CONCERTED ACTION
ENERGY PERFORMANCE
OF BUILDINGS

Implementation of the EPBD in Belgium

STATUS IN DECEMBER **2015**

Walloon Region

1. Introduction

In Belgium, the responsibility for implementing the Energy Performance of Buildings Directive (EPBD) resides with the three regions: the Walloon Region, the Flemish Region and the Brussels Capital Region. This reports focuses on the implementation of the EPBD in the Walloon Region, where the relevant overall responsibility (except for the inspection of boilers and Air-Conditioning (AC) systems, which are the responsibility of the Walloon Agency for Air and Climate) rests with the Public Service of the Walloon Region, Department of Energy and Sustainable Buildings (hereinafter referred to as 'administration').

The Walloon Region of Belgium implemented the EPBD on 19 April 2007. The region has had a thermal regulation for new residential buildings in place since 1985, and for existing residential buildings, new and existing schools, as well as offices since 1996. For existing buildings, there are requirements in place for the building envelope (U-values) and for ventilation. These requirements are applicable to every renovation, but an administrative procedure is only organised in renovation cases where a building permit is required. For new buildings, the requirements depend on the building type, and may cover the building envelope (U-values, global insulation level), the global energy performance rating (E_w, E_{spec}), ventilation, and an overheating rating. A certification scheme is in place for existing residential buildings since June 2010, and for existing non-residential buildings since October 2011.

The EPBD is implemented by a decree, for which its execution orders were adopted on 28 November 2013 and 15 May 2014, and fully entered into force in May 2015. These rules incorporate existing regulations and include changes required by the EPBD Directive 2010/31/EU, such as display of energy performance indicators in sale and rental advertisements, extension of the concept of major renovations to buildings under 250 m² and, among others, the addition of system requirements for renovations.

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2. Current status of Implementation of the EPBD

I. ENERGY PERFORMANCE REQUIREMENTS

In Belgium, regulations on buildings' energy performance are a regional competence. However, there are cooperation agreements between the three regions, in the interest of establishing an almost common methodology[1], leaving each region to define its own requirements. Also, the three regions use a single, jointly

NATIONAL WEBSITE energie.wallonie.be

[1] *The major difference between the Flemish Region and the Walloon Region is the reference building to which the project is compared when calculating the requirement E.*
The major difference between the Brussels Capital Region and the other two regions lies in the indicators used for the requirements, in production performance of hot water generators and the conversion factor in primary energy of wood.

developed, software tool (Figure 1). The aim is to make it easier for professionals to apply the tool.

I.i. Progress and current status

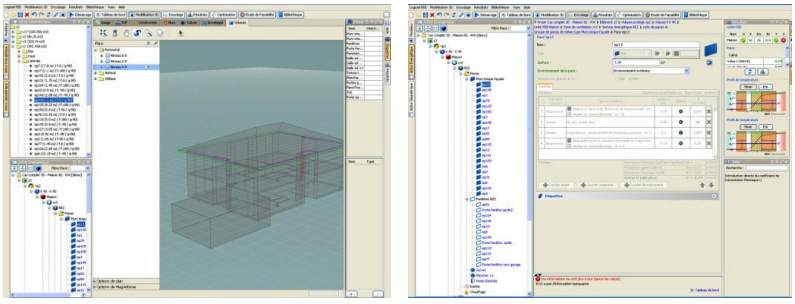
The calculation procedures and the minimum requirements for new and existing buildings have been included in an Executive Order of 22 June 2012 (p. 34014). After a transition phase that began in 2008, the Walloon Energy Performance Regulation (EPB) came fully into force in its current form in May 2010.

Since May 2010, the demand levels of the requirements have been tightened three times, i.e., in September 2011, June 2012 and January 2014, as illustrated in Table 1. The calculation procedure will continue to evolve, and technical studies are constantly being conducted to continue these developments. Priorities are established through consultation with the stakeholders. The next update is planned for January 2017.

After May 2015, further changes in administrative procedures and agreements were introduced. The administrative procedure anticipates that an initial EPB statement[2] would be submitted along with the request for planning permission (instead of fifteen days before work would start, as in the past). This initial EPB statement requires a complete energy performance calculation when the request for planning permission is submitted. The administrative procedure for new buildings subject to an overall energy performance level requirement is as follows:

> At the time of the request for planning permission:
  - Initial EPB statement. This is a document by which the applicant shows the measures taken to meet the requirements. Compliance with the requirements is mandatory to obtain a building permit. This document is submitted to the administration and uploaded to a central EPB database.

Figure 1: Software tool for the calculation of a building's energy performance.



> At the end of works:
  - Final EPB statement. This is a document by which the applicant demonstrates compliance with the energy performance requirements. This document is also submitted to the administration and uploaded to the central EPB database.
  - The Energy Performance Certificate (EPC) is then established by the expert, based on the information provided in the final EPB statement.

The amendments to the regulation also set requirements for the accreditation of Qualified Experts (QEs), which include the requirement to undergo training and to pass an examination. With a certain professional background, it is possible to directly attempt the exam without going through training.

Meanwhile, the administration put the necessary elements in place to prepare the sector for the arrival of the 2021 building regulation, which includes the Nearly Zero-Energy Building (NZEB) requirements.

Figure 2 shows the impact of the changes in the regulations on the primary energy consumption among new building projects registered in the EPB database.

I.ii. Format of national transposition and implementation of existing regulations

Regulations

The type and level of requirements for new buildings are determined by the function and type of the building (residential and schools, or offices, industry and other, non-residential, buildings), as shown in Table 1, and cover the following areas:

> the maximum E_{spec} value, which expresses the primary energy demand per m^2 of heated and/or conditioned floor area;

> the maximum E_w value, which expresses the primary energy consumption of the building compared to the primary energy demand of a reference building (different from the reference building in the Flemish Region);

> the maximum K-value, as in the Flemish Region and the Brussels Capital Region, which depends on the average U-value and the compactness (ratio between the volume of the conditioned space and the external area of the envelope) of the building;

[2] *EPB statement is an official declaration from the person who assumes the responsibility to tell the authorities that the building, as designed or built, meets the requirements of the EPB regulation.*

Requirements	Before EPBD		EPBD		
	Old requirements (2)	Requirements sept '08 - apr '10	Requirements may '10 - aug '11	Requirements sept '11 - dec '13	Requirements jan '14 - ...
A - U_{max} values ($W/m^2.K$) - New and existing (1) houses, collective housing, hospitals, offices and schools - New and existing shops, catering buildings, sports facilities, business and industry					
1. Walls defining the protected volume, excluding dividing walls with an adjacent protected volume					
1.1. Windows and other translucent walls, excluding doors, garage doors, curtain walls and glass brick walls	$U_{w,max} = 3.5$	$U_{w,max} = 2.5$ and $U_{g,max} = 1.6$	$U_{w,max} = 2.5$ and $U_{g,max} = 1.6$	$U_{w,max} = 2.2$ and $U_{g,max} = 1.3$	$U_{w,max} = 1.8$ and $U_{g,max} = 1.1$
1.2. Opaque walls					
1.2.1. Ceilings and roofs	0.4	0.3	0.3	0.27	0.24
1.2.2. Walls without any contact with the ground, with the exception of walls covered in 1.2.4	0.6	0.5	0.4	0.32	0.24
1.2.3. Walls in contact with the ground	0.9	0.9	$R_{min} = 1.0$	$R_{min} = 1.3$	$R_{min} = 1.5$
1.2.4. Vertical walls and sloping walls in contact: - with underfloor spaces	0.6	0.6	$R_{min} = 1.0$	$R_{min} = 1.2$	$R_{min} = 1.4$
- with cellars outside the protected volume	0.9	0.9			
1.2.5. Floor in contact with the outside environment or above an underfloor space	0.6	0.6	0.6	0.35	0.3
1.2.6. Other floors: - above a crawl space - above a cellar outside the protected volume - basement floors underground	0.9	0.9	$U_{max} = 0.4$ or $R_{min} = 1.0$	$U_{max} = 0.35$ or $R_{min} = 1.3$	$U_{max} = 0.3$ or $R_{min} = 1.75$
- above the ground	1.2				
1.3. Doors and garage doors	$U_{D,max} = 3.5$	$U_{D,max} = 2.9$	$U_{D,max} = 2.9$	$U_{D,max} = 2.2$	$U_{D,max} = 2.0$
1.4. Curtain walls	3.5	$U_{CW,max} = 2.9$ and $U_{g,max} = 1.6$	$U_{CW,max} = 2.9$ and $U_{g,max} = 1.6$	$U_{CW,max} = 2.2$ and $U_{g,max} = 1.3$	$U_{CW,max} = 2.0$ and $U_{g,max} = 1.1$
1.5. Glass brick walls	3.5	3.5	3.5	2.2	2.0
2. Walls between 2 protected volumes located on adjacent properties	1.0	1.0	1.0	1.0	1.0
3. Opaque walls inside a same protected volume or adjacent to another protected volume on the same property, except for doors and garage doors:					
3.1. between distinct residential units	1.0	1.0	1.0	1.0	1.0
3.2. between residential units and common spaces (staircase, entrance hall, passage)	-				
3.3. between residential units and non-residential occupancy spaces	1.0				
3.4. between industrial occupancy spaces and non-industrial occupancy spaces	1.0				

