC input data
- There should be clear legal procedures about how to decide on non-compliance and related actions
- There should be effective control and sanctioning mechanisms to be applied in case of non-compliance

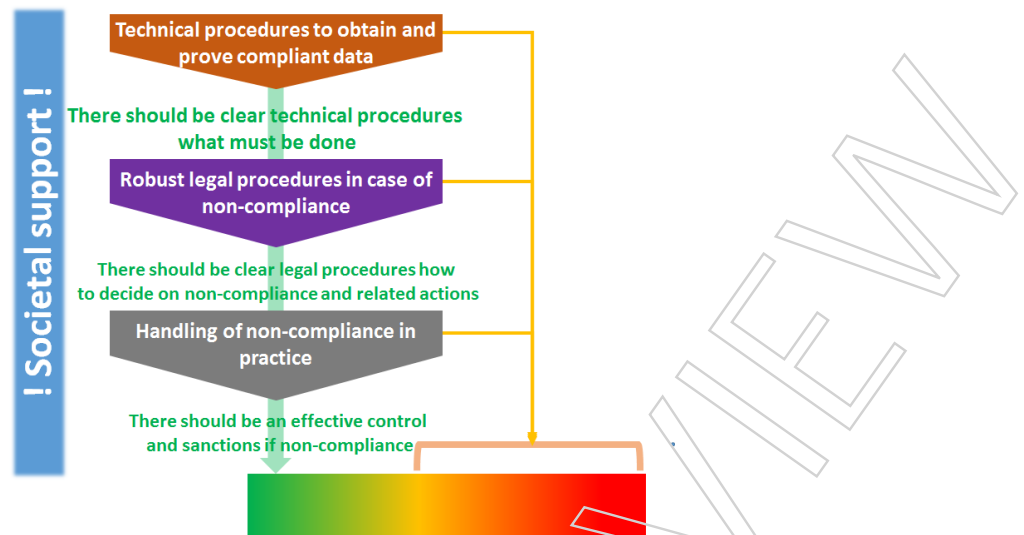


figure 1: Overview of three-step approach

In **chapter 2**, the context and scope of this source book is developed, with specific attention to various EPC aspects and its implementation.

Chapter 3 is focusing on the analysis of the reasons for good/poor EPC related compliance. Hereby, the crucial elements for coming to an effective enforcement are briefly described in 3 steps.

The detailed description of these 3 steps (compliant input data, legal procedures in case of non-compliance, handling of non-compliance) is then discussed in **chapters 4, 5 and 6**.

As innovation is a key element for progress, it is important that control and enforcement frameworks are not a barrier for innovation. This is discussed in **chapter 7**.

For control and enforcement schemes, it often is crucial to have societal support, and this is covered in **chapter 8**.

Control and enforcement schemes introduce always some extra costs, but are there also benefits? This is discussed in **chapter 9**.

In **chapter 10**, the focus is on BIM (Building integrated modelling). To what extent can BIM be a game changer with respect to EPC calculations and the related compliance and enforcement challenges?

Finally, the conclusions are found in **chapter 11**.

2. Overall context

2.1 Field of application of the source book

The primary focus of this source book is to provide suggestions for more effective compliance and enforcement in relation to EPC declarations, i.e. in the context of the EPBD implementation. But the suggestions provided in this source book can to a large extent be applied also on all kind of voluntary schemes related to energy performance of buildings.

2.2 Specifications in the EPBD in relation to compliance and sanctioning

There are 2 articles which are of specific relevance with respect to the topic of compliance and enforcement, i.e. articles 18 and 27.

Article 18 Independent control system

1. Member States shall ensure that independent control systems for energy performance certificates and reports on the inspection of heating and air-conditioning systems are established in accordance with Annex II. Member States may establish separate systems for the control of energy performance certificates and for the control of reports on the inspection of heating and air-conditioning systems.
2. The Member States may delegate the responsibilities for implementing the independent control systems. Where the Member States decide to do so, they shall ensure that the independent control systems are implemented in compliance with Annex II.
3. Member States shall require the energy performance certificates and the inspection reports referred to in paragraph 1 to be made available to the competent authorities or bodies on request.

ANNEX II Independent control systems for energy performance certificates and inspection reports

1. The competent authorities or bodies to which the competent authorities have delegated the responsibility for implementing the independent control system shall make a random selection of at least a statistically significant percentage of all the energy performance certificates issued annually and subject those certificates to verification.

The verification shall be based on the options indicated below or on equivalent measures:

- (a) validity check of the input data of the building used to issue the energy performance certificate and the results stated in the certificate;
- (b) check of the input data and verification of the results of the energy performance certificate, including the recommendations made;
- (c) full check of the input data of the building used to issue the energy performance certificate, full verification of the results stated in the certificate, including the recommendations made, and on-site visit of the building, if possible, to check correspondence between specifications given in the energy performance certificate and the building certified.

2. The competent authorities or bodies to which the competent authorities have delegated the responsibility for implementing the independent control system shall make a random selection of at least a statistically significant percentage of all the inspection reports issued annually and subject those reports to verification.

Article 27 Penalties

Member States shall lay down the rules on penalties applicable to infringements of the national provisions adopted pursuant to this Directive and shall take all measures necessary to ensure that they are implemented. The penalties provided for must be effective, proportionate and dissuasive. Member States shall communicate those provisions to the Commission by 9 January 2013 at the latest and shall notify it without delay of any subsequent amendment affecting them.

2.3 Create appropriate boundary conditions that stimulate compliant EPC declarations

It is crucial that the EPC information is compliant with the applicable EPC regulations. In order to increase the probability of good compliance, there are several areas of action to be considered (figure 2).

- TRAINING and COURSES:
 - o As the cost-optimal and NZEB requirements represent new challenges for the market, it is important to evaluate if there is a need for more and/or improved training/courses (on EPC calculation procedures, formal procedures, design approaches, execution aspects ...). If so, such new offers should be made available and, in parallel, existing training and courses should be upgraded to be in line with the new challenges.
 - o The EPBD has not formal requirements towards the member states with respect to actions in this area. There should be consideration for a revision of EPBD in order to take into account compliance and quality issues.
- VERIFICATION or CERTIFICATION of competence
 - o As function of a risk assessment, one has to evaluate if there is a need for a systematic check if the required competence is effectively available. If so, one has to evaluate which type of checks/verification/certification is the most appropriate
 - o The EPBD has no formal requirements towards the member states with respect to this area
 - o The RES has a formal requirement towards the member states to have a framework for certification of installers active in renewable energy sources
- CHECKING if EPC information is compliant and related enforcement
 - o These activities by the member states are explicitly requested in the EPBD (articles 18 and 27)

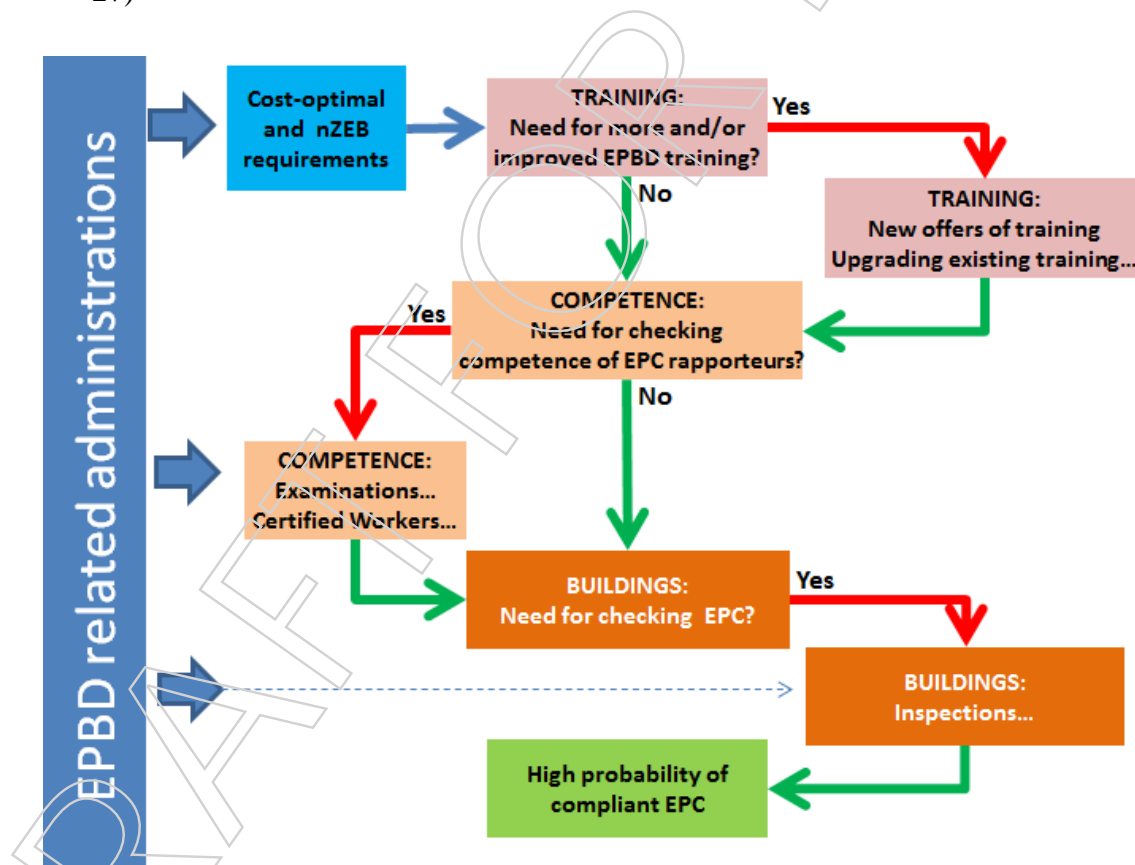


figure 2: Possible areas of action for better EPC compliance

2.4 Enforcement is politically a sensitive issue

In general, enforcement of legislation is in most areas quite challenging. This is also the case for enforcement (and related sanctioning) of building regulations. In domains where non-compliance may have health effects or even be life threatening (e.g. stability, fire), there societal support for a strict enforcement is typically quite

broad. This might be substantially less for areas like energy efficiency. In the past, few countries had effective enforcement frameworks related to energy efficiency requirements for buildings. At present, although the EPBD imposes member states to have an operational framework for penalties, few countries have such framework in operation.

For policy makers, deciding on the implementation of an enforcement framework might often not receive a lot of societal support, on the contrary. However, without societal support, there is no long term future for enforcement and penalties.

The fact that there is a growing international consensus and will to action against climate change (as highlighted by the Paris COP 21 in December 2015) might help to obtain more societal support.

The issue of societal support is further developed in §8.

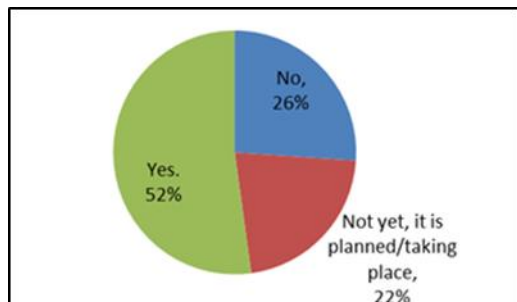
2.5 Present situation in Europe regarding compliance and enforcement

Enforcement is a key aspect to ensure effective compliance with rules and regulations related with energy performance. Articles 4, 6 and 7 of Directive 2010/31/EU about the energy performance requirements for new and renovated buildings are essential elements regarding the subject of compliance checks. The Core Theme *Compliance of Regulations* established in the third phase of the Concerted Action EPBD from 2011-2015 investigated the implementation of compliance and enforcement procedures as required by Article 18 on Independent Control Systems and Article 27 on Penalties.

The respective Core Theme report provides an overview of the present situation in Europe and makes clear that there is much room for improvement to check compliance with the EPBD requirements in most Member States, as well as with issuing sanctions. For example, not all Member States know the compliance rate achieved in their country (Figure 1), and the timing of checking is not always chosen in accordance with the intention of the EPBD: In 2014, twenty-one MSs asked for proof of compliance at a certain point after construction was complete while the other countries check compliance at different phases or even only through random checks (

Figure 2). Although various sanctions are defined, practical application lacks behind. Very few Member States have applied sanctions in issues related with energy performance requirements. There are many reasons for the insufficient implementation such as limited resources for checking and lack of political will to enforce. This source book builds on the information gathered in the Concerted Action EPBD and extends the range of challenges to be addressed for better compliance.

Figure 1: Countries with a view on the compliance rates of new buildings

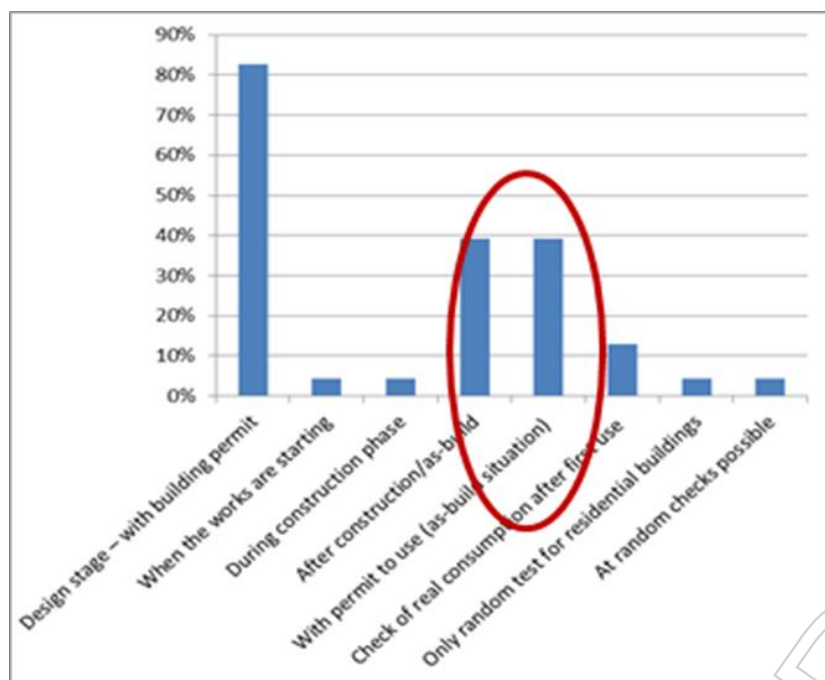


A questionnaire done during the Concerted Action EPBD shows that about half of the countries have an idea about the compliance rate of new buildings with energy performance requirements, while about half of them don't.

For more information see publications by the Concerted Action EPBD Core Theme Compliance and Regulation on: <http://www.epbd-ca.eu/themes/compliance-regulation>.

Source: Presentation by Wina Roelens held on the event on 2nd February 2016 (Revamped BUILD UP and findings from Concerted Action EPBD: <http://www.buildup.eu/en/events/revamped-build-and-findings-concerted-action-epbd>) and Concerted Action EPBD Core Theme report 2015 <http://www.epbd-ca.eu/ca-outcomes/2011-2015>

Figure 2: Timing of compliance checks



The figure shows that most countries check the compliance of energy performance requirements at the design stage as part of the building permit procedure. However, due to the fact that it is normal that design changes occur, another check is necessary after construction or as part of the procedure of issuing the permit to use.

There are still countries only checking at design stage which is insufficient because it does not give a realistic picture of the energy demand. Bearing the intention of the Directive 2010/31/EU in mind, namely to transform the building sector towards energy efficiency, the as-built situation needs to be checked and controlled.

Source: Presentation by Wina Roelens held on the event on 2nd February 2016 (Revamped BUILD UP and findings from Concerted Action EPBD: <http://www.buildup.eu/en/events/revamped-build-and-findings-concerted-action-epbd>) and Concerted Action EPBD Core Theme report 2015 <http://www.epbd-ca.eu/ca-outcomes/2011-2015>

2.6 Enforcement should not be a barrier for innovation

A compliance framework in combination with enforcement and penalties can be a major driver for realising buildings which are in line with the declarations in the EPC. (e.g. the correct U-value of the components, the PV installation as declared, ...).

An effective compliance framework supposes that there is no discussion about the input data to be used. In the case of systems which are not covered by the EPC calculation method, this can be problematic. (e.g. a new concept of heating system which is not meeting the specifications in the EPC calculation method). Unless an alternative assessment procedure is available, there is a real risk that the compliance framework will block innovation as there is a risk for penalties when using such new concepts.

2.7 Terminology

Compliance - Compliant

Compliance is defined as the fact of according with EPC procedures or with specifications of the works. Compliant is the adjective referring to something which is in accordance with EPC procedures or with specifications of the works.

The most typical cases of non-compliance are:

- NO REPORTING:** The reporting requirements of the EPC procedures (e.g., certificate, database transfer, test report, etc.) or specifications of the works (e.g., test report, photo archives, etc.) are not met. This type of non-compliance may occur if, for instance, there is no energy performance certificate for a new building, or there is no test report of a given system (if mandatory in that context).
- WRONG REPORTING:** There are substantial differences between the data reported and the correct data according to the agreed procedure or specifications of the works. This may happen for instance if the energy performance certificate assumes or the installer formally confirms that a given component or system is certified, although the installed component or system is not certified.

- c. **NOT MEETING THE ENERGY PERFORMANCE REQUIREMENTS:** The required energy performance or specifications of the works are not achieved. This may happen for instance if:
- the minimum building energy performance level is not met;
 - a minimum performance requirement for a system or component is not met;
 - a non-certified contractor has performed work which required certification.

Note that these cases may or may not occur simultaneously (see following table).

Type of non-compliance			Example
(a)	(b)	(c)	
X			There is no EP certificate but the building characteristics comply with the technical requirements.
X	X		Simultaneously: no test report of a given system; inappropriate value used in the EPC for this system; the characteristics of the installed system comply with the regulatory requirements.
X	X	X	Simultaneously: no test report of a given system; inappropriate value used in the EPC for this system; the characteristics of the installed system <i>do not</i> comply with the regulatory requirements.
	X		The value used for a characteristic of a given system in the EPC is inappropriate according to the procedures, but the characteristics of the installed system comply with the regulatory requirements.
	X	X	The value used for a characteristic of a given system in the EPC is inappropriate according to the procedures, and the characteristics of the installed system <i>do not</i> comply with the regulatory requirements.
		X	The value used for a characteristic of a given system in the EPC is correct according to the procedures, but the characteristics of the installed system <i>do not</i> comply with the regulatory requirements.
X		X	There is no EP certificate and the building characteristics do not comply with the technical requirements.

Table 1: Categorised examples of non-compliance

Evidence of compliance

Evidence of compliance is any type of confirmation of compliance which can be checked according to the rules.

Input data for Energy Performance Certificates (EPC)

EPC input data are data used to assess the energy performance of a building which results in an Energy Performance Certificate. Such data describe or can be related to the physical characteristics of the building (e.g., floor area, heat transmission of building materials and components), its environment (e.g., climate and orientation), its systems (e.g., efficiency of heating system and/or individual components) and its operation (e.g., occupant schedule).

Agreed procedures for determining EPC input data

Agreed procedures for determining EPC input data are publicly-available documents produced at national or regional level in the EPC regulation explaining how to derive the proper values for the input data. These documents have a legal status. They may refer to standards, professional rules, etc.

Ideally, these procedures should give:

1. Technical procedures explaining how to determine the value of the EPC input data (e.g., calculation of thermal transmittance of walls, calculation of solar shading coefficients¹);
2. Organisational procedures stating requirements in order for the input value to comply with the rules (e.g., control by an independent third-party; product or system certified data; product manufacturer or distributor declaration; competence of the expert in charge of assessing the data; competence of the expert issuing the certificate if he assesses himself the value of the input data¹);
3. Requirements for evidence of compliance, i.e., a set of elements considered as evidence that the EPC input data has been correctly determined (examples of elements: electronic file including all input values uploaded in a national database, test report issued by an accredited laboratory, certificate of certification or qualification of persons or companies, certificate issued by a competent person that the calculation is consistent¹).

Compliant EPC input data

A quantity used as an input data for:

- the calculation or the assessment of the energy performance of a building and/or
- the declaration of its energy performance in the Energy Performance Certificate (EPC)

is "compliant" in EPC context if this data has been established in line with the procedures in force in the context of the applicable legislation. For brevity, this term is sometimes shortened to "compliant input data" or "compliant data".

Easily accessible input data

A quantity used as an input data for:

- the calculation or the assessment of the energy performance of a building; and/or
- the declaration of its energy performance in the Energy Performance Certificate (EPC) is "easily accessible" if it can be found, seen and used by taking "reasonable time, effort or money".

The notion of "reasonable time, effort and money" is to be appreciated in the context of the modern information technologies and media to get the information.

We consider as reference for easy access to data with these modern information technologies and media, information available on an Internet page, preferably with a free access. Input data will be considered more or less accessible depending on the effort needed to obtain this data compared to this reference.

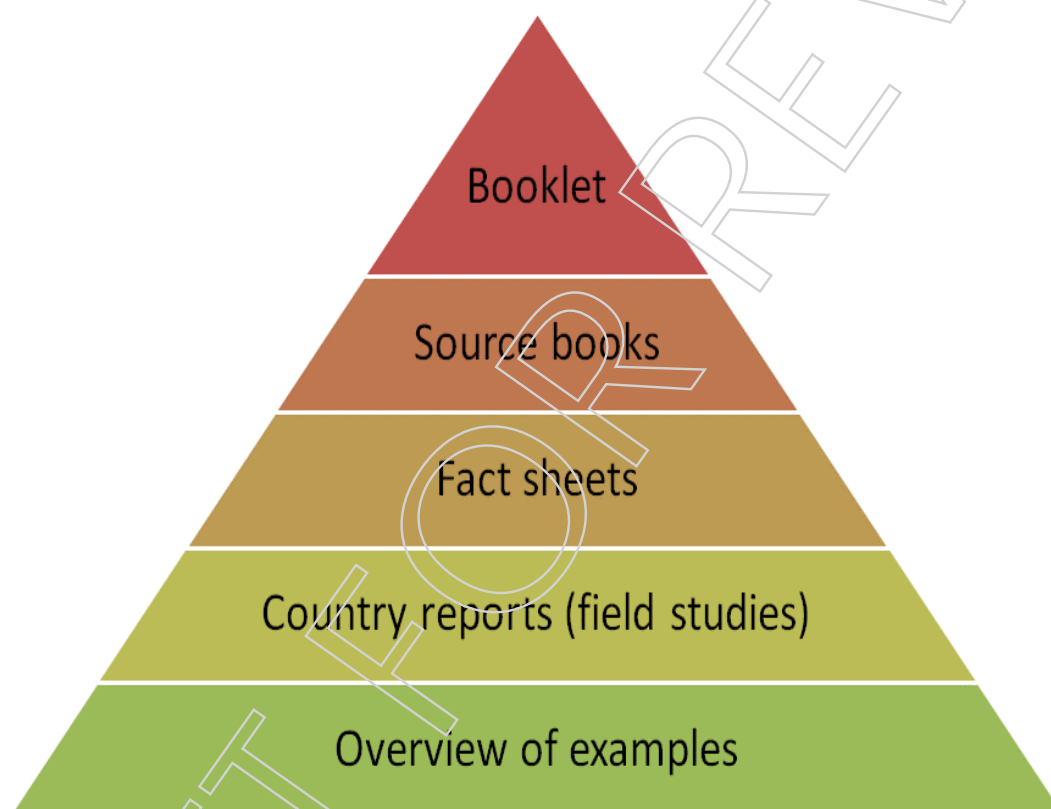
¹ Some of these examples may or may not be relevant depending on the regulatory context.

2.8 This source book and the other QUALICHeCK deliverables

This report builds on the outcomes of QUALICHeCK, namely:

1. The **status on the ground report**, which includes the analysis of 31 specific studies addressing specific concerns on performance data from the field, the compliance of input data, the quality of the works, as well as feed-back from compliance frameworks.
2. The **reports of each of the 10 field studies** conducted within QUALICHeCK in the 9 focus countries of the consortium. These studies aimed at enriching the literature on quality and compliance issues with clear data. Each study investigated a sample of at least 25 buildings.
3. The **report on existing approaches on compliant and accessible input data** that describes 8 interesting approaches.
4. **55 (Xx) factsheets** produced in total within QUALICHeCK, including xx with a specific focus on EPC input data and compliance aspects.

All of these deliverables are available on the QUALICHeCK website. (www.qualicheck-platform.eu)



3. Analysis of reasons for compliance/non-compliance of EPC

3.1 Introduction

EPC-related compliance refers to the following EPBD requirements:

- Energy performance minimum requirements for new buildings and major renovations;
- Presenting and handing over the EPC including recommendations for improvement in case of selling or renting a building or a building unit;
- Publication of the energy performance indicators in the commercial media when advertising a building or a building unit for sale or rent.

In this report, we focus on compliance aspects related with the first bullet point *Energy performance minimum requirements for new buildings and major renovations*.

We analyse reasons for EPC-related compliance and non-compliance to answer the following question: *How to make sure that the Energy Performance Certificate of a building is compliant, and consequently that the minimum energy performance requirements are met and/or that the consumer is well informed?*

The analysis covers new buildings, existing buildings that undergo a major renovation and existing buildings that are sold or rented out. It focuses on input data for calculation of the energy performance, but not on the calculation method as such. It also covers the compliance of the EPC, which is established by using the result of this calculation. The analysis does not cover the direct measurement of the energy use of a recently built or an existing building.

Because of demanding energy performance requirements and to prepare the development of nearly-zero energy buildings, as required by the EPBD, it is important to address the quality of input data related to four technologies, which are essential in this context:

- technologies to eliminate thermal bridges in the building envelope and to get low energy transmission characteristics,
- technologies for airtight construction and good ventilation of the building
- technologies for sustainable summer comfort (solar control, cool roofs, ventilative cooling,...)
- technologies using renewable energy sources in multi-energy systems.

These technical areas will be explored in detail, in order to ensure compliance at the level of energy performance minimum requirements. Compliance is demonstrated by fulfilling defined minimum requirements according to national and European framework at different levels, e.g. maximum allowed specific heat transmission losses, maximum U-values of the envelope elements, maximum annual heat demand for space heating and for cooling, maximum primary energy for operation of building systems (HVAC and lighting).

There are mainly three crucial aspects influencing the level of EPC-compliance achieved in practice:

- Clarity of procedures on what must be done
- Clarity of procedures on how to decide on non-compliance and related actions
- Effectiveness of control and sanctioning mechanisms to be applied in cases of non-compliance

3.2 Overall approach

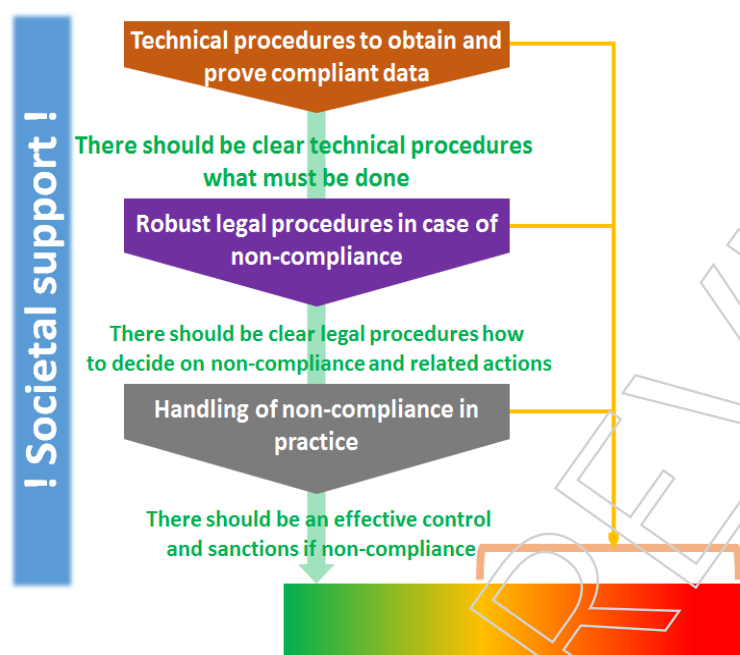
In order to achieve good compliance, societal support is important, meaning that stakeholders understand and accept the need for energy efficiency requirements, the need for compliance and the need to check and enforce compliance.

A three-step approach has been identified how to achieve good compliance:

- There should be clear procedures what must be done in order to determine EPC input data (Part 1)
- There should be clear legal procedures how to decide on non-compliance and related actions (Part 2)
- There should be effective control and sanctioning mechanisms to be applied in cases of non-compliance (Part 3)

The chapters below present the analysis of reasons for good and poor EPC related compliance allocated to each of the three steps.

Figure 3: Overview of three-step approach



3.3 PART 1: Issues related to procedures for determining EPC input data

3.3.1 Different types of EPC input data

The data used to assess the energy performance of a building which results in an Energy Performance Certificate (EPC) may be classified as follows.

- **Data describing the building** (environment, physical characteristics):
 - ✓ location;
 - ✓ climatic conditions at this location (temperature, humidity, wind);
 - ✓ geographical orientation, obstacles to solar radiation;
 - ✓ areas of floors, walls, facades, ceilings, roofs, windows, doors...;
 - ✓ nature and characteristics of the construction products used (quantities, thermal properties);
 - ✓ information about the implementation of these construction products (for e.g. the materials and thicknesses of the various layers of thermal insulation) and the way they are positioned with one another, especially at their interfaces (in order to identify junctions – thermal bridges - where insulation is not continuous and causes heat loss);
 - ✓ airtightness of the building envelope;
 - ✓ ...
- **Data describing the building systems** (heating, cooling, ventilation, domestic hot water production, lighting...):
 - ✓ types of energy sources used;
 - ✓ energy efficiencies;
 - ✓ power or capacity;
 - ✓ energy input, energy output;
 - ✓ flow rates;
 - ✓ operating temperatures;
 - ✓ type of controls;
 - ✓ ...
- **Data describing the building operation:**

- ✓ occupants schedule;
- ✓ ...

This classification can be refined by distinguishing data that are independent from the building (construction product data, system data) from data linked to the building and its execution (and if needed its occupancy).

- Data **independent from the building**:
 - ✓ Construction product data (only linked to the products, independently from the building in which they will be placed)
 - ✓ System data (only linked to the systems, independently from the building in which they will be installed)
- Data **linked to the building**:
 - ✓ Building basic data (location, climate, orientation, surfaces...), assessed from architectural plans and/or basic measurements on site
 - ✓ Execution related data:
 - Data for installed systems (ventilation airflows, ductwork airtightness...)
 - Data for the whole building (building airtightness...)
 - ✓ Occupancy related data (number of occupants, internal gains, room temperature set value...)

EPC input data may also be classified according the way they are made available:

- Data **made available** by a manufacturer:
 - ✓ This applies to construction products and to systems
 - ✓ Data describe the characteristics of the product/system. They are made available by the manufacturer or by an importer, a distributor or an authorized representative
 - ✓ This also applies to innovative products and systems, for which a calculation method does not always exist; in this case, the announced values may be used to build up a dedicated calculation method
 - ✓ Examples: heat transfer coefficient of an insulation material, energy efficiency of a boiler...
- Data **published** into a database:
 - ✓ This applies to data that are not only made available by the manufacturer but that can be found into common database
 - ✓ Such database may be implemented and operated under the control of public authorities or result from private initiatives; the reliability of the content can be checked by a third party or rely on the responsibility of those who fill in the data
 - ✓ The database includes the characteristics of construction products and systems
 - ✓ Examples: properties for building materials (wall thermal transmittances, resistance or conductivity of insulation products) or system components (efficiency of systems, part load equipment efficiency as a function of outdoor temperatures, ...)
- Data **recorded** by an expert:
 - ✓ This applies to data that may be specific to the building, or depending on the ways the construction products and the systems have been implemented
 - ✓ The data are noted from the plans or description of the building, or from on-site observations or measurements provided that these measurements do not require a dedicated know-how and specific measuring devices; they may also result from simple calculations
 - ✓ These data may be descriptive (e.g. type of controls for the heat emitters) or quantitative (e.g. nominal set value of the summer indoor temperature)
 - ✓ The expert who finds and notes these data is usually the one who will operate the EPC rating calculation; it may also be the building designer
 - ✓ The determination of these data may rely on the experience of the expert, as some values may be based on previous knowledge
 - ✓ Examples (depending on the data required by the national EPC calculation method): building location, building orientation, floor area, volume of the heated zones, windows area, presence of thermal bridge

breakers, length and size of the ductwork outside heated zones, energy efficiency of the air conditioning system according to the regular inspection report,...

- **Data measured** on site:
 - ✓ This applies to data that need to take into account the actual implementation of the construction products or systems, and that are determined by an on-site measurement
 - ✓ The measurement requires a dedicated know-how and specific measuring devices
 - ✓ The measurement may be in some cases performed by the expert who will operate the EPC rating calculation, but it is usually performed by another expert (for example an energy performance auditor)
 - ✓ Examples (depending on the data required by the national EPC calculation method): airtightness of the building envelope, airtightness of the ductwork, flue gas temperature at the boiler outlet...
- **Data fixed** by the applicable legislation:
 - ✓ These data can be default values, i.e. relatively disadvantageous values fixed by a legislation when no actual value is used or no detailed measurement or calculation is realized. They can also be fixed average or pre-calculated values when no actual value can be determined (for example because no assessment or testing method exists).
 - ✓ Example: a national EPC calculation method may require using a conventional standard value of 0.5 for the solar shading coefficient, used in the calculation for all buildings.

In summary:

Three ways for classifying EPC input data:

- Data describing the building / Data describing the systems
- Data independent of the specific building considered / Data that depend on the specific building and its execution
- Data classified following the way they are made available (by manufacturer, into database, recorded by an expert, measured on site, fixed by legislation...)

These three types of classifications will be used to analyse the best practice to obtain and prove compliant EPC input data (see chapter 4).

Whatever the classification used, EPC input data should ideally be determined with the following procedures:

- 1) Clear technical procedures explaining how to determine the value of the EPC input data;
- 2) Clear organisational procedures stating requirements in order for the input data to comply with the rules;
- 3) Clear requirements for evidence of compliance, i.e., a set of elements considered as evidence that the EPC input data has been correctly determined.

These procedures for determining EPC input data should be publicly-available documents produced at national or regional level in the EPC regulation explaining how to derive the proper values for the input data. These documents have a legal status. They may refer to standards, professional rules, etc.

An EPC input data is "compliant" in EPC context if this data has been established in line with the procedures in force in the context of the applicable legislation.

In addition, an easy access to the EPC input data should also be offered.
These points are detailed in paragraphs 3.3.2 to 3.3.5.

Paragraph 3.3.6 explains how innovative products or systems may be dealt with.

Paragraph 3.3.7 shows the need that these procedures for determining EPC input data remain in line with other EU or national legislations.

3.3.2 Clear technical procedures

It is essential that clear procedures exist that explain how to determine the value of the EPC input data.

These procedures should define:

- the quantity concerned;
- the unit in which it has to be expressed;
- the way to determine it:
 - o for data made available by manufacturers: clear reference to a testing and/or measurement method,
 - o for data published into a database: clear reference to the database and the place to find the data into the database,
 - o for data recorded by an expert: clear methods for recording data from the plans or description of the building, or clear methods for recording data from on-site observations or simple measurements, or clear method for calculating the data,
 - o for data measured on site: clear reference to a measurement method, describing the way to operate and the measuring device to be used,
 - o for data fixed by the applicable legislation: clear description of the data and the value to be used.

When the definitions and the procedures for obtaining the data are unambiguous and robust (i.e. with a very high insensitivity to changing external parameters), it can be expected that the assessment of the EPC input data is repeatable (i.e. by the same expert issuing the certificate or inspector) and reproducible (i.e. by different experts issuing the certificate or inspectors).

When input data for the energy performance calculation are wrong (even due to unintentional mistakes) or wrongly understood, the risk is to get a wrong assessment of the energy performance of the building. This may lead to believe that the minimum energy performance requirements are fulfilled while this is not the case.

Concerning construction products and systems, though the performance characteristics of several construction products are defined in a unique way in the CEN standards, in a number of cases there can be different interpretations of the product data. There are still some products and systems for which an unambiguous definition of data is not obvious. This is in particular the case for some of the most innovative technologies.

Concerning data linked to the building (building basic data, execution related data, occupancy related data), it is also crucial that procedures define how to determine them (see also 4.6).

It is essential that the procedures take into account the specificities of the EPC input data for existing buildings (more data to be recorded or measured on site, some data difficult to find... - see also 4.13).

It has to be noted that compliant input data may sometimes be far from real values. For example, a default value used as an input data according to the existing definitions and procedures may be too pessimistic or too optimistic compared to the real value. Nevertheless, it will meet the definition of compliant data.

More information about the way to implement clear technical procedures can be found in chapters 4.1, 4.6 and 4.13.

3.3.3 Clear organisational procedures

These organisational procedures define requirements such as for example:

- the need that the input data is controlled by an independent third-party,
- the need that the data is certified,
- the way by which the data has to be declared by the manufacturer or distributor,
- the need for a specific competence of the expert in charge of assessing the data,
- the need for a specific competence of the expert issuing the certificate if he assesses himself the value of the input data,

- ...

Such procedures must be very clearly formulated: which type of control? Which certification? Which declaration? Which competence?

More information about the way to implement clear organisational procedures can be found in chapters 4.2 and 4.12.

3.3.4 Clear procedures for evidence of compliance

Procedures should define clearly the set of elements considered as evidence that the EPC input data has been correctly determined, and that can be provided to prove compliance.

Such elements could be for example:

- the fact that the data has been uploaded into a national database,
- a test report providing the input data that has been issued by an accredited laboratory,
- a certificate of certification or qualification of persons or companies for those have determined the input data,
- a certificate issued by a competent person that the determination of the input data is consistent,
- ...

More information about the way to implement clear procedures for evidence of compliance can be found in chapter 4.2.

In summary:

A need for three very clear procedures:

- How to determine the value of the EPC input data? (clear technical procedures)
- What are the organizational requirements linked to the determination of the EPC input data? (clear organizational procedures)
- How to prove compliance of the EPC input data? (clear procedures for evidence of compliance)

3.3.5 Easy access to compliant data

There is often a problem of easy access to the required and, most importantly, to the compliant input data. For certain aspects or technology areas, this may require a very substantial effort (e.g. the estimation of the thermal bridge effects).

Where input data for the energy performance calculation are difficult to find, the risk is that the expert in charge of the energy performance calculation uses default or estimated values that could be far from the actual data or from the data that are considered as "conventionally true". This also may lead to believe that the minimum energy performance requirements are fulfilled while this is not the case.

In Europe, a data will be considered as easily accessible if it can be found with quite the same time, effort and money as an information that would be available on an Internet page, preferably with a free access and possibly after using a password. All data that need more time, effort or money than this "standard" information to be found will probably be considered as not easily accessible.

More information about the way to implement easy access to compliant data can be found in chapters 4.3 and 4.11.

3.3.6 EPC input data for innovative systems

This applies to innovative construction products and systems, i.e. new or advanced construction products and systems that are highly energy efficient in comparison to similar compatible ones; these are in most cases not properly accounted for in the regulatory calculation method.

The EPC input data must describe the characteristics of the innovative product/system. They can be determined using equivalence rules defined in the procedures. These EPC input data can be made available by the manufacturer or by an importer, a distributor or an authorized representative. They can also be recorded by an expert if the input data needed have to take into account the performance of the installed product or system.

This can for example be the case for the equivalent airflow rate of demand-controlled ventilation systems. More information about the way to handle with innovative systems can be found in chapters 4.8 and 4.9.

3.3.7 Procedures in line with EU or national legislation

Articles 34 and 35 of the Treaty on the functioning of the European Union (Consolidated version – 2010) prohibit quantitative restrictions on imports and exports, and all measures having equivalent effect, between Member States.

Some products are covered by harmonisation measures adopted by the European Parliament and the Council, by the Council or by the Commission. Such harmonization measures (Article 115 of the Treaty) are for example, among others, the European Regulation on construction products (Regulation (EU) N° 305/2011) and the European Directive about the Ecodesign of energy related products (Directive 2009/125/EC).

They define requirements; manufacturers may demonstrate compliance with these requirements either directly or by using harmonised standards to this effect; manufacturers issue a declaration of conformity and affix CE mark on their product.

It is essential that the procedures (technical, organisational, to show compliance) defined to determine the EPC input data (see 3.3.2, 3.3.3 and 3.3.4) are not in contradiction with the Treaty and/or Directives or European Regulations.

Declaration of performance of a construction product (and its CE marking) must be based on the Construction Product Regulation ((EU) N° 305-2011) as soon as harmonized European standards cover this product. It is therefore important that the procedures for determining and making available EPC input data are not in contradiction with this requirement.

Member States may specify national requirements for construction products only if no harmonised standard exists and if performances may not (or may not fully) be assessed on the basis of an existing harmonized standard. In such cases, they need to foresee an equivalence clause, permitting products that have already demonstrated compliance with the national regulatory requirement through an equivalent system in another country. More information about the way to handle with innovative systems can be found in chapter 4.7.

In summary:

It is crucial that:

- EPC input data are easily accessible
- Innovative systems are not too much handicapped regarding the possibility to find compliant EPC input data
- The procedures linked to EPC input data fulfil the requirements of other EU or national legislations

3.4 PART 2: Legal framework related issues

A clear legal framework on **how to detect and decide on non-compliance** is absolutely necessary.

Non-compliance in the EPBD context refers to all obligations imposed by the EPBD: Meeting energy performance minimum requirements, presenting and handing-over the EPC including recommendations for improvements in case of selling or renting a building or a building unit, publicising the energy-related information in real estate advertisements, hanging out the EPC in buildings occupied by the public or frequently visited by the public, and carrying out inspections of heating and air-conditioning systems in existing buildings.

Performance requirements mainly refer to final and primary energy consumption indicators, and the achieved performance must be shown in the EPC. Although the EPBD does not specify the point in time when the EPC has to be available, several countries introduced the procedure that EPCs submitted as a condition to receive the building permit must be updated to the as-built situation and only then will be valid for 10 years. Here “quality of the works” comes in: mistakes at the construction site could result in a worse energy performance than actually allowed, and then sanctioning according to EPBD will be due.

With regard to the EPC, non-compliance can occur at different levels:

- input data needed for calculating the EPC can be non-compliant (i.e. they have not been established in line with the procedures in force in the context of the applicable legislation), or
- the way to calculate the energy performance rating of the building can be non-compliant (i.e. the calculation has not been operated in line with the procedures in force in the context of the applicable legislation), or
- the energy performance rating of the building mentioned in the EPC, which is used to check whether energy performance minimum requirements are met or not, can be non-compliant.

The non-compliance of the input data results in a non-compliance of the EPC.

The non-compliance of the way to operate the energy performance calculation of the building results in a non-compliance of the EPC.

In this document, we shall not discuss the non-compliance of the way to operate the calculation of the energy performance of the building.

Regarding input data, there are mainly three types of non-compliance:

- *Procedures not followed*: the technical or organizational procedures (see 3.3.2 and 3.3.3) or the procedures to prove compliance of the input data (see 3.3.4) are not followed
- *Wrong value*: the input data is wrong (a check shows another value)
- *No information about the compliance of the input data (no reporting)*: there exist no evidence of compliance of the input data (see 3.3.4), or there is no traceability of the fact the procedures have been followed.

A wrong value of the input data can result from errors or be intentional in case of fraud. The reason for the wrong value of the input data can be that the procedures have not been followed. A non-compliant input data can also result from unintentional errors when following the procedures: to limit this risk, the procedures have to be very clear (see 3.3.2, 3.3.3 and 3.3.4).

Regarding the EPC, there are mainly two types of non-compliance:

- *Wrong value*: the energy performance mentioned in the EPC is wrong;
- *Not meeting the requirements*: the energy performance mentioned in the EPC does not fulfil the minimum requirements of the applicable legislation.

A wrong value of the energy performance can result from errors or be intentional in case of fraud. It does not necessarily mean that the minimum energy performance requirements are not met. The reason for the wrong value of the energy performance can be - among others - that the input data are not compliant.

Not meeting the requirements does not necessarily mean that the value of the energy performance is wrong.

Another type of non-compliance of the EPC (*no reporting*) can occur regarding the availability and presentation of EPC energy indicators in the commercial media and the EPC as such when selling or renting a property, or regarding the availability of the EPC in public buildings and buildings frequently visited by the public.

In order to achieve compliance, laws transposing the EPBD must be unambiguous and include methods (e.g. full automatic checks and in depth random control of statistical sample) and responsibilities of checking compliance (e.g. third party control and/or carried out by public bodies) as well as penalties to be applied in case non-compliance is detected. Well-designed compliance frameworks are effective and simplify implementation for administration as well as for the construction and real estate sector.

3.4.1 A transparent compliance framework focussing on key aspects

A feasible compliance framework focuses on few key aspects which are crucial for building energy performance, such as transmission characteristics, ventilation and airtight construction, summer thermal comfort, and renewable energy systems. These are areas where clients expect substantial extra cost and/or normal users cannot detect extra energy losses during building operation. Therefore it is important to have a transparent compliance framework in place to handle non-compliance issues effectively. The following examples concerning thermal bridges and designing high-performance ventilation systems highlight what has been said above:

- Often, building details avoiding thermal bridges are more expensive and/or require more labour time. In practice, it is very difficult (almost impossible) for normal users to detect extra energy losses due to thermal bridges. (BUS/Belgium)
- Airtight constructions require ventilation systems in order to ensure the required exchange of air volume. Practice shows that there are concerns about the performances of installed ventilation systems (correct air flow rates, acoustics ...) in many countries. Also in this case, it is very difficult for normal users to detect inefficiencies due to bad planning and installation. (BUS/Belgium)

Thus, checking compliance of critical aspects ensures that the client actually receives the specific quality advertised by the EPC.

3.4.2 Checking compliance of input data for EPC calculation

Checking compliance is a means of quality assurance. In the context of this project, quality is defined by the procedures how to determine input data and by minimum requirements imposed by EPBD-related legislation. Clear technical and organisational procedures are a precondition for checking compliance. Checking compliance can be done on a full scale basis, for example by means of automatic checks during EPC-database upload or by means of random sample checks, for example based on cross checks with other buildings documents, check of authorized experts issuing certificates, and check of supporting documents submitted as a proof of compliant measurement data. It is necessary to check input data for calculating the design EPC as well as for calculating the updated EPC representing the as-built situation. Compliance frameworks can demand for input data resulting from specific measurements to update the EPC according to the as-built situation.