(1) Renovated buildings where a building permit is mandatory, and unheated buildings changing their occupancy
(2) These U-value requirements do not apply to shops, catering buildings, sports facilities, business and industry

Requirements	Before EPBD		EPBD		
	Old requirements (2)	Requirements sept '08 - apr '10	Requirements may '10 - aug '11	Requirements sept '11 - dec '13	Requirements jan '14 - ...
B - K values (-) – Global insulation level (function of average U-value and compactness)					
New buildings:					
Houses	K55	K45	K45	K45	K40
Offices and schools	K65				
Collective housing, hospitals, shops, catering buildings, sports facilities and business	-				
Industry	-	K55	K55	K55	K55
Existing unheated buildings changing their occupancy to:					
Houses	K65	K65	K65	K65	K65
Offices and schools	K70				
Other uses (heated)	-				
Existing heated buildings (except industry) changing their occupancy to:					
Houses	K65	-	-	-	-
Offices and schools	K70				
Other uses (heated)	-				
Existing industry (heated or unheated) changing their occupancy to:					
Houses	K65	K65	K65	K65	K65
Offices and schools	K70				
Other uses (heated)	-				
Others	-	-	-	-	-

Requirements	Before EPBD		EPBD		
	Old requirements (2)	Requirements sept '08 - apr '10	Requirements may '10 - aug '11	Requirements sept '11 - dec '13	Requirements jan '14 - ...
C - E_w (-) – Global energy performance level (calculated primary energy consumption divided by calculated primary energy consumption of a reference building) **D - E_{spec} (kWh/m².year) – Specific energy consumption** (calculated primary energy consumption per m² of heating floor area) **E - Overheating rating (K.h)**					
New buildings:					
Houses	-	-	$E_w \leq 100$ $E_{spec} \leq 170$ $I_{overh} \leq 17,500$	$E_w \leq 80$ $E_{spec} \leq 130$ $I_{overh} \leq 17,500$	$E_w \leq 80$ $E_{spec} \leq 130$ $I_{overh} \leq 17,500$
Offices and schools	-	-	$E_w \leq 100$	$E_w \leq 80$	$E_w \leq 80$
Other destinations	-	-	-	-	-
Existing buildings:	-	-	-	-	-

Requirements	Before EPBD		EPBD		
	Old requirements (2)	Requirements sept '08 - apr '10	Requirements may '10 - aug '11	Requirements sept '11 - dec '13	Requirements jan '14 - ...
F - Ventilation					
New houses and buildings changing their occupancy to houses	Requirements are set in the annex V of the execution order of 17 April 2008 (based on NBN D50-001)				
New offices, schools and buildings changing their occupancy to offices or schools	Requirements on air outputs are function of premises use	Requirements are set in the annex VI of the execution order of 17 April 2008 (based on NBN EN 13779)			
New collective housing, hospitals, shops, catering buildings, sports facilities, businesses and buildings changing their occupancy to these uses	-				
Renovated houses with a mandatory building permit	Partial system (only for supply air if windows are replaced)				
Renovated offices and schools with a mandatory building permit	Partial system (only for supply air if windows are replaced)				
Renovated collective housing, hospitals, shops, catering buildings, sports facilities and businesses with a mandatory building permit	-	Partial system (only for supply air if windows are replaced)			
New and existing industry	-	-	-	-	-

Table 1: Evolution of energy requirements.

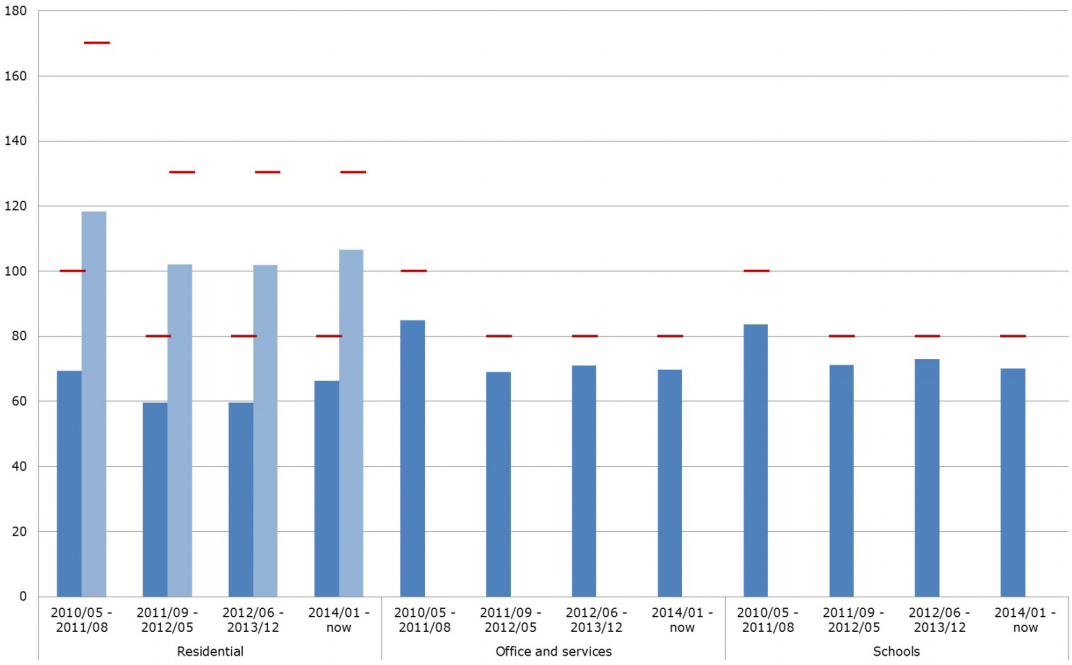


Figure 2: Average results for buildings registered in the EPB database, in terms of E_w (primary energy consumption), compared to the legal requirements. - Dark blue: E_w value average - Light blue: E_{spec} value average - Red lines: maximum allowed consumption

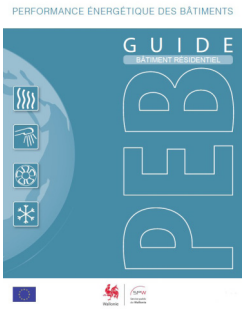


Figure 3: Guide to energy performance for residential buildings.

> the maximum U-values for each element of the building envelope;

> the requirements concerning ventilation (minimum ventilation rates to ensure indoor air quality);

> the maximum rating value for overheating.

Technical guidance document

A practical guide (Figure 3), designed for professionals, helps them to understand the new regulation. This guide is available on the website[3] of the Department of Energy and Sustainable Buildings.

A specific support service called "*Facilitateurs PEB*" is also available. This service is accessible by e-mail or phone.

Table 2: Elements included in the energy performance calculations for residential and non-residential buildings.

	Residential buildings	Non-residential buildings
For the envelope:		
○ Transmission losses, including thermal bridges	X	X
○ Ventilation losses, including evaluation of infiltration	X	X
○ Internal and solar gains	X	X
○ Heat capacity	X	X
For systems:		
○ Heating installation	X	X
○ Air-conditioning installations, including free cooling systems	X	X
○ Hygienic ventilation	X	X
○ Hot water supply (currently only for residential buildings)	X	-
○ Lighting installation (only for non-residential buildings)	-	X
○ Consumption of auxiliary equipment	X	X
○ Thermal and photovoltaic solar system	X	X
For internal comfort:		
○ Type of ventilation (natural, mechanical, mixed) and air flow rates	X	X
○ Assessing the risk of overheating	X	-

The energy performance calculation methodology is almost identical for the three regions. There are two variations of the calculation methodology, one for residential, and another for non-residential buildings. The main elements included in each version are listed in Table 2.

The following factors (f_P) are used to express the final results in terms of primary energy:

> natural gas, oil, propane, butane, LPG, wood, pellets: $f_P = 1.0$;

> electricity (consumed or self-produced): $f_P = 2.5$.

The three regions are working together to adapt the energy performance calculation method (to develop a simplified method and to propose an alternative to fixed values, allowing the inclusion of product data and consideration of the EcoDesign Directive, etc.). The three regions, together with the Belgian Building Research Institute, the main universities of the country and design offices, have established a common platform, the so-called 'EPB consortium', with the objective to bring together a variety of actors capable of conducting studies on the evolution of the energy performance calculation method. In those technical studies, the existing standards (including CEN standards) are always considered.