3.4.3 Checking compliance using the EPC-database

In most European Member States an EPC-database has been established as a means to ensure compliance with EPBD requirements. The way the EPC-database has been set up is crucial for the options how to make use of the EPC-database and at what cost. Automatic checks of selected input data and automatic checks of energy indicators whether they meet energy performance minimum requirements or not can be carried out during uploading the EPC and related information into the EPC-database.

Publicly accessible parts of the EPC-database are essential for bottom up control of publicised energy indicators by potential buyers and tenants (e.g. partly publicly accessible EPC-database UK, automatic compliance checks of energy minimum requirements during EPC upload into the EPC-database in Portugal).

Table 1: Checking compliance regarding selected input data and energy minimum requirements

Element	How to enable check of compliance	What hinders check of compliance
Connection between EPC-software and EPC-database	Defined input data, calculation results and the EPC are uploaded into the database and checked with requirements during upload	Only EPC and selected EPC-indicators are uploaded into the EPC-database and checked during upload
Concept of EPC-database	EPC-database is linked with other databases containing building specific information, allowing for cross-checking information	EPC-database is a single unit without links to other databases
Accessibility of EPC-database	Publicly accessible parts of the database allow for bottom-up checks of published energy indicators by interested buyers or tenants	If access is only for public bodies, checking of published indicators will be done top-down, which is either costly or only possible on a small scale

3.4.4 Checking compliance regarding availability of EPC-indicators and EPC

The legal framework has to consider the following elements including the definition of procedures in order to be able to check compliance:

- Presenting energy indicators in advertisements in commercial media (e.g. mandatory guideline how to present indicators in the media, Ireland; partly publicly accessible EPC database to check published indicator values, UK)
- Presenting and handing over the EPC including recommendations for improvement when renting or selling (e.g. transaction through notary, the Netherlands; partly publicly accessible EPC database to check published indicator values, UK)
- Display of EPC in buildings owned by the public and/or visited by the public (e.g. unambiguous definitions, inspection procedure, Slovenia)

Table 2: Checking compliance regarding availability of EPC-indicators and EPC

Element	How to enable check of compliance	What hinders check of compliance
Presenting energy indicators in advertisements in commercial media	Specification of how to present which type of energy-related information in commercial media; Publicly accessible part of EPC database where information can be easily identified and checked by interested parties	Information published in commercial media cannot be easily found in EPC-database; EPC-database is not publicly accessible at all
Presenting the EPC when renting or selling	Specification of procedure, involved parties and their roles and obligations	No specification of procedure, roles and obligations; many exemptions
Display of EPC in buildings owned by the public and/or visited by the public	Simple definition of affected buildings: e.g. all non-residential buildings > 1000 m ²	Definitions with many exemptions and unclear terminology such as "frequently visited"

3.4.5 Checking EPC-compliance at the right point in time

The EPBD targets actual energy savings, and therefore it is not sufficient to declare the design status at the beginning at the process during the application process to achieve the building permit. In fact, it is necessary to update the EPC by taking into account design changes and declare the as-built situation after completion of the building. While some Member States have already adopted a two-step approach, others have not yet implemented such procedures.

3.4.6 Regional or central implementation influences economic feasibility

Setting up and running the enforcement and sanctioning framework needs respective budget allocations. Regional or central implementation has an impact on the cost of the enforcement framework and thus on economic feasibility. Member States following regional EPBD implementation should investigate which elements of the enforcement and sanctioning framework could be used together to avoid multiplication of effort and cost and to increase the chance of creating an economically feasible and effective framework. In this regard, there are some examples to learn from in European member States (e.g. database of product characteristics in Belgium, France, UK; example Germany).

3.4.7 Interaction with other legislations: avoiding potentially negative impact of EPBD-compliance

The obligation to publicise energy indicators in advertisements in the commercial media will be less effective if this is regulated in an isolated way, being limited to the energy related information. If there is no regulation concerning all mandatory elements of a real estate advertisement, comparability of buildings and building units could be affected. Energy-related information will be presented in order to be compliant, but other important parameters such as number of rooms or location could be left out due to the fact that space for publication in print media is expensive. This is an unwanted development, resulting in difficulties regarding the assessment of the EPBD impact on the real estate market (e.g. Austria). In fact, it is recommended to evaluate advertisements published in print media because it is nearly impossible to extract a meaningful sample from the internet, due to the frequent updating procedures practised by real estate agents to achieve a better rank in the listing.

3.5 PART 3: Compliance enforcement in practice related issues

The way **how to react in case of non-compliance** influences EPC-related compliance to be good or poor. Stakeholders respect clear enforcement procedures resulting in adequately severe sanctions being executed in case of non-compliance. Legal obligations without clear procedures in case of non-compliance lack practical implementation. Threat of penalties and other sanctions tend to be less effective if sanctioning procedures are not clear.

First of all, sanctions should address the room for improvement detected during the compliance-check, not only to ensure compliance but also to assure the quality of EPCs in general.

Thus, apart from financial sanctions such as penalties and withdrawal of grants, there are other types of sanctions, such as mandatory trainings for EPC experts, to improve EPC quality.

In order to achieve good compliance, handling of non-compliance in practice must be effective, cost-efficient and affordable and should not be compromised by conflicting legislation. There is clearly a societal wish to limit the administrative burden and cost.

3.5.1 Clear enforcement procedures facilitate exploitation of room for improvement

Clear enforcement procedures also address the room for improvement in terms of quality assurance. For example, the EPC database does not only facilitate automatic checks of input data and energy indicators but also helps tracking the energy experts and the mistakes they make in EPC calculation. If minimum energy efficiency requirements are not met the EPC will be rejected and the energy expert has to recalculate the EPC and re-submit it again at own expenses in order to achieve the building permit (e.g. Denmark).

A stepwise penalty system depending on the frequency of submitting faulty EPCs addresses the energy expert, starting with the obligation of re-calculation, attending trainings, paying a fine and ending with the withdrawal of the licence (e.g. Portugal). Frequent mistakes will be detected and used to re-design training courses or to offer additional training modules supplementing existing ones.

3.5.2 Clear enforcement procedures and adequately severe penalties

Effective enforcement frameworks stipulate clear procedures and adequately severe penalties. If there is no clear procedure how to react in case of non-compliance, enforcement will be difficult and costly, because the usual way will be to approach the court based on Civil Law which is often a lengthy and also costly process. As a consequence, this will hardly take place. Therefore, clear penalty procedures are essential.

Penalties must be adequate to be effective. Comparing the cost of compliance with the cost of non-compliance must always result in the conclusion that non-compliance does not pay.

3.5.3 Conflicting legislation could weaken the political will of enforcing EPBD-compliance

The availability of affordable housing is very important for the peaceful development of society. In some Member States, tenants' protection and a cap on rent amounts could compromise activities (such as compliance checks and handing out punishments) with the potential to result in higher cost for the building owners (and, as a consequence, for the tenants) (e.g. Austria).

In some Member States, data privacy legislation prevents the accessibility of the EPC-database by the public. Interested tenants or buyers are not allowed to enter the EPC-database to check the published energy indicator with the original one in the EPC-database. Check of published EPC indicators is only carried out by the public administration or not at all.

3.6 Examples transmission characteristics

This section will we worked out towards the end of the project, whereby the findings of the specific workshops and the available factsheets will be taken into account.

3.7 Examples ventilation and airtightness

This section will we worked out towards the end of the project, whereby the findings of the specific workshops and the available factsheets will be taken into account

3.8 Examples sustainable summer comfort technologies

This section will we worked out towards the end of the project, whereby the findings of the specific workshops and the available factsheets will be taken into account

3.9 Examples renewables in multi-energy systems

This section will we worked out towards the end of the project, whereby the findings of the specific workshops and the available factsheets will be taken into account

3.10 Other interesting examples

This section will we worked out towards the end of the project, whereby the findings of the specific workshops and the available factsheets will be taken into account

4. Best practices PART 1: Procedures to obtain and prove compliant data

4.1 Clear technical procedures for determining EPC input data

TOPIC:

Clear technical procedures for determining EPC input data

CONTEXT AND MOTIVATION:

An effective compliance is far from evident if the technical procedures are not clear and/or a source of discussion and interpretation. It is important to minimise such sources of uncertainties.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- For the calculation of the thermal bridges, it is only specified that thermal bridges have to be analysed by 2D- and 3D simulations as specified in CEN standards. Without additional specifications, such description is too vague for having afterwards a compliance control and related sanctions.
- In the national calculation method for the heat losses to the ground is the depth of the ground water layer an input variable. This is an input data which is not evident to identify and, moreover, might lead to discussions.
- A national EPC method allows specifying the required ventilation air flow rates as function of the number of occupants, whereby this number can be chosen by the design team. There is a high probability that one will choose the number which gives the best EPC result, whereby a controlling body will have nearly no possibility to question the choice.
- There can exist ambiguities on how to determine the floor or wall surfaces: internal or external areas, floor area in case of an inclined roof, floor area in case of an atrium in the house?
- It can be not clear how to prepare the building before its airtightness measurement

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

It is essential that clear procedures exist that explain how to determine the value of the EPC input data. These procedures should very precisely define:

- the quantity concerned;
- the unit in which it has to be expressed;
- the way to determine it:
 - for data made available by manufacturers: clear reference to a testing and/or measurement method,
 - for data published into a database: clear reference to the database and the place to find the data into the database,
 - for data recorded by an expert: clear methods for recording data from the plans or description of the building, or clear methods for recording data from on-site observations or simple measurements, or clear method for calculating the data,
 - for data measured on site: clear reference to a measurement method, describing the way to operate and the measuring device to be used,
 - for data fixed by the applicable legislation: clear description of the data and the value to be used.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- Germany: handling of thermal bridges by allowing various procedures, including use of a thermal bridge atlas
- France: to avoid misunderstandings in the determination of the EPC input data for HVAC systems, the manufacturer association Uniclimate, together with CETIAT, published more than 20 factsheets

providing guidance for boilers, water heaters, heat pumps, solar systems, hot water tanks, radiators, roof tops and ventilation units.

REFERENCES:

- How to get compliant and accessible data for the energy rating calculation of a building? - Overview of some existing approaches, François Durier (CETIAT, France) and al., October 2014, <http://qualicheck-platform.eu/results/reports/>
- Fiches d'aide à la saisie des données dans la RT 2012 - UNICLIMA, CETIAT - <http://www.uniclima.fr/documentation/guides-techniques.html>

QUESTIONS:

- Are there sometimes complaints that it is not evident to know which information is exactly needed?

4.2 Clear procedures to show evidence of compliance

TOPIC:

Clear procedures to show evidence of compliance

CONTEXT AND MOTIVATION:

An EPC input data is compliant in EPC context if this data has been established in line with the procedures in force in the context of the applicable legislation.

The evidence of this compliance may be shown by different ways, e.g.:

- a control of the data by a third party
- a declaration by a manufacturer, a distributor, an architect, an expert, an installer...
- the proven competence of persons or companies previously recognised by a third party
- ...

EXAMPLES OF PROBLEMATIC SITUATIONS:

- A product data is available but there is no clear evidence that it has been established in line with the procedures
- An expert has recorded a data describing the building or its systems, but there is no evidence that he has followed the procedures, or that he has the competence to determine this data
- A data has been measured on site but there is no evidence that the measurement has been operated by a competent person
- A data has to be chosen as a pre-calculated data, for example in a thermal bridges atlas, or in a building airtightness atlas, but there is no clear evidence that this choice has been made correctly.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

In case of third party control

- A third party checks that the data have been determined according to the applicable rules (for e.g. a standard, a professional rule, a written methodology...)
- This third party is independent from the one who has been involved in manufacturing the product or system, or in determining the data; this third party may be for example a notified body, a certification body, an independent control body...
- This control by a third-party may be operated for each individual data, or rely on a check of a significant sample of all the data
- This control can be operated within a quality management scheme (that is preferable) or not
- This third party control results in a certificate established by the third party, that brings an evidence of compliance

- This certificate and/or the corresponding data may be made available on a case-by-case basis, or published into a central database if appropriate
- Examples: certification of the characteristics of a product or a system by a notified body or a certification body, compliance control of the finished building by an independent body...

In case of declaration

- This declaration may be provided by a product or system manufacturer, a product or system distributor, an architect, an expert, an installer... who has been involved in determining the data
- The declaration states that the applicable procedure has been followed to determine the EPC input data
- The declaration may rely on the honour of the one who claims to have followed the procedure (declaration on honour), on a self-control procedure, on a final verification, on a quality assurance scheme...
- Usually, the traceability of the procedure followed has to be ensured, in order to show the evidence of the declaration in case of control or contestation
- Example: certificate of conformity to the professional rules signed by the installer, based on a check-list to fill in during installation...

In case of proven competence of persons or companies

- The competence of the expert and/or of the company in charge of assessing the EPC input data has been previously evaluated and recognized by a third party
- This evaluation and recognition may rely on a certification, a qualification, an accreditation, a label...
- The proven competence may also include an evaluation of the existence and the ability of measuring equipment
- This recognized competence by a third party is shown by a certificate, that brings an evidence that the EPC input data that are determined by these persons or companies are compliant
- Examples: qualification by a third-party of the experts who will operate measurements of the airtightness of building envelope...

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

The following table identifies which are the ways for showing evidence of compliance that are applicable to the different types of input data.

Possible ways for showing evidence of compliance				
Ways of getting input data	Additional information	Third-party control	Declaration	Proven competence of persons or companies
Made available by a manufacturer	Applies to construction products and systems	<i>Control of the data by a notified body, a certification body, an independent control body</i>	<i>Declaration by the manufacturer that the data made available are compliant</i>	<i>Certified or accredited quality control system of the manufacturer, or/and its laboratory</i>
Found into a database	Applies to construction products and systems	<i>Control of the data by the operator of the database</i>	<i>Declaration by persons or companies that have filled in the database that the data are compliant</i>	<i>Qualification scheme for persons or companies who will fill in the database</i>
Recorded by an expert	Covers data noted from plans or description of the building, on-	<i>Control of the recorded data by a third party, probably on a</i>	<i>Declaration by persons or companies that they have</i>	<i>Qualification scheme for persons or companies who</i>

	site observations, simple measurements, simple calculations	<i>representative or random sample</i>	<i>recorded compliant data</i>	<i>will record the data</i>
Measured on site	Covers data whose measurement requires a dedicated know- how and specific measuring devices	<i>Control of the measured data by a third party, probably by repeating some or all measurements</i>	<i>Declaration by persons or companies that they have measured compliant data</i>	<i>Qualification scheme for persons or companies who will operate measurements</i>
Fixed by the applicable legislation	Covers default values, fixed average values, pre-calculated values	<i>Control by a third party that the data have been determined according the procedures</i>	<i>Declaration by persons or companies that they have chosen compliant data</i>	<i>Qualification scheme for persons or companies who will choose data</i>

REFERENCES:

- How to get compliant and accessible data for the energy rating calculation of a building? - Overview of some existing approaches, François Durier (CETIAT, France) and al., October 2014, <http://qualicheck-platform.eu/results/reports/>
- Certified Performance Database: tool for quality and compliance, Sylvain Courty (Eurovent Certita Certification, France), pp. 28-29, REHVA Journal, Volume 52, Issue 4, August 2015
- Overview of competent tester schemes for building airtightness, François Rémi Carrié (ICEE, France), slide presentation at Qualicheck Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>
- Competent tester schemes for building airtightness, Valérie Leprince (PLEIAQ, France), François Rémi Carrié (ICEE, France), pp. 16-17, REHVA Journal, Volume 52, Issue 4, August 2015
- Ventilation: steps towards framework for reliable EPC input data and improved quality/compliance, Samuel Caillou (BBRI, Belgium), slide presentation at Qualicheck Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>

QUESTIONS:

- Are there other ways to show evidence of compliance than a third party control, a declaration or a proven competence?
- According to the table, all ways of showing evidence of compliance may be applicable to all types of input data. Do you agree?
- Should all the ways to show evidence of compliance be operated under accredited or certified quality management systems?

4.3 Easy access to compliant data

TOPIC:

Easy access to compliant data

CONTEXT AND MOTIVATION:

A quantity used as an input data for:

- the calculation or the assessment of the energy performance of a building; and/or
- the declaration of its energy performance in the Energy Performance Certificate (EPC) is "easily accessible" if it can be found, seen and used by taking "reasonable time, effort or money".

The notion of "reasonable time, effort and money" is to be appreciated in the context of the modern information technologies and media to get the information. A reference for easy access to data with these modern information technologies and media is an information that is available on an Internet page, preferably with a free access. Input data will be considered more or less accessible depending on the effort needed to obtain this data compared to this reference.

There are several reasons why it is important to pay specific attention to an easy access to EPC input data:

- this minimises the time for finding the correct and compliant data,
- this minimises the risk that the expert in charge of the calculation uses wrong data,
- this minimises the risk of discussions about which data to be used,
- ...

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Difficulty to find the characteristics of a construction product
- Difficulty to find the characteristics of a system
- Difficulty to find the result of an on-site measurement
- ...

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

Possible approaches for an easier access to the EPC input data may be related to:

- easy access to the description of the building and the systems
- documentation about products and systems with an easy access
- publicly available database of characteristics of products and systems
- database of characteristics of products and systems embedded inside an EPC calculation tool
- easy access to on-site measurement results
- easier access to the actual energy consumption of the building

If a database is referred to by a national regulation, precaution should be taken that this is not in contradiction with the Treaty (that prohibits restrictions on imports and exports, and all measures having equivalent effect, between Member States) and/or with Directives or European Regulations (as for example the Construction Product Regulation).

Ideally, the issue of easy access to compliant input data for products and systems should be handled at European level. This is probably difficult as products and systems are not always the same for different national markets. In addition, the input data needed at national levels may differ from one country to another. This means that there probably is a need for national and/or industry led initiatives.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- Information and communication technologies are a key element to contribute to an easy access to EPC input data
- The development of the use of the Building Information Model (BIM) should help for an easy access to the data related to the building and its systems
- Most of the manufacturers of products and systems provide an easy access to their characteristics

- Database exist at European or national level that provide an easy access to product or system data; they are sometimes embedded into EPC calculation tools
- Easy access to on-site measurement results could be improved by relevant procedures, including building commissioning, building log books and in the future BIM

REFERENCES:

- How to get compliant and accessible data for the energy rating calculation of a building? - Overview of some existing approaches, François Durier (CETIAT, France) and al., October 2014, <http://qualicheck-platform.eu/results/reports/>
- Certified Performance Database: tool for quality and compliance, Sylvain Courty (Eurovent Certita Certification, France), pp. 28-29, REHVA Journal, Volume 52, Issue 4, August 2015
- French voluntary scheme for harmonised publication of ventilation product data, François Durier, Laure Mouradian (CETIAT, France), Fabrice Lamarre (Uniclimate, France), April 2015, <http://qualicheck-platform.eu/results/factsheets/>
- Energy Performance of buildings regulations in Belgium – The key puzzle pieces for an effective regulation, Xavier Loncour (BBRI, Belgium), slide presentation at QUALICheck Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>

QUESTIONS:

- Could there be a central European database and/or guidance where appropriate data can be found?
- Is there a risk that a database referred to by a national regulation creates a restriction of the imports and exports between Member States? How to overcome this risk?

4.4 Availability of various paths for compliance – trade-off between accuracy and effort

TOPIC:

Availability of various paths for compliance – trade-off between accuracy and effort

CONTEXT AND MOTIVATION:

For various types of EPC input data, there are quite accurate determination procedures which are well described. In principle, one could impose to use such detailed methods. In practice, some of these determination methods require a substantial amount of time and/or expert knowledge. On-site related performances as building airtightness may require a specific measurement.

More simplified methods and/or use of default values might make the determination of the EPC input data easier, but may result in less good results.

Allowing the choice between accurate determination methods (with better results) and more simple determination methods (with less good results) can contribute to a broader societal support. Depending on the context, one might choose the more accurate or the more simple approach.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- EPC methods which only allow complex approaches to determinate EPC input data might require a lot of efforts and result in a lack of societal support. One could for e.g. ask to calculate the U-value of each window exactly according to the CEN/ISO procedure, which is rather complex and time consuming. Moreover, it would require extensive databases with input data for all window profiles available on the market.
- The use of default values for the efficiency of heat pumps, heat exchangers, ... is in principle very easy for the one who has to determinate the EPC input data but this approach does not give any kind of stimulus for using products with high performance. If one would decide to allow only default

values, the EPC would become a major barrier for innovation as there would be no stimulus at all for using better performing products and systems.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- More accurate methods should typically give better results. It means that simpler methods should be on the save side.
- Default values are input data which can be used in all cases without any requirement for proof. Default values are typically conservative estimations whereby the real values might be better. By using a more detailed method, once should be able in most cases to obtain a better EPC. In practice, there might be cases where the real building has components or systems with worse performances than the default value. However, the default value can still be used.
- In case the EPC input data determination method allows simpler and more detailed approaches, it will result in different EPC levels. All results can be compliant, e.g. respecting the foreseen procedures. However, the degree of 'reliability' can substantially be different.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **Lighting:**
There is a whole range of possibilities for modifying the energy performances of lighting systems, e.g. the use of more efficient lamps, better luminaires, presence detection, daylight compensation, ...). The use of a default value in office buildings (e.g. 20 W/m²) is in most cases a conservative estimation, but might in some rooms be less that effectively installed. Typically, the use of such default value will not be evident when moving to NZEB requirements. More refined methods become then important (in combination with a smart lighting strategy)
- **Thermal bridges:**
A correct assessment of thermal bridges can be done according the CEN standards. However, this is very time consuming. The use of simpler methods (e.g. default values, use of standard details or standard rules in combination with a better default value) might be necessary.
- **Heat exchangers**
This paragraph will be developed in a later phase
- **Windows**
This paragraph will be developed in a later phase
- **Building airtightness**
This paragraph will be developed in a later phase

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- Are there products and/or systems for which only default values exist? If so, is this seen by the market as a barrier for product and/or system innovation?
- Are there complaints from stakeholders about the complexity/required effort for obtaining certain types of input data?

4.5 Delicate balance between accuracy of calculation model and number/complexity of input data

TOPIC:

Delicate balance between accuracy of calculations and number/complexity of input data

CONTEXT AND MOTIVATION:

The issue is not the scientific and methodological aspects of calculation methods, but considerations regarding input data and compliance.

- From a scientific point of view, it is clear that a multi-zonal, non-steady state calculation tool gives the largest potential for accurate predictions of the energy consumption and the indoor climate conditions.
- But in terms of challenges for a robust and efficient compliance framework, such detailed calculation methods may be more challenging as there will be a large amount of data, which moreover might be not evident to define in an unambiguous way.

Moreover, more detailed calculation models typically require more efforts for providing the input data.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- An hourly calculation method is able to better assess the risks of overheating. In case a residential building is still modelled as one single zone, the gain in accuracy/reliability might be limited. If a multi-zone modelling is required, it will require a lot of extra input data (room volumes, internal walls. Moreover, one has to define occupancy profiles, internal gains... room by room.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- **Monthly versus hourly method**
An hourly calculation method allows a more accurate prediction of system performances, overheating risks, indoor air quality, ... At the same time, it often needs more input data
- **Single zone versus multi zone**
A multi-zone modelling has several advantages, in particular in terms of accuracy. However, there are also risks and drawbacks, e.g. the need to introduce much more input data, (to be completed)
- **Standard tool versus use of commercial calculation packages**
There are several very powerful calculation tools on the market. Some of these tools are highly standardised, others have modules which can be modified/adapted by users. There are procedures to check the accuracy of these calculation tools (e.g. BESTEST...).
- **Potential offering by BIM (Building Information Modelling)**
The use of BIM might reduce the efforts required for providing input data. This topic is further developed in §0.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- This paragraph will be developed in a later phase

REFERENCES:

- BESTEST
- Standard related to BESTEST

QUESTIONS:

- Has the calculation method been assessed in terms of complexity and/or efforts required for determining the EPC of a building? In particular for simple and small projects, is the effort considered as reasonable?
- Are there sufficient options for carrying out more detailed calculations, whereby offering the possibility for a better result?

4.6 Specific attention for procedures regarding execution related input data

TOPIC:

Specific attention for procedures regarding execution related input data

CONTEXT AND MOTIVATION:

Some EPC input data depend on the execution on the building site. This is in particular the case for input data:

- depending on the construction works: building airtightness,
- depending on the installation works: ductwork airtightness, mechanical ventilation air flow rates, electrical fan power, ...
- depending on the adjustment of operation parameters of systems at commissioning: mechanical ventilation air flow rates, heat input, heat output and combustion parameters of heating systems, water flow rates, fan or pump speed/stage...

For some of these input data, national regulations can require that it is not necessary to know the actual value. Reasons for this choice can be for example that:

- the actual variations of the input data value on either side of a nominal (or normal) value are in practice small and/or they do not have much influence on the whole building energy performance assessment (for example combustion parameters),
- the value is fixed by other regulations or professional rules.

For other input data, either because they may vary within a wide range depending on the construction, installation or commissioning works, or because their variations have a big influence on the assessment of the building energy performance, national regulations can require that the actual value has to be known and used. This may be the case for example for building airtightness, ductwork airtightness, ventilation air flow rates, ...

In this case, construction product or system data as supplied by the manufacturers are not sufficient and in most cases on-site records or measurements have to be done.

In some cases, the non-availability of on-site measured data is allowed but then default values have to be used resulting in a disadvantage when issuing the EPC (see 3.3.1 and 4.4).

EXAMPLES OF PROBLEMATIC SITUATIONS:

- A data has to be recorded on site (see 3.3.1 and 4.2) but there is no procedure or the procedure does not explain clearly how to operate this record
- A data has to be measured on site (see 3.3.1 and 4.2) but there is no procedure or the procedure does not explain clearly how to operate this measurement
- A data should be recorded or measured on site but this needs too much time, competent persons or companies, money... making it unrealistic

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

For on-site records or measurements:

- As for all EPC input data, there is a need for three very clear procedures:
 - Clear technical procedure explaining how to record or measure on site the data (see 4.1)
 - Clear organisational procedure giving the organisational requirements linked to the onsite determination of the data (see 3.3.3)
 - Clear procedure for evidence of compliance (see 4.2)
- These procedures should especially describe how the record or measurement result is made available to the person or company who will use it as an input data for the energy performance calculation of the building

For limiting or avoiding the on-site records or measurements by a third party:

- A specific framework for quality control of the construction, installation or commissioning works (proven competence of persons or companies) can, in some cases, limit (or even avoid) the on-site records or measurements.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- In Sweden, very clear procedures exist for the regulatory check of the ductwork airtightness in new buildings (AMA)
- Clear procedures under a quality framework have been defined and implemented in Belgium for building airtightness measurements and ventilation systems
- In the United-Kingdom, all building airtightness measurement results have to be uploaded into a specific database in which the person in charge of the building energy performance calculation can find the result
- A certification of the quality management system of construction companies regarding the airtightness of buildings has been implemented in France; certified companies benefit of a non-systematic measurement of building airtightness.
- In the Netherlands, three methodologies can be used to determine the building airtightness: 1. Calculate a fixed value according to NEN 8088 based on building year and type, 2. Measure airtightness, 3. Calculate airtightness based on reference details: if this outperforms the fixed value according to NEN 8088, a measurement is necessary.

REFERENCES:

- Background on Swedish regulation BBR – Ventilation and airtightness. Wanda Rydholm (Boverket, Sweden), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>
- Building airtightness: towards improved and reliable declared performances, Clarisse Mees (BBRI, Belgium), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>
- Air-permeability testing of new dwellings & buildings in the UK: challenges to maintaining standards, Barry Cope (ATTMA, UK), slide presentation at QUALICHeCK Workshop, Lund, March 2015, http://qualicheck-platform.eu/events/workshops
- Building regulations can foster quality management: the French example on building airtightness, François Rémi Carrié (ICEE, France), Sandrine Charrier (CEREMA, France), January 2015, <http://qualicheck-platform.eu/results/factsheets>
- Quality and compliance on building ventilation and airtightness in the Dutch context, Wouter Borsboom (TNO, The Netherlands), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>

QUESTIONS:

- Are there other ways to get input data that depend on construction, installation or commissioning than systematic records or measurements by a third-party?

4.7 Procedures in line with EU or national legislation

TOPIC:

Procedures in line with EU or national legislation

CONTEXT AND MOTIVATION:

Articles 34 and 35 of the Treaty on the functioning of the European Union (Consolidated version – 2010) prohibit quantitative restrictions on imports and exports, and all measures having equivalent effect, between Member States.

Some products are covered by harmonisation measures adopted by the European Parliament and the Council, by the Council or by the Commission. Such harmonization measures (Article 115 of the Treaty) are for example, among others, the European Regulation on construction products (Regulation (EU) N° 305/2011) and the European Directive about the Ecodesign of energy related products (Directive 2009/125/EC).

These regulations define requirements; manufacturers may demonstrate compliance with these requirements either directly or by using harmonised standards to this effect; manufacturers issue a declaration of conformity and affix CE mark on their product.

Other Directives on renewable energy sources (2009/28/EC) and on energy services (2006/32/EC) have also some link with some of the EPC input data.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- It is essential that the procedures (technical, organisational, for evidence of compliance) to determine the EPC input data are not in contradiction with the Treaty and/or Directives or European Regulations.
- The following paragraph gives a summary of the main requirements of these regulations when they may have an influence on the way to define, determine and show evidence of compliance of the EPC input data.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

European regulation on construction products (Regulation (EU) N° 305/2011)

Declaration of performance of a construction product (and its CE marking) must be based on the Construction Product Regulation ((EU) N° 305-2011) as soon as harmonized European standards cover this product. It is therefore important that the procedures for determining and making available EPC input data are not in contradiction with this requirement.

Member States may specify national requirements for construction products only if no harmonised standard exists and if performances may not (or may not fully) be assessed on the basis of an existing harmonized standard. In such cases, they need to foresee an equivalence clause, permitting products that have already demonstrated compliance with the national regulatory requirement through an equivalent system in another country. (See also 5.3).

European Directives about the Ecodesign of energy related products (Directive 2009/125/EC) and energy labelling of energy related products (Directive 2010/30/UE)

The European Directive 2009/125/EC (sometimes called ErP Directive or Ecodesign Directive) requires that energy-related products fulfil Ecodesign requirements as defined in specific implementing measures, usually Commission Regulations, for the different products. Such regulations cover or will cover space heating and domestic hot water systems, air conditioners and air to air heat pumps, ventilation units, as well as some of their components (fans, pumps, electric motors), chillers, fan coil units, condensing units, solid fuel boilers, local room heating products, etc. The regulations include among others requirements about energy performance levels and the way to assess energy efficiency, based on harmonised standards. Often, the regulations establish requirements with thresholds becoming stricter over time. The regulations also list which information data must be published in systems technical documentation. The directive requires that the manufacturer keeps and makes available an EC declaration of conformity, and affix the CE marking.

The European Directive 2010/30/UE (sometimes called Energy Labelling Directive) relates to the indication of the consumption of energy and other resources by energy-related products through labelling and information to end-users. Commission Delegated Regulations have already been published for household air conditioners, space heaters and water heaters and residential ventilation units, defining energy efficiency classes, contents of the label and product information to be made available to consumers.

It can be noted that the parameters and methods used in the regulations linked to these two Directives are generally very different from those used to take into account the performance of HVAC products in the calculation of the energy performance of buildings (national transpositions of the EPBD).

European Directive 2009/28/EC on the promotion of the use of energy from renewable sources

This directive requires, among others, that Member States promote the use of renewable energy sources in buildings. Member States must have defined specifications for renewable energy systems to benefit from support schemes, based on European standards if these exist (article 13). Such technical specifications must not prescribe where the systems are to be certified and should not impede the operation of the internal market.

For biomass, Member States are required to promote technologies that achieve a conversion efficiency of at least 85 % for residential and commercial applications and 70 % for industrial applications. Member States are required to promote heat pumps that fulfil the minimum requirements of the European eco-label and to promote certified solar thermal systems based on European standards if these exist.

Member States had also the obligation to ensure that certification or qualification schemes were available by the end of 2012 for installers of small-scale biomass boilers and stoves, solar photovoltaic and solar thermal systems, shallow geothermal systems and heat pumps, with a mutual recognition of these certifications or qualifications between Member States (article 14).

Finally, article 5 defines how Member States must include heat pumps in the calculation of their share of renewable energy sources. The heat energy captured by heat pumps shall be taken into account for this calculation if the final energy output significantly exceeds the primary energy input required to drive the heat pumps. This is described by a formula (Annex VII) using a seasonal performance factor and requiring to take into account only heat pumps for which this factor is higher than a given limit, depending on the national ratio between gross production of electricity and the primary energy needed for this electricity production.

European directive 2012/27/EU on energy efficiency

This Directive includes a requirement that Member States promote the availability of high-quality energy and cost-effective audit schemes for all final customers, aimed at identifying and quantifying cost-effective energy savings opportunities, which are carried out in an independent manner by qualified and/or accredited experts (article 8).

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

Not applicable.

REFERENCES:

- Consolidated version of the Treaty on the Functioning of the European Union (2010/C 083/01)
- Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products
- Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of Ecodesign requirements for energy-related products
- Directive 2010/30/UE of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products
- Overview - Impact of the Ecodesign and Energy Labelling Directives on HVAC products, François Durier, Michèle Mondot (CETIAT, France), <http://www.buildup.eu/news/43913>
- Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources

- Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency
- Legal issues when developing compliance frameworks, Eric Winnepeninckx (UBAtc, Belgium), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>

QUESTIONS:

- Would it be possible to go towards an harmonisation of the quantities defined and used by all these directives and regulations and the quantities used as input data by the various national regulations implementing the EPBD?

4.8 Robust technical handling of project independent innovative systems

TOPIC:

Robust technical handling of project independent innovative systems (= not covered by the standard procedure and not specifically conceived and installed in a given building)

CONTEXT AND MOTIVATION:

In principle, QUALICHeCK is not dealing with aspects of the calculation methods. However, in order to come to an effective compliance framework, societal support is important. It is clear that new innovative concepts may result in better energy performances and/or a better indoor climate and/or a better cost-benefit relation.

As indicated in §2.6, a compliance and enforcement framework should not be a barrier for innovation. Therefore, the issue of innovation is included in this source book.

Technologies not covered by a calculation method

In general, but in particular in a context with effective compliance control, it is not possible to take into account technologies in the EPC calculation if these technologies are not covered by the calculation method.

Technologies only covered by a very simple and/or conservative input value

In some cases, a technology is considered in the calculation method but by a conservative default value. If there is no procedure for proving a better performance, there is no drive for innovation.

In both cases, it is clear that the market uptake of interesting technologies can be blocked or seriously limited. In particular with severe EPC requirements (NZEB, ...) it may mean in practice that such technologies are not used.

In case there is not an effective compliance and enforcement framework, this issue is less critical. However, with an effective compliance and enforcement framework, there is no market for such technologies if there is no possible to correctly assess their performances

EXAMPLES OF PROBLEMATIC SITUATIONS:

- A national calculation method which does not take the absorption and emission characteristics of opaque components into account does not allow to handle **cool roof products**
- A national calculation method which does not take a **specific type of heat pump technology** into account means in practice that this type of heat pump cannot be used in that country for EPC calculations
- A national calculation method does not take into account **advanced natural ventilation strategies for summer comfort control**
- A national calculation method has a conservative value for **demand controlled ventilation**, whereas substantially better products are in the market. However, there is no procedure foreseen for obtaining a better result

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

The following aspects are important when developing an approach:

- Transparency of the assessment procedure for project independent innovative technologies
It is very important that the procedure to be followed is clearly communicated in the market
- Predictability of the possible outcome
Although not always easy and in case of very innovative technologies probably not even possible, it is important that the market is informed about the assessment methodology in order to allow optimisation of product development
- Developing an equivalent assessment methodology can be very challenging because such methodology usually does not exist in the literature or in foreign EPC methods.
- Integration in later phase in standard procedure

Once there is enough experience in the market with a given technology, it could be useful to integrate the assessment method in the standard calculation method with the possibility to improve the assessment method (potentially toward less favourable assessment) based on the experience.

- Legal aspects
It is important to respect all national and EU legislation, in particular in terms of the criteria about the persons and organisations which make such assessments
- Time and costs
In order to stimulate innovation and surely not to hinder innovation, it is important that the duration for the assessment can be short and at reasonable costs.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

Several countries have already a procedure in place for handling such technologies, i.e. Belgium (reference), France (reference) and the Netherlands (reference).

The overall TOPIC of these national procedures is very similar, but in practice there are differences in approaches, as well in terms of legal framework, the kind of technologies to be covered, financial aspects...

REFERENCES:

1. ASIEPI project – [WP on assessment of innovative systems](#)
2. ASIEPI project – [Presentation on demand 'EPBD as support for market uptake of innovative systems'](#)
<http://www.asiepi.eu/wp-6-innovative-systems/presentation-on-demand.html>

Conference papers on BE-FR-NL approach

QUESTIONS:

- Is there in your country of interest a procedure for handling such innovative technologies?
- Do you know manufacturers who are confronted with such type of barrier?

4.9 Robust technical handling at project specific innovative concepts

TOPIC:

Robust technical handling at project specific innovative concepts

CONTEXT AND MOTIVATION:

As already indicated in §4.8, the need for a robust framework for handling technologies not covered by the standard EPC procedure is more important if there is a strict compliance framework. If such framework is not existing, there is basically no market for such technologies.

In §4.8, the focus is on products and systems which can be installed in any buildings and whereby it is possible to have a project independent assessment. However, there can be also cases where the technology

is so project specific that the analysis should be done at project level. An example could be a big office building which uses a nearby river as source for a heat pump, whereby this technology is not integrated in the standard EPC method.

As is the case for §4.8, this aspect is important within the scope of QUALICHeCK as the lack of such procedures might be very problematic in a legal framework where there is effective compliance and enforcement. In case of no compliance and enforcement, it is of less concern if innovative concepts are supported or not.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- One wants to realise a big office building project, whereby the nearby river as cold source for a heat pump based heating system. The legal calculation procedure does not foresee the possibility to use a river as a cold source for heat pump.
- (other examples...)

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- This kind of request is probably more typical for larger projects.
- It is very important that the assessment time is reasonable, if not there is in practice no market
- The assessment by the government or by organisations designated by the government of the applied methodology typically requires expert knowledge. It might be useful to consider a panel of competent experts. In small countries, it might be challenging to find such panel which guarantees a sufficient degree of independence from the submitters of proposals

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

This paragraph will be developed in a later phase

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- Are there in the EPC procedure possibilities to assess specific design solutions and/or technologies at project level which are not covered by the official EPC procedure? If so, is it covered in the legislation? Is there experience in practice? Are there practical limitations (e.g. only technologies or concepts with a minimum improvement)

4.10 IT can help to minimise the risk of non-compliant EPC input data

TOPIC:

IT can help to minimise the risk of non-compliant input data

CONTEXT AND MOTIVATION:

There can be several reasons for not-compliant EPC input data. This can be e.g. a lack of understanding of certain aspects, an error when introducing data in the EPC calculation tool...

In principle, these kind of problems are fully the responsibility of the persons in charge of the calculation. However, a good IT environment can help to minimise the risk of such kind of errors and related non-compliant input data. Such functionalities can also help to increase societal support in case of strict sanctions for non-compliance.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- The efficiency of a heat exchanger must be introduced as percentage. For a heat exchanger with an efficiency of 78%, one introduces 0.78.
- There are 12 PV panels with each a nominal power of 250 W, i.e. a total power of 3 kW. In the software, 12 panels are introduced with each a nominal power of 3 kW. This results in a much too optimistic EPC result.
- The thermal conductivity of an insulation material is wrongly introduced, e.g. 0.32 W/mK instead of 0.032 W/mK (resulting in a too negative result). As long as the building energy performance requirements are met, this should not result in a sanction, but such kind of errors should be avoided.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It can be useful to associate with the various input parameters conditions resulting in a warning and conditions resulting in a non-acceptance of the introduced value:
 - **Non-acceptance:** if the submitted data is not possible, e.g. an efficiency of an air to air heat exchanger of more than 100%, a negative lambda value,
 - **Warning:** in case a value is outside a reasonable range, e.g. a nominal power of a PV panel of more than 500 W, an efficiency of an air to air heat exchanger of less than 1%

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- The availability of databases of input data, which are coupled to the software for calculating the EPC can avoid the risk of such errors
- The use of files giving product characteristics in the context of BIM should help to avoid such errors (see Chapter 10).

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars...).

QUESTIONS:

- Does the EPC calculation tool include automatic checks regarding correctness of input data? (see examples above)

4.11 Recognition of the competence of persons or companies for specific aspects

TOPIC:

Recognition of the competence of persons or companies for specific aspects

CONTEXT AND MOTIVATION:

To improve compliance and to help for showing evidence of compliance of EPC input data, a previously recognised competence of persons or companies may be useful:

- EPC input data that are made available by a manufacturer or found into a database may result from measurements operated by an accredited laboratory,
- Data that are recorded by an expert or measured on site may be determined by a certified or qualified person or company,
- Choosing the relevant data that are fixed by a legislation (for example finding the correct value into a thermal bridges atlas) may be done by a certified or qualified person or company.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Without previous recognition of a testing laboratory, it may be necessary that the procedures require that the EPC input data for construction products and systems are provided together with a report showing that all aspects of the technical procedures have been fulfilled (detailed description of the testing installation, of the measuring appliances used, of their calibration, of the corrections brought to the measured values to take into account the calibration certificate,...)
- Without previous recognition of experts that record data describing the building or its systems, it may be necessary that the procedures require that all the data used for the EPC calculation are provided together with detailed information about the way they have been determined
- Without previous recognition of experts that measure data on site, it may be necessary that the procedures require that the measured data are provided together with a report showing that all aspects of the technical procedures have been fulfilled (detailed description of the preparation of the measurement, of the conditions of measurement, of the measuring appliances used, of their calibration, of the corrections brought to the measured values to take into account the calibration certificate,...).

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

According to the needs, procedures may require either qualification, certification or accreditation:

- Qualification is the recognition by a third party that a person or a company has the ability, quality, or attributes to perform a particular job or task, after successful completion of a course or training or passing of an exam or an audit.
- Certification is the procedure by which a third party gives written assurance that a product, a process, a system or a person conforms to specified requirements mentioned in the rules of the relevant certification scheme.
- Accreditation is the recognition by a third party of the competence of a conformity assessment body to carry out specific conformity assessment tasks. Accreditation only applies to conformity assessment activities, such as tests and inspections. Accreditation also applies to certification bodies for their activity of certifying a product, a process, a system or a person.

With such definitions, it may be interesting that the organisational procedures for the determination of the EPC input data, and/or the procedures for the evidence of compliance of these data make reference to:

- Qualification of persons (for example: qualification of experts for establishing the EPC of an existing residential building, relying on a training followed by a successful exam),
- Qualification of companies (for example: qualification of a company for measuring building airtightness, relying on the training of employees, an examination of the measuring devices and a relevant quality insurance system),

- Accreditation of testing laboratories according to EN ISO/IEC 17025, for the measurement of product data, and if appropriate of certain data measured on site,
- Accreditation of inspection bodies according to EN ISO/IEC 17020 (for example: accreditation of the body that checks the compliance of the EPC input data),
- Certification of management systems implemented by companies, inspection bodies or certification bodies (for example: certification of the management system of a building company for the construction of airtight buildings, allowing for non-systematic measurement of building airtightness)
- Certification of services (seen as a process) provided by companies or inspection bodies (for example: certification of the service consisting in establishing an Energy Performance Certificate),
- Certification of persons (for example: certification of experts for establishing Energy Performance Certificates for all types of non-residential buildings).

It may also be required that such certifications of management systems, services or persons are managed by certification bodies that are themselves accredited:

- for certification of services and processes, according to EN ISO/IEC 17065,
- for certification of systems, according to EN ISO/IEC 17021,
- for certification of persons, according to EN ISO/IEC 17024.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- Schemes for the recognition of the competence of building airtightness testers have been implemented in the Czech Republic, Denmark, France, Germany, Ireland, Sweden, the United-Kingdom.
- A certification of the quality management system of construction companies regarding the airtightness of buildings has been implemented in France; certified companies benefit of a non-systematic measurement of building airtightness.

REFERENCES:

- How to get compliant and accessible data for the energy rating calculation of a building? - Overview of some existing approaches, François Durier (CETIAT, France) and al., October 2014, <http://qualicheck-platform.eu/results/reports/>
- Building regulations can foster quality management: the French example on building airtightness, François Rémi Carrié (ICEE, France), Sandrine Charrier (CEREMA, France), January 2015, <http://qualicheck-platform.eu/results/factsheets/http://qualicheck-platform.eu/results/factsheets/>
- Air-permeability testing of new dwellings & buildings in the UK: challenges to maintaining standards, Barry Cope (ATTMA, UK), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>
- Certification of persons issuing OVK and energy performance certificates. Magnus Jerlmark (Kiwa, Sweden), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>
- Qualification of airtightness testers, Paula Wahlgren (Chalmers, Sweden), Magnus Hansén (SP, Sweden), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>
- Building airtightness: towards improved and reliable declared performances, Clarisse Mees (BBRI, Belgium), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>
- Overview of competent tester schemes for building airtightness, François Rémi Carrié (ICEE, France), slide presentation at QUALICHeCK Workshop, Lund, March 2015, <http://qualicheck-platform.eu/events/workshops/>
- Competent tester schemes for building airtightness, Valérie Leprince (PLEIAQ, France), François Rémi Carrié (ICEE, France), pp. 16-17, REHVA Journal, Volume 52, Issue 4, August 2015

QUESTIONS:

- The cost for the recognition of competence is usually paid by persons or companies that request for it. Is it always compensated by simplifications in the procedures or is it sometimes an additional cost?
- Are there clear criteria to decide about the level of requirements to get a qualification or a certification?
- Does the level of requirements to get a qualification or certification always results from a compromise between professionals that would like less requirements and administration that would like more requirements?