Quality Assurance (QA) / Compliance checking process

A free, commonly used software tool for QEs has been developed to calculate the primary energy consumption of the

[3] www.leguidepeb.be

building, to check compliance with regulation requirements, and to deliver proper documentation to the administration. The software tool integrates validation rules to avoid encoding errors and to facilitate control. In addition to the adaptations necessary for the implementation of requirements that are regularly increased, the Walloon Region ensures constant improvements in the usability of the tool, in response to user expectations and feedback.

QEs must save all their files on the central EPB web database (Figure 4). Local and regional administrations (920 civil servants in total) have access to this database in order to ensure compliance with the regulation. Until now, 40,315 construction projects have been registered in the database (these consist of new buildings and major renovations since May 2010), of which 6,814 have been completed (building construction completed) (Figure 5).

Qualified Experts (QEs)

Professionals in charge of implementing the regulation are called "*EPB responsibles*", and they are required to hold a degree in either architecture, or engineering. For a person to become accredited, he/she must hold one of the required degrees, and prove that they have insurance coverage. Training courses are not mandatory, but are organised continuously. Their aim is to:

> explain the basic principles of the calculation method and the energy requirements to new QEs;

> explore the technical aspects in more detail with the accredited QEs.

Names and addresses of QEs are listed on the website[4] of the Department of Energy and Sustainable Buildings.

From May 2015, QEs will need to undergo training and must pass an examination to become accredited.

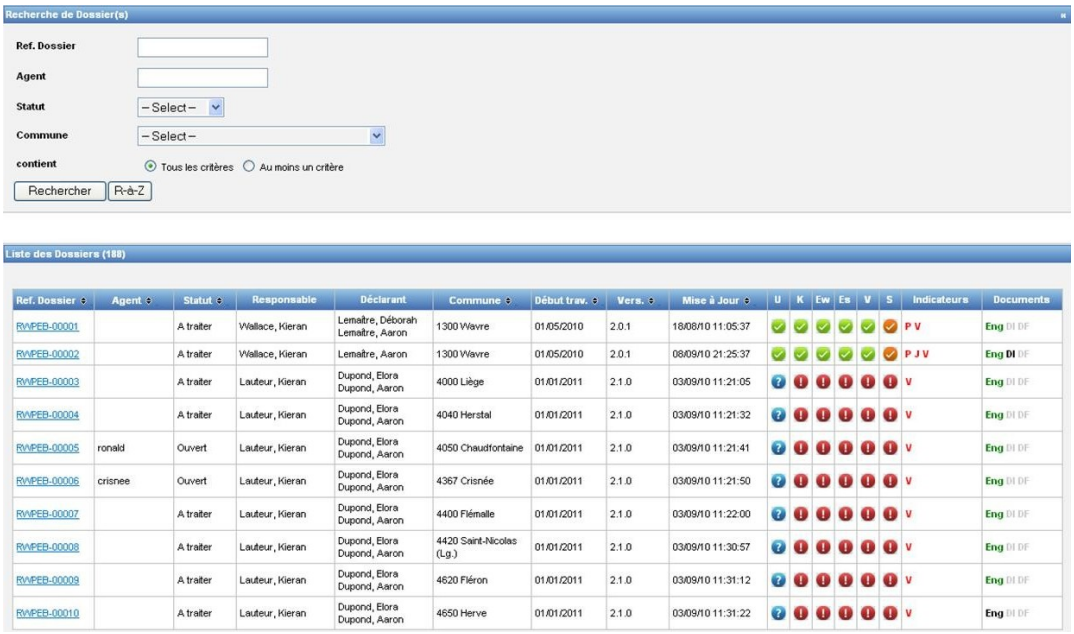


Figure 4: Preview of the central EPB database.

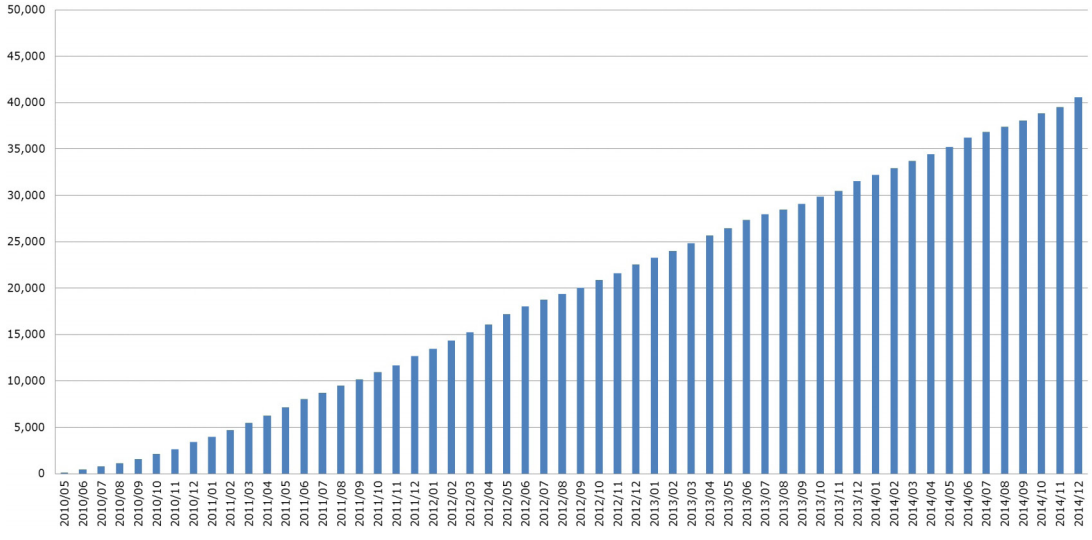


Figure 5: Central EPB database – number of registered EPB statements.

[4] *http://energie.wallonie.be/fr/liste-des-responsables-peb-agrees.html?IDC=7264*

I.iii. Cost-optimal procedure for setting energy performance requirements

In order to determine optimal energy performance levels in relation to costs, a study (called 'Co-ZEB' and available on the website[5] of the Department of Energy and Sustainable Buildings) was launched at the end of 2011 and published in June 2013. The economic parameters included are as follows:

- macro-economic calculation scenario;
- a discount rate of 4%, as suggested in the guidelines;
- medium scenario trend for energy cost increases (1.75%).

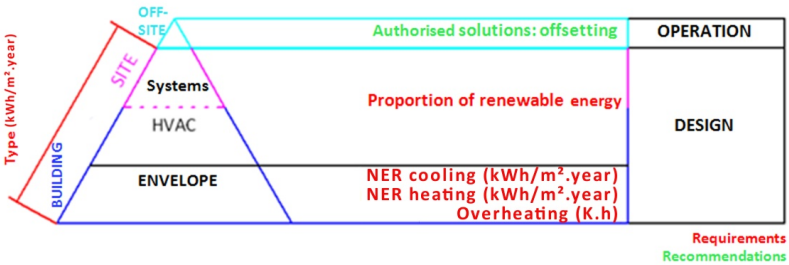
Table 3: Comparison between cost-optimal levels and 2014 requirements.

Elements	Optimum
Window insulation	Requirement 2014 : $U_{w,max}$ = 1.8 W/m².K and $U_{g,max}$ = 1.1 W/m².K
Ceiling and roof insulation	No clear optimum
Wall insulation	Requirement 2014 : U_{max} = 0.24 W/m².K
Floor insulation	Requirement 2014 : U_{max} = 0.3 W/m².K
Global insulation	**2014 Requirements (see table below)**

Destination	Cost-optimal K level	Required K level since January 2014	Gap (%) with 2014 requirements
Houses	-	K35	-
Offices (without AC system)	K33	K35	-5,7%
Offices (with AC system)	K37	K35	+5,7%
Schools	K36	K35	+2,8%

Destination	Cost-optimal E_w level	Required E_w level since January 2014	Gap (%) with 2014 requirements	Cost-optimal building setup
Houses	65,55	80	-18%	- 2014 U values - gas condensing boiler - ventilation C+ - airtightness 4 m³/h.m²
	E_{spec} : 112,6 kWh/m².year	E_{spec} : 130 kWh/m².year	E_{spec}: -13%	
Offices (without AC system)	50	80	-37%	- 2014 U values (glass with solar factor g=0.38) - gas condensing boiler - ventilation D - lighting diming - indoor manual solar protections
Offices (with AC system)	63	80	-21%	- 2014 U values (without solar glass) - gas condensing boiler - ventilation D - lighting diming - indoor manual solar protections - AC system
Schools	32	80	-60%	- 2014 U values (without solar glass) - air/water heat pump - ventilation C - efficient lighting - indoor mobile solar protections - PV panels

Figure 6: NZEB definition.