4.12 Specific attention for procedures regarding existing buildings

TOPIC:

Specific attention for procedures regarding existing buildings

CONTEXT AND MOTIVATION:

The EPBD (Directive 2010/31/EU) requires that Member States ensure that an EPC (energy performance certificate) is issued for:

- (a) buildings subject to major renovation
- (b) buildings or building units which are constructed, sold or rented out to a new tenant; and
- (b) buildings where a total useful floor area over 250 m² is occupied by a public authority and frequently visited by the public.

This means that EPC input data have to be determined not only for new buildings but also for existing buildings.

While data availability and quality of input data might be better in case of major renovations due to the simple fact that they are needed for planning renovation measures, data availability and thus also EPC compliance may be problematic in the two other cases.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- In existing buildings, it may be difficult or even impossible to get all the information required by the procedures. The procedures for determining EPC input data may be not adapted to the specific case of existing buildings, where information about the construction products used, their characteristics, the way they have been implemented, the performance of the systems... may be not available.
- In most cases, the determination of EPC input data for existing buildings will rely on observations, records or measurements operated on site: the procedures may not be adapted to this specificity.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- As for all EPC input data, there is a need for three very clear procedures:
 - Clear technical procedure explaining how to record or measure on site the data (see 4.1)
 - Clear organisational procedure giving the organisational requirements linked to the onsite determination of the data (see 3.3.3)
 - Clear procedure for evidence of compliance (see 4.2)
- These procedures should be adapted to the case of existing buildings, taking into account that some required information may be not easily accessible or even impossible to find, record or measure. They should use default values as necessary (see 4.4 and 5.22).

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

This paragraph will be developed in a later phase (see 5.22).

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICheck (factsheets, webinars...).

QUESTIONS:

4.13 (Other points of attention?)

In case stakeholders identify other potential relevant points of attention, please inform the QUALICHeCK consortium, preferably by mail to info@qualicheck-platform.eu.

5. Best practices PART 2: Legal framework for better enforcement and effective penalties

It is important to have an effective enforcement and sanctioning framework in place in order to drive the market towards good energy efficiency performances.

In the current EPBD version,

Article 18 “Independent control system” requires

- The implementation of an independent control system for energy performance certificates and reports on the inspection of heating and air-conditioning systems in accordance with Annex II.
- The Member States may delegate the responsibilities for implementing the independent control systems in compliance with Annex II and shall require the energy performance certificates and the inspection reports referred to in paragraph 1 to be made available to the competent authorities or bodies on request.

Article 27 “Penalties” requires that

- “Member States shall lay down the rules on penalties applicable to infringements of the national provisions adopted pursuant to this Directive and
- Shall take all measures necessary to ensure that they are implemented. The penalties provided for must be effective, proportionate, and dissuasive.

In this chapter, the focus is on the rules and formal procedures (i.e. “Member States shall lay down the rules on penalties applicable to infringements of the national provisions”), whereas chapter 6 is focusing on the application in practice (i.e. “Shall take all measures necessary to ensure that they are implemented”)

Societal support for EPBD implementation is important (more information see chapter 8) as well as an effective framework for enforcing compliance. In this chapter, the focus is on the legal boundary conditions.

Legal obligations imposed by the EPBD are the following ones:

New buildings and major renovations:

- The availability of the EPC
- Meeting minimum energy requirements regarding specific systems and building components
- Meeting minimum energy requirements regarding energy performance indicators

All buildings and building units:

- The availability of the EPC in case of construction, sale or rent
- EPC to be presented and handed over to buyers and renters
- EPC indicators to be published in the media when selling or renting
- EPC to be displayed in public buildings and buildings frequently visited by the public

With regard to the EPC, non-compliance can occur at different levels (for more information see chapter 3.4):

- input data needed for calculating the EPC can be non-compliant (i.e. they have not been established in line with the procedures in force in the context of the applicable legislation), or
- the way to calculate the energy performance rating of the building can be non-compliant (i.e. the calculation has not been operated in line with the procedures in force in the context of the applicable legislation), or
- the energy performance rating of the building mentioned in the EPC, which is used to check whether energy performance minimum requirements are met or not, can be non-compliant.

In all cases it is important to have an enforcement framework in place in order to drive the market towards good energy efficiency performances.

In the following paragraphs, various aspects related to the legal framework are identified, whereby good practice examples are provided. This list is quite long and it reflects the many aspects to be taken into account in order to be able to come to an appropriate legal framework.

5.1 Clear procedures regarding communication with authorities

TOPIC:

Clear procedures regarding communication with authorities

CONTEXT AND MOTIVATION:

It is crucial that the legal framework specifies WHEN and WHICH TYPE of information has to be communicated, e.g.:

- At which moment of the building process is communication with the authorities necessary?
- What type of information has to be communicated?
- Which procedures exist regarding confirmation of information?
- (other aspects)

EXAMPLES OF PROBLEMATIC SITUATIONS:

- In case the legislation does not clearly specify the latest moment to submit the EPC, it is not possible to have an enforcement/penalty if no EPC is submitted.
- In case the legislation does not clearly specify the practical procedure for submitting the EPC (by post, registered mail, by web application...), it will be not evident to have an enforcement/penalty due to non-submission of the EPC.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It is important to check systematically if all communication aspects with the public authorities are precisely described in the legislation.
- A well-developed web application can substantially contribute to efficient communication with the public authorities

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

This paragraph will be developed in a later phase

REFERENCES:

-

QUESTIONS:

- Is your legislation clear in terms of how information exchange has to be done with the governmental services in charge of EPC implementation?

5.2 Philosophy on type of requirements and requirement levels

TOPIC:

Philosophy on type of requirements and requirement levels

CONTEXT AND MOTIVATION:

Most countries have, in addition to a requirement in terms of primary energy consumption, additional requirements:

- Related to energy use, e.g.:
 - Minimum component requirements
 - Net heating and/or cooling demand
 - Building airtightness

- Minimum contribution of renewable energies
- Related to indoor climate, e.g.:
 - Summer comfort
 - Indoor climate and indoor air quality
 - Daylight availability
- Related to energy flexibility, smart grid, ...

It is important in all circumstances to critically evaluate if such requirement is necessary and/or whether it is better to consider another type of requirement.

Once a type of requirement has been decided, there is also the choice of the requirement level.

EXAMPLES OF PROBLEMATIC SITUATIONS:

The following examples might lead to problematic situations or may create unnecessary burdens in terms of design process, building costs, ...

- Imposing severe airtightness requirements
(To be completed)
- Imposing very low U-value for windows
(To be completed)
- Imposing heat recovery with a minimum efficiency
(To be completed)
- Imposing very low U-value requirements for common walls
(To be completed)

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

For each of the potential requirements, there are at least 2 key issues of concern:

- Make objective the motivation for imposing such a requirement.
 - There can be more than one objective for imposing such requirements.
 - It is important to evaluate if the requirement is needed for meeting the objective. It is not always sure that the requirement is effectively needed for meeting the objective. Moreover, a requirement could make sense in the past but less necessary today for a given objective (see below example on glazing)
- Critically analyse and motivate the requirement level.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

U-value glazing

- In the past, a major motivation to impose maximum U-values was because of thermal comfort considerations (motivation: comfort)
- In the case of passive houses whereby the aim is to avoid a classical heating system, imposing a U-value corresponding with triple glazing can be a good approach. (motivation: limited peak power)
- In most countries and in order to avoid unreasonable choices, one can impose a maximum U-value of 1.1 W/m²K (corresponding with low-e, argon filled double glazing) as such glazing is at present of a quite similar price level as ordinary double glazing (motivation: cost-optima choice in ALL cases)

Building airtightness

- Passive houses: logical choice to impose a severe requirement (motivation: limited peak power)
- In general: imposing a requirement requires a test and related costs.
- ...

Net heating and cooling demand

- ...
- ...

REFERENCES:

- This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars...)?

QUESTIONS:

- Do you have a good justification for imposing a certain type of requirement?

5.3 Conformity with EU legislation

TOPIC:

Conformity with EU legislation

CONTEXT AND MOTIVATION:

There are several EU legislations (construction product regulation, workers' rights to free movement, EU rules governing State Aid and Competition, ...) containing specifications which have to be respected when developing legal procedures in relation to EPBD compliance handling.

- In the context of the EPBD, the **Construction Product Regulation (EU) No 305/2011** is especially important, imposing the free circulation of construction products in the EU's Single Market, meaning that products have to be tested only once according to a harmonised European standard or European Assessment Document. This has to be taken into account when setting rules on how to check compliance.
- Regulation (EU) No 492/2011 and Directive 2014/54/EU are crucial in the context of freedom of movement for workers, meaning that qualification requirements targeting the workforce for establishing the EPC must be set without excluding workforce from abroad. This has to be taken into account when setting rules how to ensure compliance of the EPC and how to check compliance.
- EU rules governing State Aid and **Competition** have to be respected when it comes to offering incentives for good compliance instead of punishing lack of compliance.

Looking at **EED 2012/27/EU** and EPBD implementation, some potential overlaps can be identified: Implementation of article 5 EED "Exemplary role of public bodies' buildings" will be facilitated if it is possible to build on the compliant implementation of the EPBD. However, if the responsibility for transposition is with different public entities, it will be difficult if not impossible to tap the full potential of synergies and exchanging information about non-conformities and the respective consequences regarding enforcement and sanctions. Usually, timelines of transposition and implementation are different and can hardly be harmonized. In countries, where the same public body is in charge of both Directives, synergies can be generated, e.g. regarding legal framework for data collection, inspection procedures, database implementation, certification of experts, and sanctions.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Examples of procedures clearly not in line with the requirements of the Construction Product Regulation are the following ones:
 - For construction products covered by a harmonised European standard, a country imposes that some data have to be included in its national product database used for the EPC calculations, being there in contradiction with the requirement that the performance of these products must be declared according to the rules of the Construction Product Regulation.
 - A country imposes for CE marked construction products some national additional assessment checks.

- For a construction product for which no harmonised standard exists and whose performances may not (or may not fully) be assessed on the basis of an existing harmonized standard, a country imposes an assessment according a national scheme without allowing the equivalence of foreign equivalent schemes.
- Regarding freedom of movement for workers, it will violate EU legislation if qualification specifications are limited to having passed a defined course or training programme, instead of determining requirements to be met, for example according to qualified tester schemes which have started to spread in Member States.
- EPBD implementation is at regional level and EED implementation is at federal level and there is no plan to tap the potential of synergies and exchange of non-conformities.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

Other EU legislation has to be observed to keep track with latest developments and avoid potential conflicts. Also in this regard stakeholders' involvement is crucial because it allows for making use of their expertise in various special fields relevant for EPBD implementation.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **EPBD products database in Belgium:** The EPBD database was developed in close collaboration with the stakeholders involved. Inclusion in the database is not mandatory, but only aims to simplify the work for the building sector and in case of compliance checks. The only guarantee given by the database is that the values in the database will never be questioned in case of EPC compliance checks, but no guarantee is given in case the data are used outside the context of the EPC calculations.
- **Qualified tester scheme:** Mandatory building airtightness testing is considered in many European countries because of the increasing weight of the building leakage on the overall energy performance of low-energy buildings. The reference testing protocol in Europe is described in EN 13829. In addition, many countries have developed specific guidelines to detail or adapt EN 13829 requirements, also regarding the tester's knowledge and know-how.

REFERENCES:

- François Durier: "Towards compliant and easily accessible EPC input data" How to get reliable and accessible data for the energy rating calculation of a building? Overview of some existing approaches. Draft report for discussion with stakeholders, 30 October 2014
- Valérie Leprince and François Rémi Carrié: Reasons behind and lessons learnt with the development of airtightness tester's schemes in 11 European countries. AIVC workshop on Quality of Methods for Measuring Ventilation and Air Infiltration in Buildings, March 18-19, 2014, Brussels, Belgium
- EPBD Concerted Action <http://www.epbd-ca.eu>

QUESTIONS:

- Do you have any experience with other EU legislation hindering EPBD compliance handling in your country?
- Are there any problematic elements in EU rules governing State Aid and Competition in this regard?
- Do you have good examples to report how other EU legislation helps EPBD compliance handling in your country?

5.4 Philosophy on timeline for evolution of requirements

TOPIC:

Philosophy on timeline for evolution of requirements

CONTEXT AND MOTIVATION:

The timing for imposing EPC related requirements is a crucial aspect, in particular if there is an effective compliance framework. Timing has 2 dimensions, i.e.

- the time between the decision on the requirement (level) and the date of become in force
- the speed of evolution in the requirements

Minimum time before announcing the requirement and become effective

In case of no or light enforcement, it might be acceptable and not so critical if in the first year there is not a real fulfilment of the requirement as there are no severe penalties such as fines, loss of license. In such context, one can focus on a progressive move to meeting the requirement.

In case of a legal framework with strict compliance and enforcement, this is not evident. One has to meet from the start the requirements. Therefore, an appropriate timing for imposing requirements is crucial for a societally supported enforcement.

Time steps between increase of requirements

A building project from conception till occupation typically takes several years. Moreover, most of the building projects are in many countries done by (small) PMEs. It is important that the building sector has time to become used with a certain requirement level before an increase in requirement level is imposed.

With respect to the increase of the requirements, early communication is important as well as an in depth check of the feasibility in increase of requirements.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Very short time between decision and date of implementation. E.g. a governmental decision on November 15 to impose new requirements for building permits from January 1 onwards.
- Strengthening of requirements with very short time intervals

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- The design process for setting up a new building often starts quite a long time before the building permit is submitted. In particular for larger apartment buildings, office buildings, schools, this can take several years.
- In case architect competitions are organised, the whole process can take quite some time before announcing the competition and the start of the work. It is crucial that the requirements which will be in force at the moment of the request for building permit are known at the start of the competition.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- In case of envisaging a strict compliance framework, is there enough time foreseen between the time of adoption the legislation and the time of becoming effective?
- Is there a strict compliance framework from the start of the legislation or is there a possibility for a transition period?

5.5 The point of time for proof of EPC compliance

TOPIC:

The point of time for proof of EPC calculation

CONTEXT AND MOTIVATION:

In the past, most EU countries required to show compliance with the building regulations at the moment of the building permit. In practice, it often happens that modifications occur after the building permit. These modifications can be at building layout level, component areas (windows), materials, use of technology... From a societal and economic point of view, most of these changes can be justified due to changing specifications of the owners, more economic solutions, new technologies.

However, it is important that such changes are included in a transparent way in the EPC calculations. If not, an effective compliance framework will be very difficult and risks to miss the required societal support.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Basically, all cases where it is not possible to update the EPC calculation after the moment of the building permit.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It is highly recommended to impose proof of compliance at the end of the works, i.e. the EPC declaration describes what has been effectively constructed. In case of control, there is then less risk for discussion.
- In addition of an EPC calculation at the end of the works, it might be useful to also impose the availability of the EPC at another time, e.g. at the moment of the building permit. A motivation for such additional requirement can be the objective to reduce the risk that the requirements will not be met, to inform the investor of the type of measures to be taken... See §5.11.
- It is very important that there is clarity about who is responsible for submitting the EPC.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- This paragraph will be developed in a later phase

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- At which time steps is there a mandatory reporting to the government (building permit, start of the works, end of the works, a certain period after the end of the works, ..)?
- Is it possible or required to make the EPC declaration at the end of the works? If not, why is this not possible?

5.6 Availability of legal procedures for penalising different types of non-compliance

TOPIC:

Availability of legal procedures for penalising different types of non-compliance

CONTEXT AND MOTIVATION:

The availability of operational legal procedures for handling (detecting and punishing) different types of non-compliance is essential if one wants to take effective measures. Within such a context, it is important to check whether such legal procedures exist for the following types of non-compliances:

1. No submission of required documents or not done in due time

2. EPC declarations not done according the legal specifications (e.g. specifications regarding persons who can make the declarations) or using a wrong value of the energy performance
3. EPC declaration not meeting one or more performance requirements
4. Non-compliant input data used in the EPC calculation
5. EPC indicators not published in real estate advertisements or not made available when selling or renting a property
6. EPC not hung out in public buildings and buildings frequently visited by the public

EXAMPLES OF PROBLEMATIC SITUATIONS:

- A legislation without specification related to penalties in case of non-compliance. Without such specifications, it probably is impossible to implement penalties.
- (other examples?)

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It is important to have specifications regarding the various possible types of non-compliance (as listed above).
- It is important to clearly specify the authorities who are authorised to deal with sanctioning in case of non-compliance. This issue is further discussed in §5.15.
- It is important to clearly specify the type and level of the possible sanctions in case of non-compliance. This issue is further discussed in §5.7, §5.8 and §5.9).
- In order to minimise potential discussions, it might be very important that the legislation clearly identifies who will be penalised in case of non-compliance. This issue is further discussed in §5.9.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

Checking compliance with energy performance minimum requirements in new constructions and major renovations: automatic checks based on central EPC-database and detailed specific checks; e.g. Belgium, Portugal, Denmark, Ireland

Checking energy indicators in advertisements in commercial media: mandatory guideline how to present indicators in the media, Ireland; partly publicly accessible EPC database to check published indicator values, UK

Checking the handing over the EPC including recommendations for improvement when renting or selling: e.g. transaction through notary, the Netherlands

Checking the display of EPCs in buildings owned by the public and/or visited by the public: e.g. unambiguous definitions, inspection procedure, Slovenia

REFERENCES:

- Factsheet on compliance checking and sanctioning systems (under development)
- EPBD Concerted Action <http://www.epbd-ca.eu/>

QUESTIONS:

- Are you aware of specifications regarding the various possible types of non-compliance in your country?
- Is it clearly stated who is the responsible authority to penalise whom in case of which type of non-compliance?

5.7 Types of penalties in case of non-compliance

TOPIC:

Types of penalties in case of non-compliance

CONTEXT AND MOTIVATION:

In case of non-compliance, there should be a consequence. A whole range of actions is possible. It is important to identify the responsible entities and most appropriate measure(s) how to enforce compliance. An effective enforcement framework specifies penalties in case of non-compliance and whom they address.

- **Typical penalties addressing EPC experts are (applied in the form of a stepwise system):**
Free re-issue of EPC → Warning → Extra training attendance and examination → Suspension of license → Loss of license → Fines → Prison
- **Typical penalties addressing building owners are:** No issue of building permit, loss of building permit, no issue of permit to use, loss of financial support, entry in land registry, lower maximum rental price, fines, prison
- **Typical penalties addressing real estate agents are (applied in the form of a stepwise system):**
Warning → Suspension of license → Loss of license → Fines → Prison

The work of the leader of the design team and the leader of the construction workforce is usually covered by warranty/liability clauses. If they do not comply with the specification, they will have to improve until they achieve the quality defined by the contract. Other requirements imposed by quality frameworks addressing the quality of the works are covered in the sourcebook xxx.

EXAMPLES OF PROBLEMATIC SITUATIONS::

- The leader of the design team and the leader of the construction workforce are responsible for achieving the energy performance minimum requirements imposed by the building legislation. However, a procedure how to check whether results comply with the specification is often not available, and warranty clauses are not applied.
Penalties are not proportionate, for example: the building owner decides to pay the fine as this is cheaper than to comply with the legislation

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- Analyse which types of penalties have the most chance to be effectively implemented and controlled (see also STEP 3).
- The choice of the type of penalty might take into account the approaches in other domains in the country.
- Punishing is always very sensitive because it might have very serious consequences for the economic activity of a person/company. Therefore, societal support is crucial and it might be preferential to decide on the type of penalties after (intense) consultation with the stakeholders.
- In some countries such as Austria, financial support (grants and subsidised loans) is very important for improving energy efficiency of new buildings as well as of existing buildings. Therefore, withdrawal of financial support is an important penalty, however difficult to implement due to political reasons.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- Portugal: Stepwise penalty system addressing EPC experts
- Belgium: Stepwise penalty system addressing real estate agents
- Austria: Financial support scheme addressing building owners

REFERENCES:

→ Factsheet on compliance checking and sanctioning systems (under development)

QUESTIONS:

- What are typical penalties addressing EPC experts, building owners, and real estate agents in your country?

5.8 Clarity in size of penalties

TOPIC:

Clarity in size of penalties

CONTEXT AND MOTIVATION:

Imposing penalties is a sensitive issue. In case of e.g. financial penalties, it is very important that the rules for these penalties are as transparent as possible and the outcome of consultation with the stakeholders.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- The legislation does not contain information about the principles for penalties.
- The legislation only specifies a maximum financial amount for the penalty but no precise rules. On the one hand, this gives a large degree of freedom to the person/organisation in charge of the penalties, but it risks to lead to arbitrariness and more risk of legal disputes.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- A possibility is to make financial penalties proportional with the degree of non-compliance. This will simplify the decision process for the persons in charge of the penalties and it will also minimise risks of legal disputes.
- One might exclude certain aspects from penalties in the EPC context, in case there are other possibilities for compliance stimuli or if the requirement is too strict in some cases. If so, one can also consider it as guidance values and not requirements.
- In case of financial penalties and in order to limit the number of dossiers with penalties, it might be useful to consider a minimum amount of penalty, whereby lower penalties are not implemented.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **Belgium:** The compliance and enforcement approach for new buildings is in the 3 Regions based on fines. These fines are all given in the legislation. In case of non-compliance regarding the U-value, the fine is 60 € per W/K. If the total amount of the penalties is less than 250 €, no sanction has to be paid. The software for calculation the EPC for new buildings automatically calculates the penalty in case of non-compliance.
- **Examples from other countries?**

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICheck (factsheets, webinars, ...).

QUESTIONS:

- Does the EPC legislation specifies the principles for sanctioning?
- Does the EPC calculation allows to estimate in advance the penalty which results from non-compliance?

DRAFT FOR REVIEW

5.9 Clear procedure about who is sanctioned in case of non-compliance

TOPIC:

Clear procedure about who is sanctioned in case of non-compliance

CONTEXT AND MOTIVATION:

Penalties in case of non-compliance often occur in the building sector. If handled by a judge, an important part of the process is to identify the persons/organisations with a liability. It regularly happens that several parties are liable for a part of the damage, whereby the judge identifies these percentages.

In case of EPBD related non-compliance, it sometimes is very clear who is liable (e.g. when no EPC is submitted). However, for various types of non-compliance (not compliant calculation, not meeting the requirements ...), the responsibility might be spread over various parties (see examples below). In such a case, it might not be easy to identify the specific liabilities and the related penalties.

An approach whereby in the governmental context the liabilities are always with specific parties might be an interesting option. See further.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- The EPC declaration specifies that the U-value of the window is 1.58 W/m²K. In practice, it proves that according to the foreseen calculation procedures, the best possible U-value to be used is 2.67 W/m²K. The applicable legislation specifies that the energy administration must sanction the organisation(s) in charge of this error. The analysis of this case leads to the following findings:
 - The person who has made the EPC calculations states that he got this value from the contractor
 - The contractor states that he got this value from the manufacturer. Moreover, he states that the owner has asked for another window type than originally foreseen.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- A major choice to be made in the legislation is to identify which governmental entity is in charge of sanctioning. This issue is discussed in §5.15.
- In general, but in particular in case of sanctioning by governmental administrations, it is important to avoid that the civil servants have to become a kind of detectives to identify who is involved in the non-compliance act and their relative contribution.
- It might be useful to make a distinction between:
 - The non-compliance handling and penalties in the relation 'government – building project'
 - The non-compliance handling and penalties within the building project itselfAn example of such approach is found in the Flemish legislation (see further)
- This aspect of sanctioning is very sensitive for the stakeholders. It is probably very important to set up an active involvement of the stakeholders in the process leading to the legislation.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **Flemish approach.** The legislation specifies that:
 - The Flemish Energy Agency is in charge of the compliance checks and related sanctioning
 - Depending on the type of non-compliance, it is clearly specified who will be sanctioned. It means that the energy administration has not to analyse who is responsible for the non-compliance
 - Moreover, the amount of sanctions is fully specified in the legislation
- Other approaches?

REFERENCES:

- Factsheet on Flemish legal framework for compliance and enforcement

QUESTIONS:

- In case non-compliance is observed, it is automatically clear which party/parties in the process are liable for this non-compliance? If not, is there not a big risk that the identification of liabilities may require a lot of efforts for the controlling organisation and/or a large potential for legal disputes about liabilities?

5.10 Penalties should be proportional with the degree of non-compliance

TOPIC:

Penalties should be proportional with the degree of non-compliance

CONTEXT AND MOTIVATION:

It is important that sanctions are proportional with the degree of non-compliance. If not, societal support might be not obtained at all or get quickly lost.

Penalties are not only a means of enforcing energy efficiency legislation but above all a means of improving actual energy efficiency in buildings. Therefore, it is important to have proportional sanctions in place to achieve actual progress, because:

- inadequately severe penalties might result in developing strategies how to avoid control;
- inadequately light penalties might result in the strategy to accept the sanction rather than comply with the legislation.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Penalties are not proportionate, e.g. not aligned with the impact of the mistake.
- Penalties are exaggerated, e.g. in case of a faulty EPC an unjustifiable multiple of EPC cost.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It might be useful to have a sanctioning scheme, which is proportional with the importance of non-compliance, e.g.:
 - In case of no-delivery of an EPC declaration: sanction proportional with the building size
 - In case of non compliance with the EPC requirement: sanction proportional with the difference in kWh/year
- Definitions must be unambiguous in order to avoid objections and associated procedures putting additional administrative burden on the authority.
- Penalties will be only effective if a control system is also in place (clear procedures how to detect non-compliance and how to react in case of non-compliance).

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

Non-compliance with EPC requirement: In Belgium / Flemish region the Energy Decree imposes a fine in case the EPC and supporting calculations do not comply with reality, and the severity depends on the degree of non-compliance:

$$\text{Fine} = x * \Delta y$$

Δy = difference between performance in calculation and performance as-built according to VEA

X = depending on how severe the mistake is

If the Flemish Energy Agency VEA detects a difference between EPC and as-built situation, the authority will be entitled to ask for a new EPC and to impose the applicable fine. 'Big mistakes' result in fines beyond 250 €.

No-delivery of EPC declaration: In Belgium / Flemish region the legislation allows penalties in the range of 500 to 5000 €. However, in practice the usual fee is 500 €. If there is an agent involved, the fine will be imposed on the real estate agent and not on the building owner.

Wrong declaration: In Italy / Lombardy region an innovative strategy to discourage experts from declaring EPC classes higher than reality has been put in place: an extra fine is calculated proportional to the building area; this fine adds to the administrative sanction.

REFERENCES:

- Factsheet on Belgium/Flemish region control and sanctioning scheme (under development)
- EPBD Concerted Action <http://www.epbd-ca.eu/>

QUESTIONS:

- How do you assess the attitude towards penalties in your country?
Are you aware of effective proportionate penalties in your country you would recommend also to be introduced in other countries?

5.11 Rewarding instead of punishing?

TOPIC:

Rewarding instead of punishing?

CONTEXT AND MOTIVATION:

It seems quite logical to handle non-compliance issues by penalties. It might be good, in particular in terms of societal support, to look for means whereby good compliance is awarded. There might be opportunities for the market. An example can be the financial/insurance sector who could give better conditions in case there is a framework for increased confidence in the compliance of the EPC information.

EXAMPLES OF PROBLEMATIC SITUATIONS::

When setting the framework, the conditions for being rewarded are made too demanding in terms of requested compliance checks and associated supporting documents. This results in building owners moving forward without the rewarding system and thus also avoiding the associated control system.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

The financial/insurance sector might require not only compliant EPCs but also “close to reality” EPCs, especially when it comes to correct installation of technical systems exposed to environmental hazards such as photovoltaic systems.

However, depending on the national legislation, compliant EPCs are not necessarily EPCs reflecting the actual building situation (see also chapter 5.5 The point of time for EPC calculation is crucial).

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

EPC as an evidence for rewarding improved building energy performance: In many EU countries, achieving better energy performance than meeting the minimum requirements is rewarded, and the EPC is used as an evidence. As soon as financial incentives are involved, there is the tendency that EPC compliance is checked thoroughly in order to justify the public money spent for better energy performance. Financial incentives can be grants, loans provided at reduced interest rates, or combinations of both.

In this case, the compliance framework is not the precondition to receive a financial benefit, but compliance checks are the consequence of applying for the financial benefit.

The European Investment Bank (EIB) could play a unique role as it is owned by the Member States and shall support the Member States in achieving the 20-20-20 targets. Projects are eligible if there is a proof that they will affect a significant amount of energy savings, CO₂-savings, and renewable energy. The EPC can be used as a proof, but at present it is not a mandatory condition, and financing conditions are not tied to EPC compliance.

In Austria, selected banks apply an internal building rating scheme as part of assessing creditworthiness and thus financing conditions. However, this scheme is not tied to EPC compliance but based on Green Building Rating schemes.

REFERENCES:

- More information on energy performance related building financing schemes is available at <http://www.buildup.eu/financing-schemes>.
- Factsheet on financial/insurance sector and rewarding energy efficiency and green building quality

QUESTIONS:

- Are you aware of a financing institution / insurance in your country rewarding compliant EPCs?
- In case there are no such instruments in your country due to weaknesses related with the EPC: which EPC improvements would be necessary?

5.12 Considerations regarding imposing a similar type of reporting at different time steps

TOPIC:

Considerations regarding imposing a similar type of reporting at different time steps

CONTEXT AND MOTIVATION:

It is important to limit the administrative burden and in particular to avoid the need to provide redundant information. In that context, it might be sufficient to ask in the legal context for an EPC declaration at e.g. the end of the works and no other obligatory communication at earlier stages. Of course, the organisations involved in a specific project might decide to do the EPC calculation at other moments in the process, but then on a voluntary basis.

However, it can be justified to impose a reporting at other moments in the building process. A major reason can be the concern to limit the risk of having at the end non-compliance problems. If so, it is then very important to have:

- on the one hand convincing arguments for such extra obligation(s) and
- on the other hand a strong support (or ideally a request) from the stakeholders.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Imposing the calculating and communicating the EPC at different moments (building permit, start of the work, end of the works, ...) can be considered by the market as unnecessary work which increase the cost of the buildings.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- From a purely rational point of view, there is no need to have a governmental requirement to carry out EPC calculations at different time step, as there is only one value which counts in the legal context.
- Although stakeholders are in general not in favour of extra obligations, it might be that they consider it useful to have such extra duties, as it might reduce the risk of non-compliance and therefore lower risks for liabilities and penalties.

- In case the stakeholders ask for such calculations at different time steps and in particular if also the stakeholders who have to do this work are in favour, it is probably useful for the government to consider such demand as it will increase the societal acceptance of the legislation.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- Example of 1 or 2 countries which such multiple requirement?
- If no other countries: in the Flemish Region, there was originally only the requirement to have an EPC calculation at the end of the works. However, and mainly due to requests by the stakeholders (including the architects), the legislation requires since 201X to also carry out an EPC calculation before the starts of the works

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars...).

QUESTIONS:

- Has the EPC to be calculated at different moments? If so, is there a broad support for this approach?

5.13 Minimise 'discussions' about who is liable towards the government

TOPIC:

Minimise discussions about who is liable towards the government

CONTEXT AND MOTIVATION:

In order to have an effective enforcement framework, one has to specify the principles for penalties for non-compliance and also the principles to identify the persons/organisations to which these penalties will be addressed.

In order to limit discussions about liabilities, contracts should be set up in a way that there are clear roles between partners.

Possible roles of partners involved in the EPC-context are e.g.:

- Building owner is responsible for EPC availability
- EPC expert is responsible for choosing appropriate input data for EPC calculation
- Leader of the design team and companies delivering building products are responsible for providing input data for EPC calculation
- The leader of the design team and the leader of the construction workforce are responsible for achieving the energy performance minimum requirements imposed by the building legislation as well as quality frameworks
- Third party control is responsible for carrying out the agreed checks and measurements

Without such clear procedures, it is often not evident to identify who is liable. Moreover, it often appears that several parties involved in the works have part of the liability (poor prescriptions, not correct execution, no appropriate control, ...) whereby the liabilities are designated to different parties (X % to designer, Y% percent to contractor A, ...). This situation can also occur in the context of EPB compliance. In order to come to a decent decision, it can require a lot of analysis work, designation of an expert and, in case of a decision, appeals against this decision, ...

In order to avoid such circumstances and in order to increase the probability that there is an effective sanctioning, it might be useful to consider approaches whereby this type of discussions at governmental level can be largely avoided.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- EPC has to be delivered at the moment of building permit, no possibility to modify afterwards
- Legislation specifies penalties, but no rules about identifying who is liable.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- The ‘Dossier as built’ at the end of the works can be a very good basis for a correct reporting.
- The need for clear rules about who is liable for a given non-compliance is in particular important if the decisions on non-compliance have to be made by civil servants. In the case of decisions by judges, there is typically more possibility for a judgment.
- In terms of liability, it might be useful/necessary to make a difference between
 - Public law: Liabilities in the context of EPC compliance and enforcement (relation between the government and the builders)
 - Private law: Principles and liabilities regarding contractual relations between private parties
 An example of this difference is illustrated below for the Belgian-Flemish approach
- Penalties must address the responsible actor who has caused the mistake.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- Belgian/Flemish approach: The legislation foresees that the compliance checks and enforcement is handled by the energy administration. The following principles are applied:
 - Public law - In case the EPC contains errors, the EPC rapporteur will have to pay the fine, even if he/she can show that no error was made. The motivation for this approach is that the energy administration must not become involved in the whole analysis where errors might have been made.
 - Private law - In case the EPC rapporteur gets a fine for a wrong declaration (e.g. because the roof insulation is not in line with the description in the EPC), and in case he/she had the required evidence (invoices, ...) from one of the parties to make the declaration, it should be quite straightforward to ask from this third party to pay back the fine.

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICheck (factsheets, webinars, ...).

QUESTIONS:

- Is the EPC legislation checked in terms of application in practice regarding the identification of liabilities in case of non-compliance?
- In the specific case that compliance and enforcement is to be handled by civil servants, it is of particular important to minimise the risk of endless discussions about who has to be penalised.

5.14 Specific attention has to be paid with sanctions towards private owners

TOPIC:

Specific attention has to be paid with sanctions towards private owners

CONTEXT AND MOTIVATION:

It is logical to assume that the one who commits a non-compliance has to be punished. In the case of the building owner (and in particular a private person), one has to check if it is feasible, correct and societally acceptable that such building owner is held liable for certain non-compliance acts. If there is a broad consensus that an average owner is not capable to understand the consequences of certain decisions in relation to the EPC, the result of sanctioning the owner might be the loss of societal support for sanctioning.

PW: the text below in red is not really in line with the topic of this paragraph

If an update of the EPC is required and it becomes evident that the completed building does not meet the legal minimum requirements, penalties addressing the building owner will be for example: obligation to correct the mistake, no issue of permit to use the building, entry in the land register, loss of financial support, loss of certification, lower maximum rental price, fines, prison. Depending on the type of failure and contractual setting, the building owner or the involved companies will be liable for the lack of performance. If the building owner is able to prove that the specification in the call for tender has been appropriate for achieving minimum requirements, either mistakes or fraud will be the reasons for not meeting the requirements. Rejection of executed work not compliant with the contractual obligations is part of the usual warranty/liability procedure.

Financial support is very important for improving energy efficiency of new buildings as well as of existing buildings. Therefore, withdrawal of financial support is an effective sanction.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- A private owner accepts a proposal by a contractor to install a component/system with a lower performance as originally specified, but without being warned of risks of non-compliance. As a result, there is non-compliance and a sanction for the owner.

-

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It is important to carefully check if an average building owner is capable of assessing the risk of non-compliance. If this is not evident, one should evaluate the possibility of alternative procedures.
- It might be useful to consider procedures whereby professional parties in the process receive specific roles. See below the example of the Flemish Region.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

Flemish Region (Belgium): The decree (ref) specifies 'In case the architect in charge of the control on the execution of the works observes a serious risk that the EPC requirements will not be met, he informs the parties involved...'. This specification aims to primarily protect the owner of decisions leading to non-conformity.

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICheck (factsheets, webinars, ...).

QUESTIONS:

- Has it been checked in your regulation that the foreseen sanctions towards (private) owners are reasonable?

5.15 Considerations regarding the organisation who decides on penalties

TOPIC:

Considerations regarding the organisation who decides on sanctions

CONTEXT AND MOTIVATION:

The choice of the organisation who is in charge of sanctioning can strongly determine the effective compliance handling. This clearly has to be checked in the national context.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- The country legislation specifies that non-compliance cases have to be handled by judges. In practice, and primarily due to a very heavy workload, non-compliance of EPC is not given priority due to which there is in practice no effective compliance.
- The country legislation does not specify the handling of non-compliance. In this case procedures take place according to civil law. Depending on the national legislation, complaints about non-compliance will be raised or will be rather not reported, for example in countries where legal proceedings are costly and time-consuming.
- The country legislation specifies that non-compliance cases have to be handled by the energy administration or a similar authority. Moreover, the national legislation specifies that civil servants have no interpretation freedom, i.e. if there is no doubt of a non-compliance, there must be a sanction. For example, a stupid error has been made (e.g. calculation with 120 PV panels instead of only 12 PV panels with an extremely good EPC result) resulting in a fine of 13.000 € for an individual dwelling. The civil servant might have no possibility to accept it as a mistake, whereas a judge could take into account the context and perhaps a less severe sanction.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It will most probably compromise the effectiveness of the enforcement framework if the entity responsible for sanctioning is different from the entity doing compliance checks.
- Will the designated organisation give enough priority to compliance checks and sanctioning?
- Will the designated organisation have the capacity (staff, competence, ...) to carry out these activities?
- What is the freedom of interpretation of the designated organisation in case of non-compliance?
 - The legislation can specify that handling of non-compliance cases has to be done by judges. They have freedom of interpretation, but maybe do not have enough capacity to handle EPC non-compliance cases.
 - The legislation can specify that handling of non-compliance cases has to be done by the energy administration. In the case of administrations, the regulation probably has to be much more specific about the rules for handling non-compliance than in case of handling by judges. However, rules can also include procedural aspects (what has to be done in which case), making this approach practically feasible. Also here, there might be questions about the available capacity to handle EPC non-compliance cases.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

Checking compliance and sanctioning carried out by Flemish energy administration VEA:

VEA compares the information gathered on site with the EPC input data. If mistakes are found, the expert will be asked to send plans and a proof of selected input data (not all). VEA calculates the impact of the mistakes on the final results. Further steps depend on the impact of the mistakes. If there are severe mistakes, the expert will receive an invitation for a meeting, and counterarguments will be evaluated before laying down definite administrative fine. VEA collects the fine which is used to finance the control system.

REFERENCES:

- Factsheet on Belgium /Flemish region control and sanctioning scheme (under development)
- EPBD Concerted Action <http://www.epbd-ca.eu/>

QUESTIONS:

- What is the appropriate solution for your country, resulting in an effective framework and societal support?

5.16 Specific attention for execution related performances

TOPIC:

Specific attention for execution related performances

CONTEXT AND MOTIVATION:

In case of execution related performances (e.g. building airtightness, air flow rates of mechanical ventilation systems...), there is always a possibility that the performances change after the moment that they have been measured. This can be due to various reasons, e.g. ageing, damage to the building envelope, manipulation of orifices by third parties.... Therefore, it is important to have a compliance approach which is not relying on control measurements which are done weeks, months, .. after the moment of the initial measurements.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- The building airtightness is controlled 8 months after the original test. The result appears to be (substantially) worse than the original value. From a legal point of view, it is not evident to identify which person/organisation is liable: it can be a wrong performance determination, but it can also be that the building envelope has been deteriorated in the time period between the original test and the control measurement. It can also be that damage has occurred to the building envelope.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It is important to identify systematically which EPC related input data are execution related. For these input data, it is then necessary to evaluate if there is a robust approach for assessing if the data are compliant.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **France:** the airtightness measurements in the context of RT2012 have to be done by recognised testers
- **France:** In the context of RT2012, there is also the possibility to have a quality based approach, which does not require a systematic testing, but an integral quality approach at execution level with a limited number of control tests
- **Flemish Region, Belgium:** In the context of EPC for new buildings, airtightness testing can only be done by recognised testers. Moreover, in order to avoid wrong declarations, the obtained result must be communicated to the control organisation by SMS, whereby random checks are implemented.

REFERENCES:

→ Factsheet French approach

QUESTIONS:

- Is there in the EPC procedure specific attention paid to the procedures for compliance checks for execution related input data?

5.17 Is complying with the EPC requirements sufficient – or also impose correct reporting?

TOPIC:

Is complying with the minimum EPC requirements sufficient – or also impose correct reporting?

CONTEXT AND MOTIVATION:

It is logical to have penalties in case it is found that the building does not meet the legal requirements. One should also evaluate if there are penalties in case the building effectively meets the legal requirements, but whereby the EPC states a too optimistic result.

An argument in favour of such type of sanction is to protect persons/organisations who want to do better than the legal requirements. In case there is no risk of penalties as long as the legal requirements are fulfilled, the compliance and enforcement framework will not be a stimulus for compliance in such circumstances.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- An investor wants to have a very energy efficient building. The EPC shows that this objective is met. Compliance checks highlight errors in the calculation, whereby the EPC result is worse than stated but still meeting the legal requirement. There is no sanction as the legal requirement is met. However, the investor does not get the building he expected.
- In order to have a good basis for judging if in the future more strict requirements can be imposed, a government can analyse the available EPC. In case a substantial proportion is better than the present requirements, this can be a good argument for a more stringent requirements. Of course, this conclusion is only possible if one can have trust in EPC declarations with (significant) better results than the minimum requirements.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- In case a government wants to create confidence in the EPC, it seems logical to have also sanctions in case the EPC gives better results than achieved in practice, even if the corrected results are still in line with the legislation.
- The fact that there is a wrong EPC can be considered as a fault, the investor has damage and there clearly is a causal relation. However, it might be not so evident for many owners (in particular families) to take legal measures. Therefore, it might be justified that the governmental compliance frameworks also sanctions if the EPC is worse than what has been built.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- Belgium: the framework for penalties foresees also sanctions in case the EPC is worse than what is built, and this is independent of the fact of the legal requirement is met or not met.

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- Is there a risk of a penalty in case it appears that the declared EPC result is not correct, whereby the legal requirement is still OK?
- Is the EPC approach also considered as a possible stimulus for achieving buildings better than the legal requirements?

5.18 No possibility to compensate non-compliances in EPC calculations

TOPIC:

No possibility to compensate non-compliances in EPC calculations

CONTEXT AND MOTIVATION:

It is important that a compliance check can be done in an efficient manner. In order to avoid time consuming works and discussions, it can be useful to foresee in the regulation that each non-compliance results in a sanction without the possibility for compensation.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- An inspector observes that the roof is less insulation than specified in the EPC. The owner declares that the floor on the ground is better insulated than reported in the EPC, resulting in the same overall performance. However, it is not evident for the inspector to check if the floor is effectively insulated as stated by the owner.
- As part of an inspection, one finds that there is ordinary double glazing instead of low-e double glazing. In order to defend this change, the argument is used that the roof and floor are better insulated than foreseen with as result the same EPC result. As it is very difficult to inspect the insulation in roofs and floors, this might take time and/or no possibility to come to conclusive statements

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- In particular of the legislation imposes/allows to have the EPC reporting after the end of the works, there is no reason to allow the possibility of compensation.
- In case the EPC must be submitted at the moment of the building permit or at the start of the works, it is clear that changes may occur, whereby it still might be possible to meet the declared EPC. However, such approaches probably are much more difficult for achieving an effective compliance and enforcement framework.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- In the Belgian approach, it is explicitly stated that no exchange of measures is allowed.
- See also §5.24

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- Do you have for your country the possibility to compensate a non-compliance for one part of the building by a better performance for another aspect of the EPC calculations?

5.19 Interrelation with other legislation: avoiding potentially negative impact of EPBD-compliance

TOPIC:

Interrelation with other legislation: avoiding potentially negative impact of EPBD-compliance

CONTEXT AND MOTIVATION:

Social policies (affordable housing) and real estate legislation (advertisements, maintenance and repair) are closely linked with EPBD implementation.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- **Evaluating EPC impact on the real estate market and publicising energy indicators:** The obligation to publicise energy indicators in advertisements in the commercial media will be less effective if this is regulated in an isolated way, being limited to the energy related information. If there is no regulation concerning all mandatory elements of a real estate advertisement, comparability of buildings and building units could be affected. Energy-related information will be presented in order to be compliant, but other important parameters such as number of rooms or location could be left out due to the fact that space for publication in print media is expensive. This is an unwanted development, resulting in difficulties regarding the evaluation of the EPBD impact on the real estate market (e.g. Austria). In fact, it is recommended to evaluate advertisements published in print media because it is nearly impossible

to extract a meaningful sample from the internet, due to the frequent updating procedures practised by real estate agents to achieve a better rank in the listing.

- **Affordable housing and achieving energy performance minimum requirements in major renovations:** The height of maintenance and repair reserve does not take into account additional expenses necessary to achieve a better energy performance (e.g. energy performance minimum requirements to be achieved when carrying out major renovations), but is still calculated based on the usual assumptions regarding maintenance and repair expenses. In addition, there is often a backlog of maintenance and repair, resulting in unrealistic cost estimation for energy efficiency measures. In reality, they are much higher than projected, cannot be paid from the maintenance and repair reserve and an additional loan is needed. From the investor's perspective, the investment contributes to increasing the value of the building because it will be rented at a higher price. From the user's perspective, higher rents might not be affordable although the better conditions are appreciated.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- A collaboration with real estate experts in general and specifically with experts representing the housing sector is useful for the evaluation and improvement of EPBD-related legislation.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- In Austria, there is a specific law for non-for-profit housing associations acting as developers and property managers at the same time. There are clear rules regarding maintenance and repair reserve, there is no backlog and renovation rate in terms of energy efficiency measures is much higher than average. This is possible due to a specific tax model for this type of organisation, resulting in better energy performance of buildings without losing the advantage of affordable rents.