The main conclusions in relation to the requirements foreseen for 2014 are:

- in terms of U values and global insulation levels, requirements were found to be cost-optimal;
- concerning system E_w level for new buildings (global energy consumption level expressed in primary energy), requirements were found to be only slightly different from cost-optimal solutions, depending on building typology (Table 3).

Thus, the requirements included in the new 2014 regulation are, so far, found to be cost-optimal.

I.iv. Action plan for progression towards Nearly Zero-Energy Buildings (NZEBs)

National application of the NZEB definition

In 2012, the Co-ZEB study laid out the national definition of NZEB as a building with the energy performance level of the building envelope close or equivalent to the '*Passive House*' standard. In this study, NZEBs were characterised by a high thermal performance of the building envelope, as well as by covering a part of the residual consumption for heating/ cooling and electricity using Renewable Energy Sources (RES), as illustrated in Figure 6.

However, it is not necessary for a NZEB to comply with all of the criteria set by the '*Passive House*' standard, given the highly constraining nature of these criteria for certain building types and/or for certain locations (in particular the criterion on the airtightness of the building envelope, which imposes a specific level of performance that is often difficult to achieve, in construction terms). The quantification of the energy performance level is based on the development zones and the building type, as well as on whether the building is new, or renovated.

To be certified as a NZEB, the building must meet a series of strict requirements or alternative criteria, which are a series of non-restrictive recommendations aimed at facilitating compliance with the requirements set. A list of recommended equipment solutions encourages the occupants of NZEBs to align their actual energy consumption with the projected or reference consumption estimated for

[5] *energie.wallonie.be/fr/etudecozebcoutoptimum.html?IDC=8729&IDD=97766*

elements not considered in the characterisation of a NZEB at the design stage.

Application of NZEB requirements to the cost-optimal calculation, based on the assumptions included in the study, has shown that:

> New NZEB residential buildings are relatively close to cost-optimal under the assumptions that were chosen for the study and they are very close to cost-optimal in case a high trend of energy cost increase had been chosen.

> New NZEB offices are about 10% above cost-optimal.

> New NZEB schools are not cost-optimal but they would approach cost-optimal in case a high trend of energy cost increase had been chosen.

In early 2014, these requirements were presented to the regional stakeholders of the building sector as part of a 2014 - 2020 roadmap, but they did not garner consensus. Therefore, a new proposal has been developed which is based on the results of calculations on model geometry, statistical data and subsidies databases. These new requirements were approved by the regional stakeholders of the building sector and will be adopted by the Government in January 2016. They are presented in Table 4.

Figures and statistics on existing NZEBs

Based on NZEBs requirements (Table 3), 2,856 of the buildings included in the EPB database meet the definition of NZEB, representing 12% of the total final EPB statements.

The renewable solutions for heating most commonly proposed by the designers to meet the NZEB requirements are shown in Table 3, and include the use of a heat pump (26%), a combination of heat pump with photovoltaic solar panels (20%), photovoltaic solar panels alone (11%), or a combination of a biomass boiler with photovoltaic solar panels (4%). It is interesting to observe that, in 26% of the cases, the net energy needs for heating and overheating set out in the NZEB requirements for primary energy consumption are met without the use of RES (Figure 7).

Table 4: NZEB requirements and recommendations.

Individual residential units			**2021**
E_W			45
E_{spec}			95 kWh/m²
K			35
U_{max} roof/wall/ceiling			0.24 kWh/m²
U_{max} floor			0.24 kWh/m²
U_{max} window			1.5 kWh/m²
U_{max} glazing			1.1 kWh/m²
U_{max} door			2.0 kWh/m²
Ventilation			*
Overheating index			< 6,500 K.h
% RES			-
non-residential units			**2021 (2019 public buildings)**
FUNCTIONS	Overall requirement E_W		
	Lodging		90
	Offices		45
	Schools		45
	Health care	With nocturnal occupation	90
		Without nocturnal occupation	90
		Operating room	90
	Group	High occupancy	90
		Low occupancy	90
		Cafeterias/ large dining rooms	90
	Kitchen		90
	Commerce		90
	Sports facilities	Sport hall/gymnasium	90
		Fitness Dance	90
		Sauna Pool	90
	Technical local		45/90
	Common		45/90
	Other		90
	Unknown		90
E_{spec}			
Other requirements			
K			35
U_{max} roof/wall/ceiling			0.24 kWh/m²
U_{max} floor			0.24 kWh/m²
U_{max} window			1.5 kWh/m²
U_{max} glazing			1.1 kWh/m²
U_{max} door			2.0 kWh/m²
Ventilation			*
Overheating index			
% RES			-

* Specified in an annex

Figure 7: Number of NZEBs and use of RES.

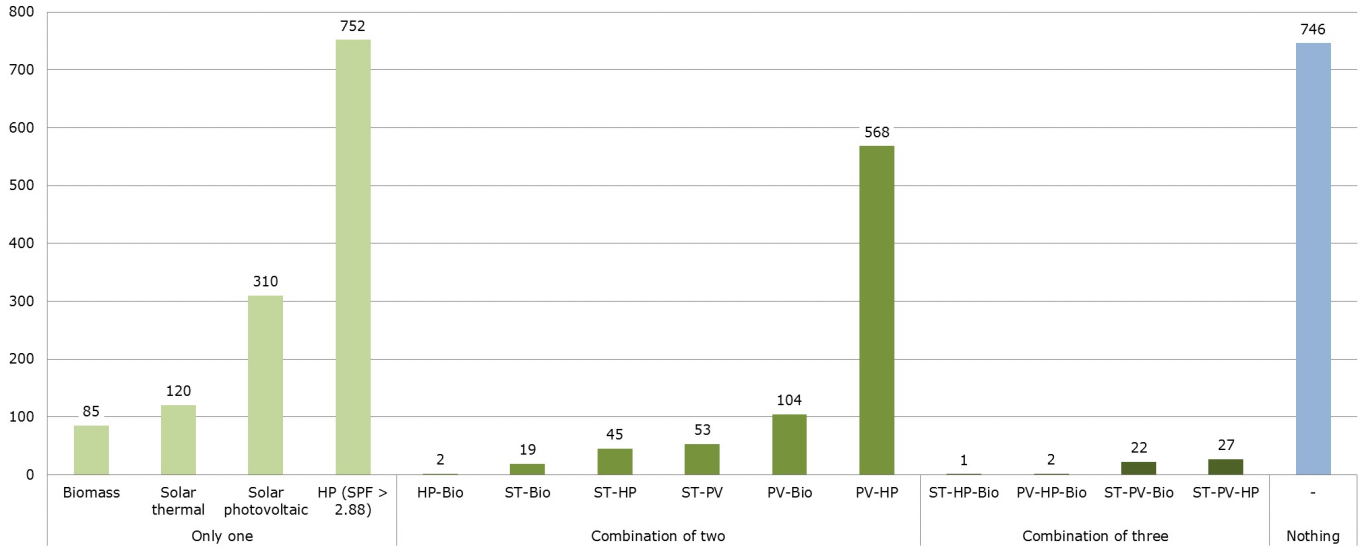


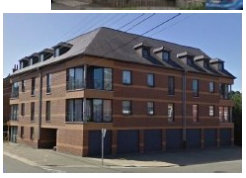
Figure 8: Reference apartment buildings for Article 4 of the EED.









I.v. Implementation of the Energy Efficiency Directive (EED) regarding building renovation and the exemplary role of public buildings

Concerning Article 4 of the EED, a first draft of a renovation action plan for the Walloon Region was included in the third National Energy Efficiency Action Plan (NEEAP3). A study was conducted by the University of Mons, the University of Liège and the 3E consultant group, with the aim to present the residential and commercial building stock, and to identify cost-effective approaches for renovation linked to building type. The study will be published at the end of 2015. Already, a summary overview of the residential and commercial building stock has been put together (Figure 8). The Walloon Region has already implemented a number of regulatory and non-regulatory measures, including subsidies for energy audits, subsidies for energy-efficient renovation of houses, zero interest rate credit for energy renovation of houses and tax reductions, as policies and instruments to stimulate major, cost-effective renovation, including gradual major renovations. The government and major stakeholders have also established an employment-environment alliance (EEA) through the "Plan Marshall 2.Vert", which aims at improving the environment, while promoting economic opportunities and job creation, ensuring the transition of the entire construction industry to a more sustainable construction/renovation model. Three areas for improvement were identified:

> stimulating the demand for renovation and for sustainable construction of private and public buildings;
> increasing the construction sector's capacity and the number of new and renovated buildings on offer in the market;
> developing skills through a comprehensive training program.

The EEA is a multi-year plan with a budget of 879 M€.

In addition to the above-mentioned measures, which represent an initial strategy of building renovation, the Department of Energy and Sustainable Building has begun to consider supporting the establishment of a refurbishing strategy for buildings in the Walloon Region, by organising workshops aimed at inspiring the vision and proposing concrete actions.

In parallel, in October 2013, a consultation on the requirements and the methodology of energy performance calculation was held at the request of the building sector. Eleven organisations participated. The objective of the consultation was to establish a roadmap for energy performance requirements applicable in the Walloon Region for the period 2014-2020, for both new construction and renovation of all types of buildings. The roadmap should be acceptable to all, on the basis of European objectives, while meeting the specific conditions of the Walloon Region and of its key stakeholders, the economic and energy context, the expected achievements, as well as the affordability of housing. For the more specific cases of renovation, a strategic consultation on the long-term renovation of buildings was also proposed. A preliminary report was produced in June 2014, in which the following main needs were identified:

> to know better all possible means of communication to pass the message to every citizen in the Walloon Region;
> to conduct an energy audit prior to any works and/or subsidies;
> to give clear instructions to QEs regarding long term energy requirements for renovations;
> to develop EPCs as a support tool for decision-making, and to work towards complementarity between EPCs and energy audits suitable for investment decisions;
> to establish criteria for evaluating whether large-scale refurbishment is preferable to demolition/ reconstruction;
> to distinguish regulation requirements for new construction versus renovated buildings that are nearly as energy efficient as new buildings.

At the end of 2015, the government in place since June 2014 has been working on a EEA in the frame of the "Plan Marshall 4.0", that will include some specific actions related to a long-term strategy for mobilising investment in the renovation of the national building stock. Concrete actions are planned for 2016 to deepen stakeholder involvement and develop tools.

Concerning Article 5 of the EED, the Walloon Region has chosen to adopt an alternative approach to the required annual renovation of 3% of existing public buildings. Article 5.6 allows for the adoption of other effective measures, such as major renovations, as well as measures to modify the behaviour of occupants in buildings owned and

occupied by the central government, in order to achieve, by 2020, energy savings that would be equivalent to those that would result from the obligatory renovation rate defined in paragraph 1 of Article 5.

The Walloon Region decided to determine its target based on the pre-existing register of buildings' energy performance, with data collected by the different institutions of central government. This register lists technical data on the buildings, e.g., heated area, occupancy and annual actual consumption data (corrected according to heating degree days), and enables the characterisation of a building's individual energy performance in kWh/m².year, which can then be compared to the cost-optimal energy performance of the region in which the building is located. This sets the goal of primary energy savings, corresponding to the required 3% of annual savings that must be achieved by each official institution that must comply with this EED requirement. At this stage, the Walloon Region has calculated its renovation target based on an economical primary energy consumption of 15 kWh/m².year.

The measures which the Walloon Region plans to take in order to achieve its energy savings objective, are those recommended by the Walloon energy audits, as defined in the UREBA programme *("Utilisation Rationnelle de l'Energie dans les Bâtiments Publics - Rational Use of Energy in Public Buildings")*.

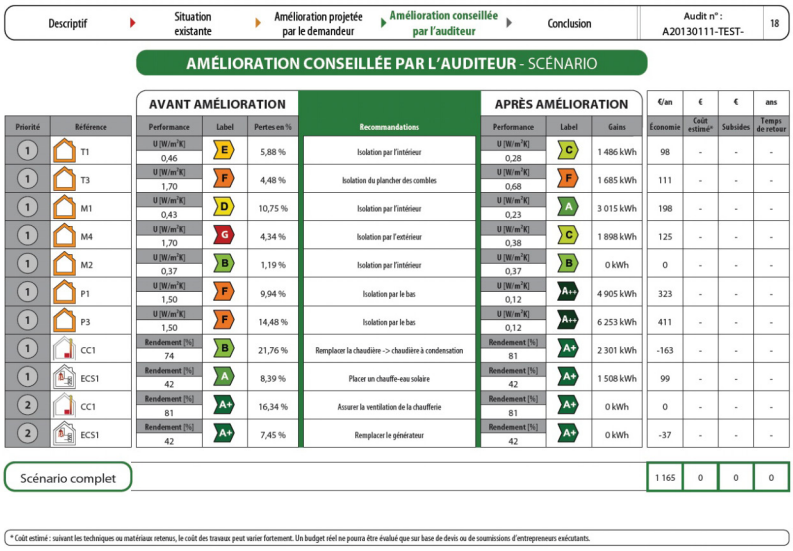
I.vi. Other relevant plans

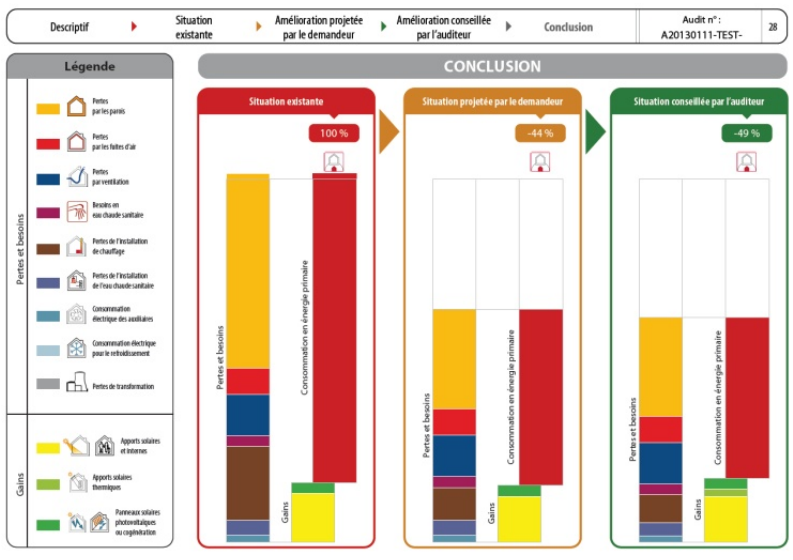
There are a number of voluntary programmes related to new and existing residential and non-residential buildings. The most significant of these are:

> The Energy Advice Procedure ('PAE1') for existing residential buildings, in force since 2006. A new procedure called 'PAE2', which is accompanied by a new report layout and includes a strong link with EPCs, has been developed and applied since late 2013. This is an audit that provides an evaluation of the building's energy performance, taking into account the real energy consumption, as well as detailed recommendations to improve this performance. The energy audit also shows how the EPC would improve if works recommended by the audit were implemented (Figure 9). At the moment, more than 483 assessors are accredited on the basis of PAE2 to perform energy audits, and all audits are centralised in a database. Currently, more than 38,900 PAE1 audits are registered in this database, as are more than 5,800 PAE2 audits, together representing more than 2.9% of the existing building stock in the Walloon Region.

> The call for projects "Exemplary buildings in Wallonia"[6] was an action aimed to develop the construction and refurbishment of buildings with strict energy and environmental criteria applied to architectural quality, cost-effectiveness and reproducibility. A technical annex lists criteria and minimum requirement levels that must be met to submit a project. The projects selected by the jury receive a grant and technical guidance to ensure compliance with their commitments. This action aims to prepare the building sector for NZEB requirements, beyond the legal minimum requirements. The first call ended in December 2012. Seventy (70) projects for residential buildings were submitted, and 23 projects, representing a built area of 7,415 m², were declared

Figure 9: Layout of the new energy audit.





[6] *energie.wallonie.be/fr/l-action-batiments-exemplaires-wallonie.html?IDC=8614*

winners by the jury. At this time, construction works are ongoing and 8 projects are being finalised. A second call closed in December 2013. Fourteen (14) non-residential projects were submitted, and 7 projects, representing 24,159 m² of buildings, were declared winners. After construction, projects that comply with their commitments shall receive confirmation showing their exemplary performance.

II. REQUIREMENTS FOR TECHNICAL BUILDING SYSTEMS (TBS)

The Walloon Region is working on the inclusion of requirements on Technical Building Systems (TBS) into its legislation. The requirements will enter into force on 1 May 2016 and are partially inspired by the Flemish Regions TBS requirements, with some additional specifications, or modifications, inspired by the Brussels Capital Region's 'heating' and 'air-conditioning' decrees.

II.i. Coverage of heating, domestic hot water, air-conditioning and large ventilation systems

The bill establishes minimal requirements for heating systems with gas, liquid, or solid fuel boilers, or with heat pumps. For instance, the requirements on the Coefficient of Performance (COP) for two types of heat pumps are presented in Table 5. The other types of heat pumps are already subject to sufficient performance requirements, laid out in Commission Regulation 813/2013.