REFERENCES:

- QUALICHeCK Workshop held during BauZ! Conference in Vienna 13th February 2015
- Wohnungsgemeinnützigkeitsgesetz – WGG <https://www.ris.bka.gv.at>

QUESTIONS:

- Are you aware of any potentially negative impact of EPBD-compliance in your country?
- Are you aware of any interesting examples where problems due to conflicting legislation could be solved?

5.20 Not always possible to find a satisfactory solution – involve stakeholders

TOPIC:

Not always possible to find a satisfactory solution – involve stakeholders

CONTEXT AND MOTIVATION:

It is not always possible to find a solution which satisfies all expectations. As a result, one sometimes must make (difficult) choices. Making these choices is often to a certain extent subjective, and can depend on the relative priorities given to the various expectations. In order to increase the societal support, it might be a good strategy to involve the (major) stakeholders in the process, so that they understand the choices to be made and whereby they will also defend the selected approach.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- It appears that a certain aspect of the EPC procedure is considered by several stakeholders organisations too complicated for use and/or too time consuming. Other stakeholder organisations indicate that they want a more detailed procedure.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- In general, it is useful to find pragmatic procedures to involve stakeholders' organisations in the EPC process.
- It is not guaranteed that such involvement will lead to a satisfactory approach, but there is a higher probability that the various stakeholders will understand the reasoning behind a certain approach, including the fact that it is sometimes necessary to make non-optimal choices

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

This paragraph will be developed in a later phase

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- To what extent are stakeholders (organisations) in a systematic way involved? During the preparation phase? During the implementation phase? Is there a formal framework for consultation?

5.21 Global compliance and enforcement approach OR a focus on specific areas of concern?

TOPIC:

Overall compliance approach OR a specific focus on specific areas of concern?

CONTEXT AND MOTIVATION:

The development of an overall compliance and enforcement approach requires a lot of efforts, in particular if there is in the present situation not a lot of attention to compliance and enforcement measures. If the resources (staff, financial means, ...) are available for the development and implementation of an overall compliance and enforcement approach, this is of course the best strategy. If these resources are not evident, it might be a pragmatic strategy to advance step by step and focus on specific issues, e.g. create easy access to reliable data.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- To be skipped?

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- In case there is a clear consensus that a better framework for compliance and enforcement is a priority, it might be very useful to start with an in depth inventory of the shortcoming of the existing approach. This source book can be a help to identify critical areas for achieving an effective compliance and enforcement framework.
- It might be good to evaluate such assessment at governmental level but also with the stakeholders' organisations.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- To be skipped?

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

→

QUESTIONS:

- Has there been made an assessment of all required actions for obtaining a better context for compliance and enforcement?
- If so, does it seem feasible to implement all these actions? Or is it more realistic to focus on a consistent subset of actions which might result in partial improvements?

5.22 Specific challenges for existing buildings

TOPIC:

Specific challenges for existing buildings

CONTEXT AND MOTIVATION:

Issuing an EPC for an existing building in case of renting or selling the building or a building unit will be much more challenging in terms of determining input data than for a new construction. Documentation is often not available, data collection is costly and therefore default data are being used to keep cost of EPCs low (see 4.13), although being aware of the trade-off between cost and reliability of EPCs. Especially estimation of U-values for constructions and solar transmission values for windows influence EPC calculation results significantly. Publication of acknowledged but unspecific standard default values can lead to compliant but unrealistic EPCs, also in terms of cost-effective recommendations for renovation.

EPBD 2010/31/EU requires that EPCs contain recommendations for improving building energy performance. Providing information about the room for improvement should motivate building owners to renovate their building. In some countries, EPCs contain specific recommendations and even the savings potential in monetary terms (e.g. England and Wales, Portugal). Issuing EPCs for existing buildings including recommendations how to improve building energy performance raises the question whether use of building specific data is necessary or default input data will be still sufficient for a meaningful EPC calculation result (see 4.4).

EXAMPLES OF PROBLEMATIC SITUATIONS::

- Default input data for EPC calculation are provided by national standards and other official documents, resulting in cheap and compliant but potentially unrealistic EPCs lacking market acceptance.
- EPC experts are entitled to calculate and issue EPCs based on their professional license and not based on proven qualification, resulting in potentially faulty EPCs especially in the field of existing buildings which requires a lot of experience and knowledge.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It is important to choose the appropriate level of detail in terms of region and construction period when setting up a building typology, in order to ensure the availability of realistic default values.
- Development of building typologies at regional level must take into account that there is an interrelation between default values.
- Determination of realistic default values as input data for the EPC calculation of existing buildings should be on the agenda of mandatory training programmes addressing EPC experts.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **In Germany and Luxembourg**, the correct determination of U-values is supported by detailed building typologies. More accurate building typologies can provide default values which are closer to reality. In both countries, such typologies are provided at regional level, and in Germany the document has the status of an official ministry document. EPC experts choose appropriate default values depending on the building typology that corresponds to the building under assessment. There is an interrelation between various default values which has to be taken into account. Therefore, qualification of experts is crucial in order to ensure the correct determination of U-values.
- **Several Member States** have clearly defined qualification requirements addressing EPC experts. These requirements are tied to the type of formal education, practical experience, and having passed targeted training courses.

REFERENCES:

- EPBD Concerted Action <http://www.epbd-ca.eu>
- Building typologies in Member States <http://episcopes.eu/index.php?id=97>

QUESTIONS:

- Are you aware of any other specific challenges for existing buildings in your country?

5.23 Integration of information regarding non-compliance issues in EPC calculation software

TOPIC:

Integration of information regarding non-compliance issues in EPC calculation software

CONTEXT AND MOTIVATION:

Integration of information regarding non-compliance issues in EPC calculation software increases transparency and helps to create awareness of sanctions which will apply if minimum requirements are not met. Use of calculation software is necessary for issuing an EPC, and therefore the software is an appropriate means to provide information about sanctioning, as well. This is especially important for EPCs issued for existing buildings in the course of selling or renting. While in new construction the obligation to meet energy performance minimum requirements is part of the building legislation and for example tied to the building permit approval for new buildings, there is no such evident sanction in cases where EPCs are issued in the course of selling or renting a building or a building unit.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Not applicable in this case

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- The procedure how to integrate information regarding non-compliance issues in EPC calculation software will depend on the specific situation in each country: Is there one mandatory software program to be applied or are there different software products available on the market which must comply with the mandatory methodology?
- Information on sanctions should not be limited to the software program but could also appear on the EPC itself. There is a legal background on the layout of the EPC and the elements an EPC must contain. In addition to the comparison between actual performance indicators and minimum requirements, sanctions could be presented in case minimum requirements are not met.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **In Belgium**, the EPC calculation software does not only calculate performance indicators but also applicable fines in case of non-compliance. The rules are straightforward, e.g. for non-compliance in relation to transmission losses 60 € per W/K, for ventilation provisions 4 € per m³/h.

REFERENCES:

- Factsheet on Belgium /Flemish region control and sanctioning scheme (under development)
- EPBD Concerted Action <http://www.epbd-ca.eu/> and BUS CA3EPBD

QUESTIONS:

- How is information regarding non-compliance issues in EPC calculation software dealt with in your country?

5.24 Smart procedures for compliance checking and enforcement

TOPIC:

Smart procedures for compliance checking and enforcement

CONTEXT AND MOTIVATION:

In most countries, the available resources for organising compliance checking and related sanctioning are limited. Therefore, it is important to consider smart procedures for compliance checking and enforcement. There are several possibilities for facilitate the work for compliance checking and enforcement.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Several countries have in the past reported that there is not the required staff to implement in daily practice a compliance and enforcement framework.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- **Not allow compensation of non-conformities**
One should consider the possibility to include in the legislation the explicit rule that a non-compliance for a certain aspect of a building cannot be compensated by a better result for another part of the building. If so, each non-compliance can result in a sanction. In order to have the necessary societal support, it probably is important that the possibility exist to have the EPC declaration made after the end of the works, i.e. reporting what has been built, and not what was the intention at the moment of the building permit. This example is further developed in §5.18.
- **Allow a sufficient period for carrying out control**
In order to increase the probability of detecting non-compliance, it is important to have a sufficient long period for compliance checking.
- **Impose full access to input data in order to allow third parties to have the possibility for compliance checks**
An increased number of owners and renters is interested in the energy performance of their buildings. A classical EPC declaration does not contain information allowing to check the validity of the EPC. If specific target groups (owners, renters, potential buyers, ...) can have access to the full EPC file (including wall composition, materials, thicknesses, name and type of heating components,...), is it quite evident to assume that some of these parties will carry out control.
- **Recognised databases**
The availability of recognised database can substantially improve/simplify the analysis of the EPC declarations. Moreover, it can be used for a statistical evaluation, to identify outliers, to check for trends. Finally, it will reduce the risk of contestation of the observed non-compliances.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- See the examples as listed above.

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- Does the EPC procedure includes aspects which simplifies/optimises the possibilities for compliance checks and enforcement?

- Has there been an analysis of the most frequent difficulties which occur when implementing a compliance and enforcement frameworks? Have there been discussions about possibilities for minimising these difficulties?

5.25 Specifications concerning type and frequency of verifications

TOPIC:

Specifications concerning type and frequency of verifications

CONTEXT AND MOTIVATION:

According to article 18 of the EPBD and annex II, MS should install an independent control system to control the quality of the issued EPC's and inspection reports. According to the annex, a random selection of at least a statistically significant percentage must be controlled every year.

In most European Member States a central EPC-database has been established as a means to ensure compliance with EPBD requirements. The EPC-database represents the basic element of verification by enabling automatic checks during uploading the EPC and related information into the EPC-database (100% control of selected elements during EPC upload to electronic database) and allowing for the planning of meaningful sampling procedures for specific periodic verifications.

Quality control systems include desk controls and on-site controls, random selection but also targeted selection of the EPCs to control, e.g. after having received complaints (100% control in case of complaints), and data mining methods, in order to get as much output as possible with the available resources. The more EPC's are controlled, the higher the cost will be.

EPC-databases can be used to check EPCs and EPC experts. The way the EPC-database has been set up is crucial for the options how to make use of the EPC-database and at what cost.

EXAMPLES OF PROBLEMATIC SITUATIONS::

- There is no central EPC database, and therefore the basis for setting up an effective sampling scheme is missing.
- The central EPC-database was designed in an isolated way and does not provide all appropriate interfaces to fully exploit the potential for setting up an effective and cost-efficient sampling scheme.
- The EPC-database does not contain a publicly accessible part and thus prevents interested individuals from checking basic information published in advertisements.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

The legal framework has to consider the following elements:

- Which part of the EPC-database should be accessible for whom? Publicly accessible parts (while respecting data privacy rules) enhance the effectiveness of the database.
- How to use the EPC-database for control of EPC experts: During upload into the EPC-database faulty EPCs are detected and types of mistakes are noted; EPC experts are addressed to improve the quality of EPCs (stepwise system from warning – additional training – fine to withdrawal of license) and in case of specific mistakes frequently detected, targeted trainings should be offered.
- Percentage or number of EPCs to be controlled every year: the percentage can be fixed in the legislation or it can be stated that the number to be controlled will be fixed every year, allowing for more flexibility. The Percentage can be fixed depending on the rating result, i.e. 80% of the total sample for A level EPCs.
- How to make use of data mining techniques in back-office analysis of EPC database:
 - Sampling e.g. only buildings with PV panels
 - Checking the validity of some input values by crosschecking with other databases
 - Plausibility checks: areas, energy indicators against expected values in the building category, to find strange or impossible input values

- To perform some cross checks to identify EPCs to be controlled, i.e. building with some specific technologies should correlate with a certain energy performance class

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

In Portugal, a stepwise system based on the use of the EPC-database is applied to check EPCs and EPC experts, using the following types and frequencies of verifications:

1. Automatic input validation when the expert fills in the EPC
 - IT platform checks the inputs, and inconsistencies or “out of range” values are identified
 - Expert can correct the inputs
 - All certificates are checked
 2. Simple quality checks to evaluate the main parameters that are displayed in the EPC and other supporting documents; evaluation consists of analysing EPC, certification report, calculations, recommendations
 - Analysis made without the involvement of the expert
 - Made exclusively by cross referencing the documents uploaded by the expert
 - About 5 to 6% of certificates are analysed
 3. Detailed quality checks
 - Replicates the work performed by the expert
 - More interaction between the quality assessors and the expert
 - If severe mistakes were made, fines can be applicable
 - 0,5 % of the certificates are verified
- **In Portugal**, at the beginning of the process of implementing the control system, around 5% of the issued EPCs were controlled. This number has been reduced as experience has been gained. Based on lessons learnt during the beginning of the process, a statistic and probabilistic study on the control procedures has been developed, in order to define what percentage could be representative, resulting in a percentage of roughly 1% of the issued EPC to go through a control procedure.
 - **In France**, the organization (private companies) in charge of control must check at least 8 EPC reports for each expert. In addition, they must carry out one on-site control per expert once every 5 years based on an existing EPC report.
 - **In UK and Ireland**, interested individuals check energy indicators published in commercial media by searching this information in the public part of the EPC-database.
 - **In Belgium**, VEA checks yearly 3000 buildings on the availability of EPC when selling or renting out. The compliance rate has changed from 47% in 2009 to 95% in 2012.
 - **In the Netherlands**, there is a new check under development for enforcing EP requirements and the EPC in new buildings. Evidence has to be collected from the point of design up to the moment of completion of a building. This can be design calculations, drawings, photographs, and invoices of applied materials and installations. As a last step in the process an onsite visit will be executed to determine whether the realised EPC is in accordance with EP requirements from the design phase.

REFERENCES:

- Factsheet on compliance checking and sanctioning (under development)
- EPBD Concerted Action <http://www.epbd-ca.eu/> and BUS CA3EPBD
- New check for enforcing EP requirements and the EPC in new buildings in the Netherlands: www.lente-akkoord.nl (in Dutch)

QUESTIONS:

- What are your lessons learnt from operating the independent control system?

5.26 Specifications regarding appeal procedures

TOPIC:

Specifications regarding appeal procedures

CONTEXT AND MOTIVATION:

Penalties do not differentiate the reasons for lacking compliance, for example, whether unintentional mistakes have been made or whether there is a case of fraud. However, punishment schemes which are too rigid might not be supported by society. Therefore, appeal procedures are necessary to give those who have made unintentional mistakes the chance to correct them. Appeal procedures will be clearly regulated if non-compliance is a court matter and treated by the judge. If the administrative authority is in charge of sanctioning, the following considerations will apply.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- ?

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- Appeal procedures have the tendency to increase the administrative burden. Therefore, specifications should simplify procedures, for instance by giving an order for correction without any further administrative procedure in terms of sanctioning.
- Orders for correction also increase the administrative burden, because there will be the need to check again whether mistakes have been corrected. However, fees can be charged to cover administrative cost. In this way, the effort to jointly achieve improvement will still come to the fore (instead of punishment) and at the same time it will prevent stakeholders from treating compliance lightly.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **Control is regarded as a service at the same time:** In Austria, there was a 2-years project carried out in the province of Lower Austria. Every single EPC used as evidence to apply for an energy-related grant was checked, also the building at the construction site. It was the objective to improve as-built situations and achieve compliance. Detecting mistakes leads to questions how to correct them. In this regard, the project was also a major qualification effort.

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- How are appeal procedures organised in your country, and which elements would you recommend for the implementation in other countries?

5.27 Are there other procedures for achieving an effective compliance?

TOPIC:

Are there other procedures for achieving an effective compliance?

CONTEXT AND MOTIVATION:

The organisation of an effective enforcement should in principle be done by the government. In parallel, or as an alternative for governmental enforcement, there might be other and sometimes more effective

mechanisms in the market leading to an effective enforcement. This can be e.g. specifications and control measures by insurance companies, ...

Another alternative approach might on the medium and long come from the market uptake of building information modelling (BIM). This approach is further developed in a specific chapter, i.e. chapter 0.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- Not applicable in this case

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- Private initiatives leading to effective compliance can be in some cases and at least on a temporary basis a valid alternative for a general enforcement by the government. This can be the case if there is not yet a governmental enforcement scheme in operation whereby the private initiative can serve as a test bed on a limited scale.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- Are there procedures in your country, which in addition, in parallel or as an alternative, contribute to good enforcement of the energy legislation?

5.28 (Other points of attention?)

In case stakeholders identify other potential relevant points of attention, please inform the QUALICHeCK consortium, preferably by mail to info@qualicheck-platform.eu.

6. Best practices PART 3: Practical implementation of a framework for better enforcement and effective penalties

6.1 Political will to have effective compliance checking is crucial

TOPIC:

Political will to have effective compliance checking is crucial

CONTEXT AND MOTIVATION:

The organisation of an effective compliance checking requires a real political will at governmental level. As compliance checks and related sanctioning is in general a politically a sensitive issue, it is important to pay attention if the boundary conditions are reached for such political will.

A major element is the support from the stakeholders to have an effective framework for better enforcement and effective penalties. This is less evident than many people might think and it probably requires specific efforts.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- In case the responsible politicians are against the introduction of penalties, there is basically no chance to come to effective compliance and enforcement. Even if the administration is strongly motivated, it will not be effective in practice and it will demotivate such administration.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- In principle, the large majority of stakeholders' organisations should not be against an effective compliance framework at the condition that the envisaged sanctions are reasonable. However, it is logical that stakeholders organisations are cautious to support measures which might be used against its members. Therefore, it is crucial that the representatives of stakeholders' organisations can be convinced that the enforcement framework will be fair, proportional and reasonable. It is not evident to expect such conviction if the stakeholders are not strongly involved in the development process of a compliance and enforcement framework. Moreover, they must be involved as well during the implementation process.
- Successful examples from other countries or other sectors might help to convince stakeholders and politicians to effectively support a compliance framework. One of the aims of the QUALICheck reports, webinars, ... is to provide documented examples of successful approaches.
- ...

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- The Swedish approach for ductwork airtightness was not developed in the context of EPC declarations but proves to be extremely efficient.

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICheck (factsheets, webinars, ...).

QUESTIONS:

- In case you have not yet a quite effective enforcement system, do you have the impression that there is, in principle, a strong political will in your country to have an effective enforcement?
- In case you have already a quite effective enforcement system, do you have the feeling that the political will for maintaining such enforcement remains sufficiently strong?

6.2 Effective monitoring if reporting is happening in due time

TOPIC:

Effective monitoring if reporting is happening in due time

CONTEXT AND MOTIVATION:

In principle, all EPC related regulations should contain requirements regarding deadlines for communication of documents (e.g. at moment of building permit, at end of works). Is this reporting happening in practice? Is there an effective control and, in case of non-compliance a sanctioning?

EXAMPLES OF PROBLEMATIC SITUATIONS:

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- It is important that there is a sufficient time allowed for submitting the required declarations, but at the same time it is important to check if the timing is respected and, if not, enforcement measures are operational.
- The use of an efficient IT platform in combination with databases can substantially simplify monitoring and enforcement of deadlines.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

This paragraph will be developed in a later phase

REFERENCES:

This part will be completed by relevant references, with specific attention for deliverables from QUALICheck (factsheets, webinars, ...).

QUESTIONS:

- Is there in your country an active monitoring of meeting deadlines in terms of reporting? Statistics?
- Is there an effective sanctioning in case of not meeting the deadlines? Statistics?

6.3 Appropriate resources to implement effective compliance checking

TOPIC:

Appropriate resources to implement effective compliance checking

CONTEXT AND MOTIVATION:

There is clearly a societal wish to limit the administrative burden and cost. Thus, the question arises whether it is necessary to set up a whole compliance framework to verify compliance with regulations, or whether one can assume that competent persons will apply their competence and control can be omitted.

Practice shows that it is not evident to assume that people with the required competence will apply the principles of good building details in case of non-compliance framework. Often, such details are more expensive in construction and/or require more labour time in the design and/or construction process. In practice, it is very difficult (almost impossible) for normal users to detect such extra heat losses caused by not applying the principles of good building details, and enforcement will be unfeasible. Therefore, it is important to have a governmentally organised framework for handling non-compliance issues in place, be it carried out by the public authority itself or by a private organisation commissioned by the public authority.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- The sampling scheme for compliance checking is not well developed and therefore not effective in terms of achieving a constant improvement of EPCs and buildings but also EPC experts.
- Compliance checks should be carried out by the public authority, but there is a lack of human resources and budget allocation is insufficient, thus resulting in isolated minimum activities with little impact on improving actual quality of EPCs and buildings.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- The development of the sampling scheme is crucial:
 - Which building related energy aspects need most attention because weaknesses are already known?
 - Which building related energy aspects should be investigated because there are hints regarding potentially problematic situations?
 - Which building related energy aspects should be investigated because little information is available?
- If financial and human resources to control are limited, solutions will have to be found how to disburden the administrative staff by improving the efficiency of administrative procedures and transferring certain tasks to market players.
- Member States following regional EPBD implementation should investigate which elements of the enforcement and sanctioning framework could be used together to avoid multiplication of effort and cost and to increase the chance of creating an economically feasible and effective framework.
- In case it is not evident to make staff from governmental agencies available for EPC compliance, it might be useful to consider subcontracting of certain parts of the work.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **Central management of decentralised tasks in Germany:** The new German control system for EPCs went into force with the amendment of the Energy saving Ordinance (EnEV 2013). Though compliance and controls are in the responsibility of 16 local governments, Germany will have one centrally organised system. This is an innovative form of cooperation between the local governments and it aims at keeping the administrative burden as low as possible.
- **In UK, EPC assessors (competent persons) assist building control officers (public authority):** The building regulation is checked (in principle on-site) by the building control officers (BCO). But these building control officers are no experts on energy so it is difficult to pick up all the evolutions in the

energy performance regulations and to control the compliance with the regulation. They also have a high work load. Different opportunities were used to solve the problem, such as the following ones:

- The same software can be used for building regulation compliance and the EPC. The EPC assessors are accredited with a QA scheme that is checked by the government. The EPC can be used by the building control officers to check the requirements.
- BCO can also use a declaration of a competent person: top assessors can be competent persons, so their declaration can be accepted by the BCO as complying with the regulation.

REFERENCES:

- Factsheet on compliance checking and sanctioning (under development)
- EPBD Concerted Action <http://www.epbd-ca.eu/> and BUS CA3EPBD

QUESTIONS:

- Could you provide information about the cost of compliance checking in your country (number of person month per year or amount in EUR)?

6.4 First warning, then punishment?

TOPIC:

First warning, then sanctioning?

CONTEXT AND MOTIVATION:

The change from a situation with no or limited compliance checks to a (more) stringent compliance check can give some chocks in the market with potentially the risk that there is loss of societal support. Therefore, it might be useful to consider a stepwise approach in the effective compliance implementation. In addition, or as part of the timing at legal level (see §5.3), one could also foresee a transition in the implementation process itself, e.g.:

- A first period where only warnings are given and corrections have to be done, however without any financial or any other consequences.
- A second period where the sanctioning system is effectively in place.