In new direct electrical heating systems installed after 1 May 2016, the power of the direct electrical heating system will be limited to 15 W/m² of the building's heated floor area. Similar restrictions are set on the power of electrical Domestic Hot Warer (DHW) boilers.

A minimal efficiency is also foreseen (Table 6) for compression cooling devices, with respect to the cooling vector (water or air).

Requirements will be set for the heat recuperation of central ventilation systems. The Walloon Region will implement some general requirements for all ventilation systems (not just large ones).

Table 5: Coefficient of Performance (COP) as function of the type of heat pump.

Heat Pump Type	Coefficient of Performance
Soil / Water	4.3
Water/ Water	5.1

Table 6: Minimal efficiency for compression cooling devices.

Type of cooling machine	$\eta_{inst,min}$
Cold water cooling machine (air cooled)	2.0
Cold water cooling machine (water cooled)	3.1
Cold water cooling machine (water cooled and with remote condenser)	2.5

II.ii. Regulation of system performance, distinct from product or whole building performance

The general philosophy of the bill is to set requirements for whole systems, instead of parts of the system. In general, parameters to be taken into account include among others pipe insulation and the initial setting of the various system components.

For instance, in the case of the heat recuperation in a serially produced central ventilation system, the requirement is set to:

$$\eta_{hr,vent} = \eta_{test} \cdot f_{at\ AHU} \cdot f_{at,\ duct} \cdot f_{insul,duct} \cdot f_{ae} \cdot f_{reg,vent} \geq 75\%$$

Where η_{test} is the efficiency of the heat recuperator measured in laboratory conditions, but where the other parameters are linked to the global system:

- $f_{at,\ AHU}$ is representative of the airtightness of the air handling unit;
- $f_{at,\ duct}$ is representative of the airtightness of the air ducts;
- $f_{insul,\ duct}$ is linked to the insulation of the ventilation air ducts;
- f_{ae} is representative of the system settings;
- $f_{reg,\ vent}$ is representative of the speed of the fans.

II.iii. Applicability to new, replacement and upgraded systems in existing buildings

The bill applies to the installation of new equipment, as well as to the renovation of existing systems in existing buildings. The requirements must be fulfilled upon new installation, or replacement of one of the main parts of the system. For a fuel boiler, these 'main parts' are the burner, or the whole boiler. For a ventilation system, these are the air-handling unit, or the heat recuperator.

The same calculation method applies for both cases (new and renovated buildings).

II.iv. Provisions for installation, dimensioning, adjustment and control

TBS requirements are often linked to parameters which reinforce efficient design and good installation of the various system components.

In the case of a boiler, for example, the requirement takes into account the location of the boiler, or the setting of its temperature by the use of different corrective coefficients.

There is no global building performance calculation involved in the TBS requirements. Better TBS have had a positive impact on the E-level, but this impact has not been calculated.

II.v. Encouragement of intelligent metering

The bill also sets requirements on the meters to be installed, depending on the TBS. In the case of a boiler, installing a fuel meter will be required when the power is greater than 100 kW. In the case of one or more heat pumps, a power meter will be required when the total power is greater than 12 kW. If the combined power is greater than 100 kW, a meter for the measurement of the energy delivered by the heat pump(s) shall also be installed. Similar requirements also apply to cooling systems.

The bill also prescribes the metering characteristics and the national or European standards they must meet. However, no requirements for intelligent metering are included.

II.vi. Encouragement of active energy-saving control (automation, control and monitoring)

The requirement to install meters in certain configurations, and the inclusion of parameters that could enhance more efficient use of a system, are some of the factors that contribute to a more rational use of energy. For instance, the air-conditioning requirements take into account a correction factor linked to the use of an automatic control system that prevents simultaneous heating and cooling in the same room.

III. ENERGY PERFORMANCE CERTIFICATES (EPCs) REQUIREMENTS

The regulations on energy performance certification can be divided into two phases: before and after 30 April 2015[7].

Since May 2015, a new EPB decree[8] and a new enforcement order[9] related to this decree have entered into force, addressing the certification of all buildings. Some aspects of this enforcement order, mainly in relation to advertising requirements, only entered into force in January 2015. Nevertheless, except in specific aspects, this new regulation will not fundamentally change the rules of previous regulations. All EPCs are valid for 10 years, except those for public buildings which are valid for 5 years. Each certificate is identified by a unique number.

Since 1 May 2010, an EPC is mandatory for new buildings when the building permit is requested. A QE is identified at the beginning of the construction works and is responsible for the building's compliance with requirements. At the end of the process, the EPC is issued by the administration on the basis of the information contained in the building's final EPB statement. According to the new regulation, from 1 May 2015, the EPC will be issued by the QE, on the basis of this final EPB statement. The EPC layout and indicators are the same as those for existing buildings, except for recommendations that are linked to behaviour.

Certification of existing non-residential buildings has not yet been implemented in practice. The calculation method and the software tool are still under preparation. Certification of existing non-residential buildings is expected to begin in 2018. The EPCs issued by a QE, will be based on an asset rating system and will be registered in a database.

Certification of existing residential buildings applies to buildings whose building permit was requested before 1 May 2010. An EPC has to be available, at the latest, when a preliminary sales agreement is signed, in case of sale, or at the time of contract signature, at the latest, in case of rental. If the EPC is missing, an administrative fine of 2 €/m² with a minimum of 250 € and a maximum of 25,000 € is legally prescribed. Because of the difficulty of measuring the building on-site, a fixed penalty will now apply. From 1 January 2015, the energy performance indicator must be stated in the sale or rental advertisements, otherwise, there will be a fine of 500 €. Moreover, if

[7] *Regulations applicable until May 2015:*
- *Certification of new buildings: the enforcement order was approved by the government on 25 August 2011 (M.B. du 05/09/2011, p. 56370).*
- *Certification of existing residential buildings: the enforcement order was approved by the government on 3 December 2009 (M.B. du 22/12/2009, p. 80379), and was modified on 27 May 2010 (M.B. du 07/06/2010, p. 35958).*
- *Certification of existing non-residential buildings: the enforcement order was approved by the government on 20 October 2011 (M.B. du 03/11/2011, p. 65830).*
- *Certification of public buildings: the enforcement order was approved by the government on 24 November 2011 (M.B. du 12/12/2011, p. 72952).*

[8] *Approved by the parliament on 28 November 2013 (M.B. 27/12/2013, p. 102985).*

[9] *Approved by government on 15 May 2014 (M.B. du 30/07/2014, p. 56172 – add. 21/08/2014, p. 61244).*

the EPC is absent at the time of the proposed sale or lease, the fine will be 1,000 €. The regional administration is responsible for monitoring compliance with this requirement. However, no fines were issued until 2015.

For existing residential buildings, the development of the calculation method (asset rating), the content of the EPC, the software tools, the handbook for QEs, and the training material are finalised. They are being continuously adapted based on input received from the certification support service, to clarify questions posed by assessors.

Figure 10: EPC generation process.

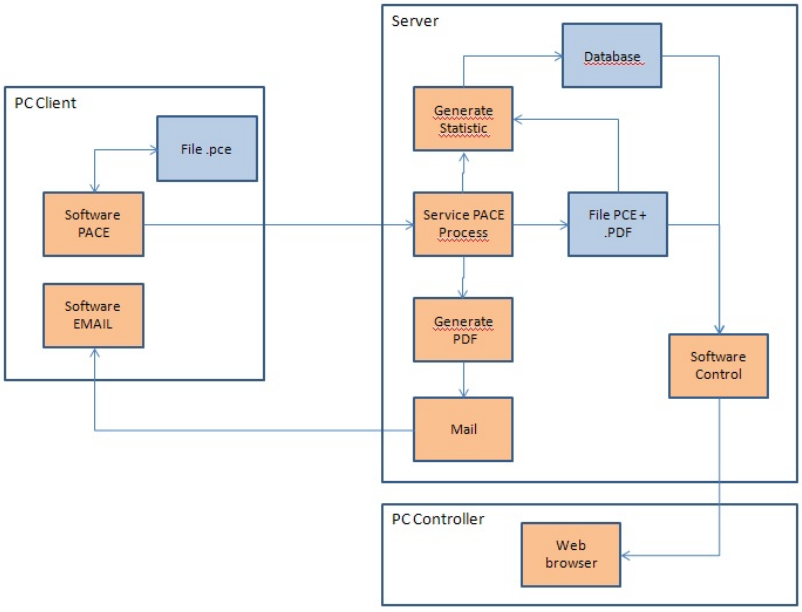
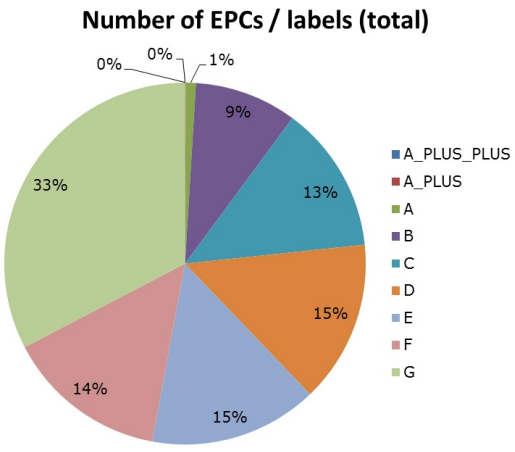
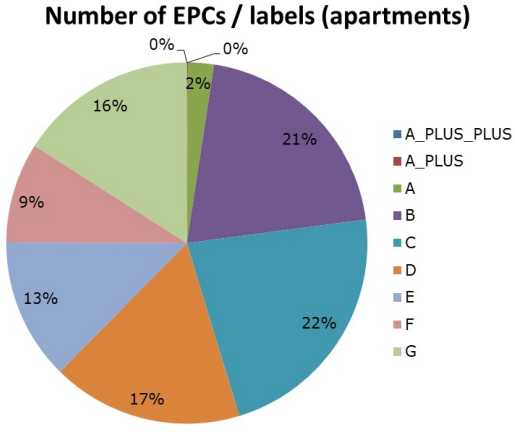
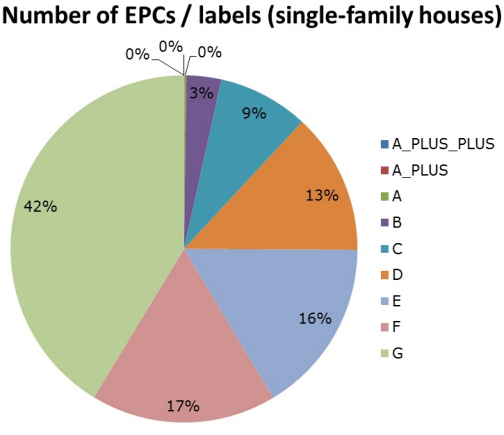


Figure 11: Distribution of EPCs per label for apartment buildings and single-family houses.







III.i. Progress and current status on sale or rental of buildings

Overview and administration system

For existing residential buildings, a dedicated, stand-alone software, called PACE, is used by assessors to input the building data collected, and then the server generates the EPC (Figure 10). This PACE software includes built-in validation rules, in order to avoid sending incomplete EPCs to the database (which also includes new buildings). It also contains validation rules for input data to prevent mistakes (rules to prohibit or flag certain values). The file with the building data and the EPC are recorded in a database before the certificate is sent to the assessors by e-mail in PDF format.

From the analysis of the data available in the central database, it is possible to extract quite interesting information. For example, the average building label is E, but this depends on the use of the building: the average label for single-family houses is F, whereas for apartments it is D (Figure 11). The average E_{spec} (Figure 12) has evolved since certification began in 2010 in the following way:

- During the first two semesters of operation of the database (in 2010), certification was only mandatory at the time of sale for single-family houses with building permits requested after 1 December 1996, and so the collected E_{spec} data cannot be considered representative.
- Data collected after the second semester of operation of the database show that the average E_{spec} improved over time, independent from the year of construction of the building. One possible explanation for this finding could be that the obligation was not well-known to the wider public and, as a consequence, few people presented additional proof to demonstrate good energy performance of their house at the time, whereas, as they gained more

knowledge on how to use the information in the EPC, they started providing more relevant documentation. A second possible explanation could be that the improvement in energy performance is achieved through the refurbishment of houses.

However, it is important for the general public to understand that old houses do not necessarily have poor energy performance, as much as recently built houses do not necessarily have good energy performance. The only way to know the actual energy performance of a building is through obtaining an EPC. Figure 13 shows the distribution of EPC labels in relation to the age of the building (for cases where the building age is known).

By the end of 2014, EPCs for new residential buildings were being delivered by the administration on the basis of data entered by QEs into the software (PEB-software). After 1 May 2015, EPCs are delivered by the QEs.

How flats are certified in apartment buildings

In multi-family residential buildings, the EPC is issued per apartment. In case there is a collective system for heating, DHW, ventilation, etc., an audit of the collective system must be completed at the time of first rental or sale of an apartment. The data from the audit are saved in a database, and are used as input for the certification of the other apartments in the building.

Figure 12:
Evolution of the average E_{spec} on single-family house certificates.

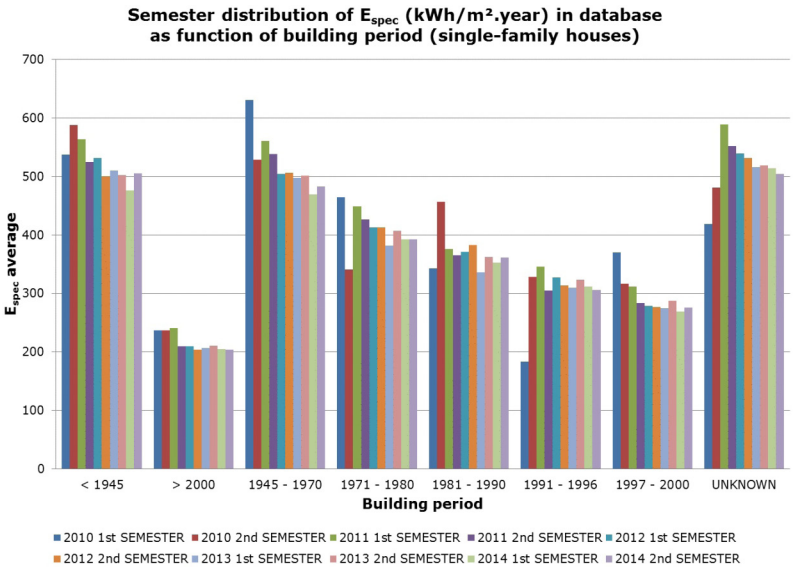
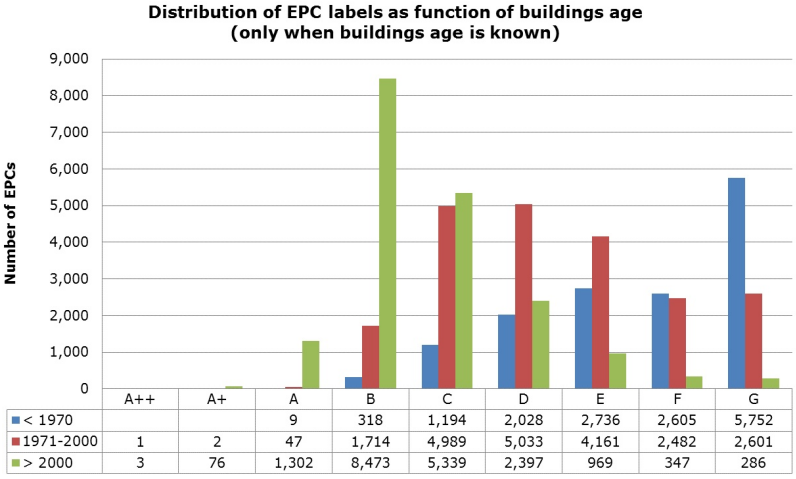
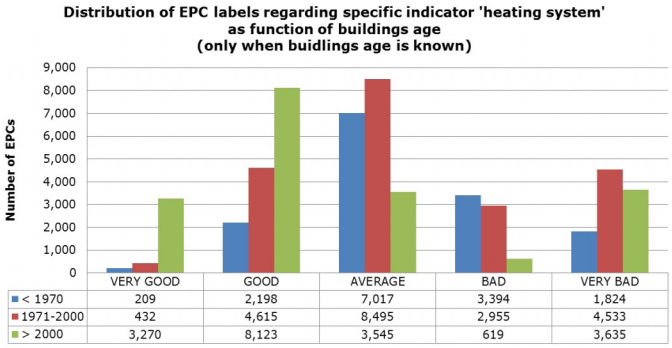


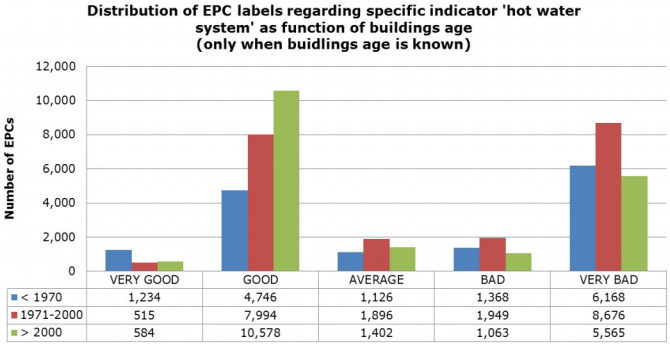
Figure 13: Main image, EPC label distribution in relation to building age. Additional images show specific indicators.