EXAMPLES OF PROBLEMATIC SITUATIONS:

- In case the legislation and/or the enforcement framework is substantially changed on short notice, there might be in the startup phase frequent cases of non-compliance. If this results in frequent penalties, one might lose the societal support.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- To warn instead of punishing is not always possible. In case the legislation is clearly specifying the rules for enforcement, and if the enforcement is handled by civil servants, they may not have the possibility to only warn during the startup process, unless this is specified in the respective regulation by defining a transitional period. Typically, if non-compliance is handled by a judge, the possibility to warn is much greater.
- One can in the legal framework explicitly foresee the possibility to warn during a given period before the sanctioning become effective.
- Warning and the final order to improve can be an explicit part of a stepwise penalty system.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- No examples available

REFERENCES:

→ EPBD Concerted Action <http://www.epbd-ca.eu/>

QUESTIONS:

- Do you see reasons in your specific context for considering a warning system during a start-up process?

6.5 Robust procedures in case of penalties

TOPIC:

Robust procedures in case of penalties

CONTEXT AND MOTIVATION:

In case of confirmed non-compliance, it is important to have a robust procedure for enforcement and penalties. Typically, there must be one or more possibilities for appeal.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- In case a civil servant has to decide on sanctions, without the possibility for appeal, there might be a loss of societal support in case there are frequently sanctions, whereby there might be the perception by part of the market that the sanctions are not fair.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- In case non-conformities are handled by judges, the typical procedures for appeal are applicable.
- In case non-conformities are handled by governmental administrations, it is important that there is sufficient control on the sanctioning decisions and the possibilities for (several levels of) appeal.
- In case non-conformities are sanctioned by organisations designated by the government, the situation is quite similar as in the case of governmental administrations, whereby it is important to evaluate whether civil servants should be involved in this whole process.

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

REFERENCES:

- This part will be completed by relevant references, with specific attention for deliverables from QUALICheck (factsheets, webinars, ...).

QUESTIONS:

- Does the regulation foresees procedures for appeal?

6.6 Support by stakeholders for effective compliance is crucial

TOPIC:

Support by stakeholders for effective compliance is crucial

CONTEXT AND MOTIVATION:

As indicated in §6.1, overall support or acceptance by stakeholders for an effective compliance framework is in most cases crucial for politicians and this at different stages:

- During the preparation phase: politicians will rarely decide a strict enforcement policy unless strong support from the stakeholders
- During implementation: it is not evident for politicians to support the effective implementation of strict enforcement and sanctions, unless supported by most of the stakeholders.

Typically, most stakeholders' organisations are in principle reluctant to actively support effective enforcement frameworks with related sanctions, if there is not a quite high guarantee that this enforcement will be fair, proportional and reasonable.

Therefore, it is important to actively involve stakeholders in the implementation of compliance measures.

EXAMPLES OF PROBLEMATIC SITUATIONS:

- The whole legislation has been developed with little or no stakeholder's interaction. In particular for the aspects related to compliance and enforcement, such lack of interaction can completely block the possibility for compliance and enforcement.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- Make stakeholders an effective partner in the development process of enforcement frameworks
- Try to find solutions which meet the expectations from the stakeholders
- Organise an active monitoring process involving stakeholders organisations

More information is provided in §0 (MUST BE 8!!)

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- This paragraph will be developed in a later phase

REFERENCES:

- This part will be completed by relevant references, with specific attention for deliverables from QUALICHeCK (factsheets, webinars, ...).

QUESTIONS:

- Are most stakeholders in your country effectively involved in the process of EPBD implementation and, more specifically, in issues related to compliance and sanctioning?

6.7 Communication on outcomes of compliance activities

TOPIC:

Communication on outcomes of compliance activities

CONTEXT AND MOTIVATION:

In case of an effective compliance framework, it might be very useful to regularly inform the regional and national market of the outcomes of such compliance activities. Communication on outcomes of compliance activities serves awareness creation among stakeholders that improvements are necessary and thus also raises acceptance and societal support for compliance activities.

This can include various types of information, e.g.:

- What kind of non-compliance issues are observed?
- Frequency of non-compliances
- Consequences of non-compliance in terms of sanctions
- Recommendations for reducing risks for non-compliances
- ...

EXAMPLES OF PROBLEMATIC SITUATIONS::

- Information about compliance is not available at all because the independent control system required by the EPBD is not in place.
- The independent control system required by the EPBD is in place, but there is no follow-up on the information gathered.
- The independent control system required by the EPBD is in place and there is a follow-up on the information gathered, but no communication takes place on evaluation results, and no activities take-off to target constant improvement.

CONSIDERATIONS REGARDING PROCEDURAL ASPECTS:

- Which organisation has access to relevant information?
- Is there a responsibility and a budget to collect, evaluate and distribute information on outcomes of compliance activities?
- Who are the relevant target groups?
- What is the best way of distributing information to which target group (conference contribution, journal article, newsletter via e-mail)?

APPROACHES WITH RELEVANCE FOR THIS TOPIC:

- **In Belgium and other Member States**, the central EPC-database is used to evaluate compliance. In Belgium, efforts in communication and presence control carried out by the authority resulted in an increase in EPC availability from 46% in the year before the measure to 80% in the year after.
- **In Portugal and other Member States**, evaluation of mistakes is used to update training programs addressing EPC experts.

REFERENCES:

→ EPBD Concerted Action <http://www.epbd-ca.eu/>

QUESTIONS:

- How is communication on outcomes of compliance activities organised in your country?

6.8 (Other points of attention?)

In case stakeholders identify other potential relevant points of attention, please inform the QUALICHeCK consortium, preferably by mail to info@qualicheck-platform.eu.

7. About innovation

7.1 Introduction

Over the last decade, substantial progress has been achieved in terms of product and system performances regarding energy efficiency and renewable energies. The type of progress can take different forms, e.g.:

- Better energy efficiency of systems (e.g. heat recovery, efficiency of heat pumps, ...)
- New technologies (e.g. vacuum insulation panels, LED lighting, deep geothermal energy, ...)
- Cost reductions for various types of energy efficient technologies and renewable energies

Energy performance regulations should correctly assess all kind of technologies and, as a result also stimulate and/or allow the market uptake of innovative technologies.

It is important to underline that the market introduction of innovative technologies is not by definition a difficulty for an EPC calculation method. In many cases, the calculation method can be perfectly able to handle the new technologies. A few examples to illustrate:

- A heat pump with a much better efficiency but whereby the technology is covered by the calculation method is no issues of concern.
- An insulation material with a much better thermal conductivity or a window profile with a much lower U-value is no problem for the EPC calculation method if the method allows to use the measured/calculated value.

7.2 Simplified procedures are important but should not be a barrier for innovation

The availability of simplified procedures is often considered as a major element for market acceptance. At the same time, it is important that innovation is not blocked due to oversimplification in the EPBD calculation methods.

In practice, there are various possibilities for dealing correctly with better performing products and it is crucial to foresee at least one of these possibilities.

Examples:

- Existing technology: condensing boiler
 - The use of a fixed value for the efficiency of condensing boilers is not stimulating the use of more energy efficient condensing boilers. A possibility to stimulate innovation is to allow to use specific product data, whereby it still is possible to have a default value when using a condensing boiler
- New technology not covered by the standard procedure: shower with heat recovery
 - In case such technology is not covered in a given country, and if considered a relevant technology, it is important that the legislation foresees a procedure for handling such technologies. See also §4.8.
- Very innovative building designs
 - In case specific and rather unique design concepts are implemented, it might be necessary to foresee the possibility of a project specific assessment method, if not innovation will be blocked. See also §4.9.

7.3 Important to have a robust framework for assessing technologies not covered by the normal procedures

7.3.1 Points of attention

In order to have a legislation which allow compliance checks and an effective enforcement, it is important that there are robust legal and technical procedures for assessing concepts and technologies not covered in the standard procedure.

There are a whole range of points of attention, i.e.:

- Technical assessment

- It is important that there is a sufficient amount of transparency in the magnitude of the impact to be expected by an innovative technology in the EPC context.
- This is in some cases far from evident and it might require a substantial effort and time to come to a decent procedure.
- In case the procedure is not transparent, it is for industry not evident to develop and optimise innovative technologies
- Legal procedures
 - It is important that the legislation foresees a framework for assessing innovative products and concepts.
 - It is important that the legislation is in line with the various EU legislations.
- Time for assessment
 - It is important that the time effort for assessing an innovative concept is still moderate, if not there is no market for an innovative approach. This aspect becomes the more important in case there is a strict compliance and enforcement framework.
- Costs of assessment
 - It is important to pay attention to the costs for the industry for the assessment of the innovative approaches.

7.3.2 Possible solutions

Assessment at product or system level

→ Examples in FR, NL, BE

Assessment at project level

→ Examples in Brussels region, ...

8. Importance of societal support for compliance and enforcement

8.1 Effective enforcement not evident without strong societal support

As already indicated before, it is in most countries for governments not evident to have (strict) enforcement schemes regarding EPC compliance (including penalties) if such enforcement is criticised by a (substantial) part of the market. The political motivation for setting strict enforcement rules might be weak without societal support. In case there are enforcement rules, there is a very large risk that enforcement measures will be diminished or stopped once there is strong market opposition against enforcement and penalties.

Therefore, it is very important to work on the required societal support, which involves various activities, including:

- Active involvement of stakeholders in the development phase of the procedures, whereby they have a good understanding of the pro and cons with various approaches and whereby they hopefully support the choices which are made
- Involvement and/or concertation in the implementation and enforcement phase, whereby it is important that they understanding the reasoning behind the enforcement measures and whereby they can provide inputs in case of criticism from the market.

8.2 Raising societal awareness regarding reliability of EPC

In general, and this is not surprising, there often are negative reactions in case someone or a part of the market is sanctioned in case of non-compliance. The reactions might be e.g. “This is not fair”, “The procedure is too heavy and/or too costly”, “the procedures are not clear”,

Therefore, it is very important that all relevant stakeholders’ organisations have the opportunity to be involved in the preparation process of compliance and enforcement procedure.

What can be the objectives for such stakeholders’ involvement?

- **Before implementation:**
 - To inform them about the motivations for an enforcement framework, e.g. by sharing experiences of problems with the EPC (EPC is not available, wrong information in the EPC, ...)
 - To discuss the procedures for determining the EPC (PART 1 of this source book), which will allow them to assess the complexity, the type of technologies covered/not covered, ...
 - To discuss the principles of the legal framework for compliance and enforcement (PART 2 of this source book)
 - To discuss the principles for practical implementation for the enforcement (PART 3 of this source book)
- **During implementation:** regular evaluation if the procedure is well balanced and/or if improvements are needed, e.g.
 - Is there a need for a modification in the procedures for determining the EPC (PART 1 of this source book);
 - Is there a need for a modification of the principles of the legal framework for compliance and enforcement (PART 2 of this source book)
 - Is there a need for a modification of the principles for practical implementation for the enforcement (PART 3 of this source book)

Practice shows that it requires substantial efforts for the stakeholders to obtain the overall picture and therefore it often is time consuming for reaching the required support. Moreover, it is important to acknowledge that many stakeholders’ organisations have a multi-layer approach, whereby it is for issues as compliance and enforcement often important that there is a broad support at different levels:

- Individual members
- One or more committees dealing with EPC issues
- Some organisations have a permanent staff which is assumed to represent the views of the stakeholders

A strong interaction requires time but can have various substantial advantages:

- Identification of opportunities for improvement
- Increased credibility of the overall approach in case there is support from the stakeholders
- Better understanding by the stakeholders of the reasons for certain choices and therefore more support in case of negative reactions from market players

In the Flemish Region a comprehensive evaluation of the EPB-regulation is foreseen every 2 years. Stakeholders participate on this process, and quality issues are brought up. If necessary legislation is adapted or actions such as communication, adaptation financial incentives are foreseen.

Real estate agents belong to a crucial stakeholder group because they are the ones presenting the energy performance of a building to customers interested in buying or renting a building or a building unit. It is paramount that they promote the EPC as a useful tool and not as an additional burden

In this regard, there must be a clear communication about the EPC based on default values serving to provide orientation on the market and to compare buildings, and the EPC based on specific building data serving to provide specific information about the building. As a result, the EPC will be regarded as a reliable source of information for potential buyers and renters during the decision making process.

9. Economics of control and enforcement

The cost issue is often a potentially critical issue in the context of 2nd and in particular 3rd party control and enforcement schemes. The cost debate has various dimensions and this is further discussed in this chapter.

9.1 An effective second or third party control and enforcement framework requires efforts

Organising control and, in case of non-compliance, set up enforcement actions requires various investment and staffing costs. These costs will depend on various elements, e.g.:

- The type of control: desktop, on site, ...
- The frequency of control
- The intensity of control
- The frequency of non-compliance and the number of enforcement actions
- IT environment
- Consultation process, legal advices, ...

9.2 Who pays the costs for control and enforcement schemes?

Overall scheme

In case of second party control and enforcement frameworks, the costs has to be covered by the parties involved and, at the end, by the client.

In case of third party control and enforcement schemes, this remains the same if the initiative is taken by the client. In case it is linked to a governmental initiative (EPC, incentives...), it is a decision of the initiator (government, organization which is setting up incentive scheme...) to decide who has to pay for the overall costs.

In case of governmental schemes, the cost of control and enforcement is covered by the budget for public administration. Specific taxes related with energy efficiency or fines due to violation of regulations can be used to sustain the budget. In the end, it is the public who pays and especially those, not complying with the regulations.

Additional costs in case of non-compliance

In case of non-compliances and the need for additional controls, corrective measures..., these extra costs have also to be covered by one or more parties involved in the process.

9.3 Are there no costs in case of no second or third party control and compliance framework?

There is no doubt that the installation and operation of a second or third party control framework induces costs. Is the alternative, i.e. no control and enforcement framework therefore cheaper?

The absence of a second or third party control and enforcement framework might result in a (much) higher degree of non-compliances. If this is the case, this can result in various types of direct or indirect costs, e.g.:

- **At individual level:**
 - Too positive EPC declarations will result in wrong information about the building energy performance and typically higher costs for operation and improvement, thus misleading potential buyers and tenants during the decision making process, but also building owners if they plan to use the building themselves.
 - A compliant EPC will act as a level playing field for investors, designer, contractors and supply industry and will allow a fair competition. In case it is easy to use wrong data in the EPC, the risk of fraud will substantially increase.
- **At member state level:**

- Not meeting the energy requirements as imposed by EED and RES directive and might cause infringement procedures due to violating the European legal framework, resulting in additional workload for civil servants and fines. It will probably have a negative impact on climate protection obligations, because usually energy efficiency in buildings is a condition for achieving CO₂-reduction targets. Missing CO₂-reduction targets causes penalties, as well.
- No reporting will cause additional efforts in substituting information otherwise provided by EPCs, e.g. for reporting according to Article 5 EED or to meet other reporting obligations. If EPCs are not available, data collection studies will have to be carried out to provide the necessary information. In the long run, expenses for these studies might be higher than cost of implementing and running a successful compliance scheme.
- **At world level**
 - Climate change. CO₂-emissions from fossil fuels cause external cost. These are cost paid by the society instead by the polluter. CO₂-emissions contribute to climate change, and damages caused by climate change are enormous: floods and droughts, and as a consequence destroyed infrastructure and crop failures, fight for resources, migration, etc. These costs must be avoided. Therefore, when striving for cost transparency, it is necessary to declare correct CO₂-emissions on building level, to develop targeted policy instruments for a reduction of CO₂-emissions.

9.4 Lower total cost?

Often, energy efficiency in buildings is motivated by lower life cycle costs. However, in practice, this is often not true. The reason is that the Standard on LCC (ISO 15686-5:2008) allows a broad range of interpretation: Similar to LCA, also LCC starts with the scoping and definition of objectives. Crucial parameters dominating the calculation result such as interest rate, intensity of maintenance and repair, and lifespan of products and systems can be defined by the person carrying out the analysis.

Apart from these crucial parameters the following choices for calculation may lead to unrealistic results:

- Additional cost for energy efficiency is calculated instead of total renovation cost;
- Cleaning cost is neglected although important in energy efficient buildings due to extensive application of glass in order to making use of solar gains;
- Assumed energy consumption used for calculation is not realistic due to prebound and rebound effect;
- User needs and user behavior might change over time and is not taken into account.

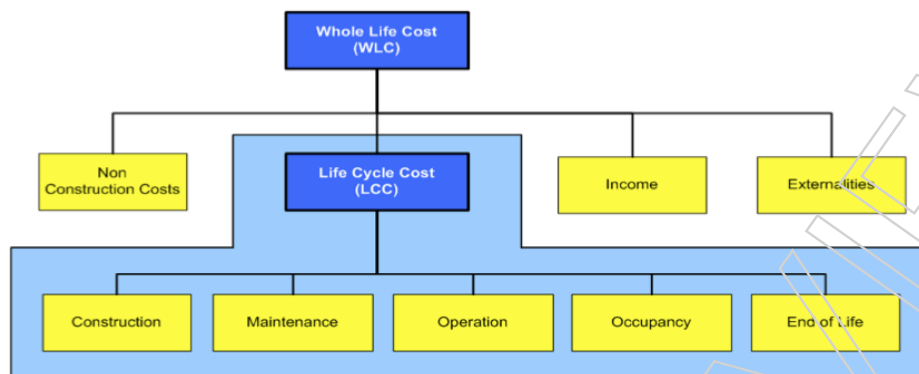
However, being aware of the possible traps, the Life Cycle Cost approach can facilitate new forms of cooperation (e.g. based on alliance contract models) and new business models (e.g. total cost of ownership).

In any case, it is crucial to start discussions at the same level of information, and thus to avoid troubles resulting from the utilisation of wrong terms. In this regard it is useful to refer to ISO 15686-5:2008, addressing the confusion over terminology.

Lower Whole Life Costs (terminology according to according to **ISO 15686-5:2008**)

Figure 3: Terminology according ISO 15686-5:2008

ISO addresses the confusion over terminology – regarding the difference between whole life cost (WLC) and life cycle cost (LCC)



9.5 Compliance checks and enforcement as means against unfair competition?

Compliance checks and effective enforcement creates a level playing field for all actors involved in the project. This can substantially contribute to avoid unfair competition.

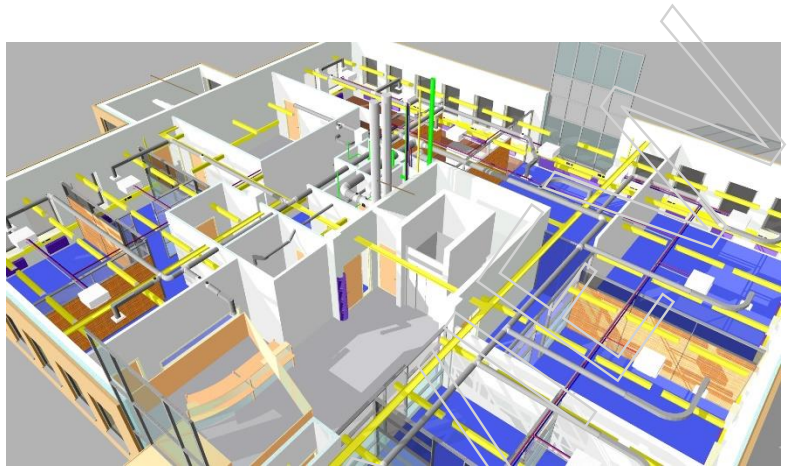
9.6 Cheap financing of stimuli for innovation?

An EPC legislation with possibilities for market uptake of innovative systems in combination with compliance checks and an effective enforcement can be a major driver for product and system innovation. If industry achieves cost effective energy efficient systems, there is in such context a very good chance for market uptake

10. Can BIM be a game changer?

REMARK: This draft version primarily aims to give the topics to be covered. A full version will be written towards the end of the project.

BIM (Building Information Modelling) is a digital representation of the characteristics of a building and its systems. It is intended to be used to save and share information before and during construction, as well as during the use of the building and at the end of its life.



The BIM objects include data linked to the design and characteristics of the building:

- ✓ Building basic data (location, climate, orientation, surfaces...)
- ✓ Construction product data
- ✓ System data

BIM should also include data linked to the execution (provided that it is correctly filled in by professionals, or by a BIM Manager):

- ✓ Installed systems (ventilation airflows, ductwork airtightness...)
- ✓ Whole building (building airtightness...)

This means that BIM should be able to provide all (or almost all) the data needed to calculate the energy performance of the building according to the applicable legislation.

Software used to calculate the energy performance are (or should very soon be) able to collect/use input data imported from BIM.

The result of the energy performance calculation will also be included into BIM.

In this perspective, BIM will surely be a strong game changer for compliance of EPCs by:

- being the place where all the individual EPC input data are stored,
- being also the place where the energy performance calculation result is stored.

This should:

- limit the risks of unintentional errors linked to multiple entering of the data
- make the EPC input data more easily accessible.

Ideally, BIM should also record all the design changes having taking place during the construction work. This would allow to find in BIM the "as built" EPC input data.

In many countries, it is today difficult to come to compliance of the EPCs and better enforcement of the energy performance of buildings regulation.

Even if there is not enough experience today to know when this will be fully operational, BIM could be the way to cover the whole issue of compliance of the EPC, by using embedded checks of the reliability of the input data and of the calculated energy performance used to issue the EPC, and by making compliance checks easier.

The potential of BIM in relation to compliance and enforcement of the EPC lies in the following areas:

- **Less specific efforts needed for collecting EPC input data**
Within the context of a BIM approach, data are associated to the different components used in a project. These data can/should include EPC relevant data.
- **Driver for compliance of EPC input data will come from other motivations**
The whole BIM approach aims to optimise the design, execution and operation phase of a building, whereby the overall quality of the works should also be improved. An essential feature of the approach is that the building and its materials/systems are in line with the data used in the BIM model. This approach should be beneficial for all parties involved. Therefore, there is less/no need to have specific actions for organising compliance of EPC input data.
- **Possibility to have a larger set of relevant input data**
In principle, the BIM model can be very detailed, including organisation of spaces, composition of building components, building nodes. In practice, it means that there might be access to a wide range of input data without the need for specific actions in the EPC context.
- **Possibility to simplify certain calculation aspects**
As indicated in the previous point, there is the potential for a larger set of relevant input data. This might e.g. allow to assess the 2- and 3-dimensional heat flows by a direct calculation, without the need for extra work by the EPC rapporteurs.
- **Possibility to have more refined assessment procedures**
An interesting example is the assessment of the risk of overheating and/or the need for active cooling. Such assessment should ideally be done at room level and by using dynamic simulations. One of the major concerns without BIM is the need for a detailed model of the building and/or its installations. With BIM, this might become very straightforward.
- **Possibility to have an effective enforcement without the need to involve governmental actions**
Within the context of BIM implementation, there might be various drivers for having a good compliance of the works in relation to the BIM modelling.

Currently, ISO 19650 BIM Standards are under development:

- ISO/WD 19650-1: Organization of information about construction works -- Information management using building information modelling -- Part 1: Concepts and principles
- ISO/WD 19650-2: Organization of information about construction works -- Information management using building information modelling -- Part 2: Delivery phase of assets

11. Conclusions

TO BE WRITTEN AT END OF 2016

12. Annexes

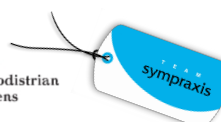
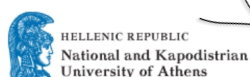
12.1 List of factsheets

(to be included)

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