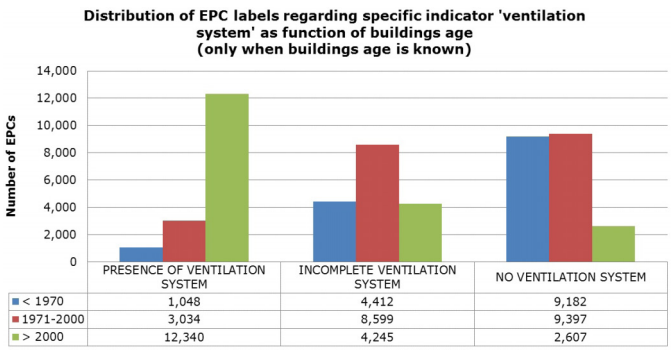
	A++	A+	A	B	C	D	E	F	G
< 1970			9	318	1,194	2,028	2,736	2,605	5,752
1971-2000	1	2	47	1,714	4,989	5,033	4,161	2,482	2,601
> 2000	3	76	1,302	8,473	5,339	2,397	969	347	286



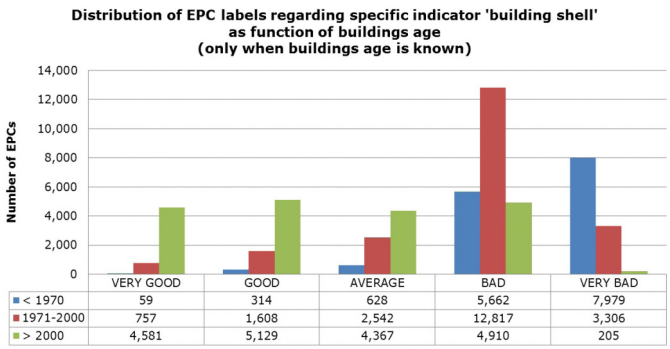
	VERY GOOD	GOOD	AVERAGE	BAD	VERY BAD
< 1970	209	2,198	7,017	3,394	1,824
1971-2000	432	4,615	8,495	2,955	4,533
> 2000	3,270	8,123	3,545	619	3,635



	VERY GOOD	GOOD	AVERAGE	BAD	VERY BAD
< 1970	1,234	4,746	1,126	1,368	6,168
1971-2000	515	7,994	1,896	1,949	8,676
> 2000	584	10,578	1,402	1,063	5,565



	PRESENCE OF VENTILATION SYSTEM	INCOMPLETE VENTILATION SYSTEM	NO VENTILATION SYSTEM
< 1970	1,048	4,412	9,182
1971-2000	3,034	8,599	9,397
> 2000	12,340	4,245	2,607



	VERY GOOD	GOOD	AVERAGE	BAD	VERY BAD
< 1970	59	314	628	5,662	7,979
1971-2000	757	1,608	2,542	12,817	3,306
> 2000	4,581	5,129	4,367	4,910	205

Format and content of the EPC

For residential buildings, the format and content of the EPC was adapted in November 2014 (Figure 14) in order to:

> obtain more information on input data (transparency), while maintaining comprehensibility for the general public, with a focus on the structure of results;

> include graphics on the global evaluation of energy performance;

> improve the recommendations section;

> inform on the importance and type of documentation that may be considered sufficient proof;

> include more space for illustrations and comments.

The EPC contains improvement measures without detailed facts and figures. These measures are automatically delivered by the software tool, however they are related to the result of the calculation. For example, a classification of a wall is given by the software depending of the U-value calculated by the software.

The EPC contains a recommendation that, in case the landlord intends to carry out a renovation, he/she should go beyond the EPC and conduct an energy audit of the building (this audit takes about a day and a half). The outcome of the audit is linked to incentives to improve the energy performance of the house. The experts authorised to conduct audits are the same who are also authorised to issue EPCs. The energy audit includes a simulated EPC after the renovation works are carried out (Figure 15).

EPC activity levels

By late 2015, more than 318,000 certificates for existing residential buildings have already been registered in the database, since June 2010. More than 200 certificates are sent per day to the database. This represents about 21% of the building stock. It is not possible to know how many EPCs are issued for renovated buildings, since it is not an input data necessary to complete an EPC.

For new residential buildings, 12,506 certificates were delivered by the administration and included in the database between May 2010 and May 2015. Since May 2015, 1,812 certificates have already been delivered by QEs and included in the database.

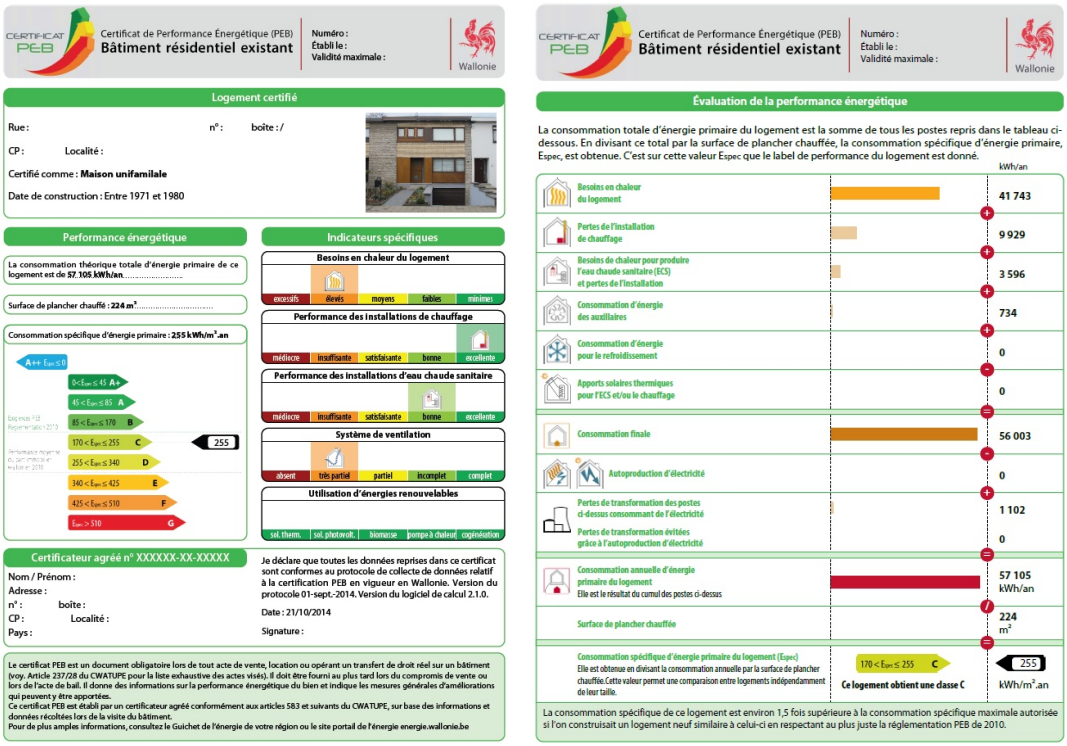
Typical EPC costs

For existing residential buildings, the certification process is quick (it takes about four hours), in order to keep the price – which is displayed on the certificate – low. In the early stages of certification, the average price (Figure 16) was 480 € (VAT included) for single-family houses. Currently, it is about 300 € (VAT included). The average price for an apartment was initially 250 - 350 €, and it is currently about 150 - 200 €. The total turnover generated since the beginning of the certification of existing residential buildings in June 2010 is about 100 M€ (VAT included).

Assessor corps

To issue EPCs for existing residential or non-residential buildings, either a degree in architecture or engineering is

Figure 14: New EPC layout for residential buildings.



necessary, or a degree in another field concerning the energy performance of buildings, or at least two years of professional experience in the field of building energy performance calculation. In order to issue certificates, QEs must attend a training course of five and a half days, and then pass an exam. So far, the administration has received 3,798 applications, of which, 3,476 were accepted. At the end of 2014, more than 2,000 assessors were accredited. Among them, more than 88% are engineers or architects. The names and addresses of the assessors are listed on the official website of DGO4 Energie[10].

In order for a firm to be accredited, there must be at least one accredited natural person working in the company.

Support for QEs is available by e-mail and phone. Another aim of this support service is to provide tools for QEs: a semestrial newsletter, a list of frequently asked questions, help on workflow (documents in a 'tree' structure to help accredited experts make decisions on how to treat a residential building, e.g., number of certificates needed, certification as 'apartment building', 'single-family house' or 'collective housing', etc.), workshops, improvements on the calculation procedure, handbooks, software, training material, etc.

Compliance levels by sector

The level of compliance is difficult to assess. Notaries require an EPC to be available before any sales agreement can be made/concluded. In case of rental,

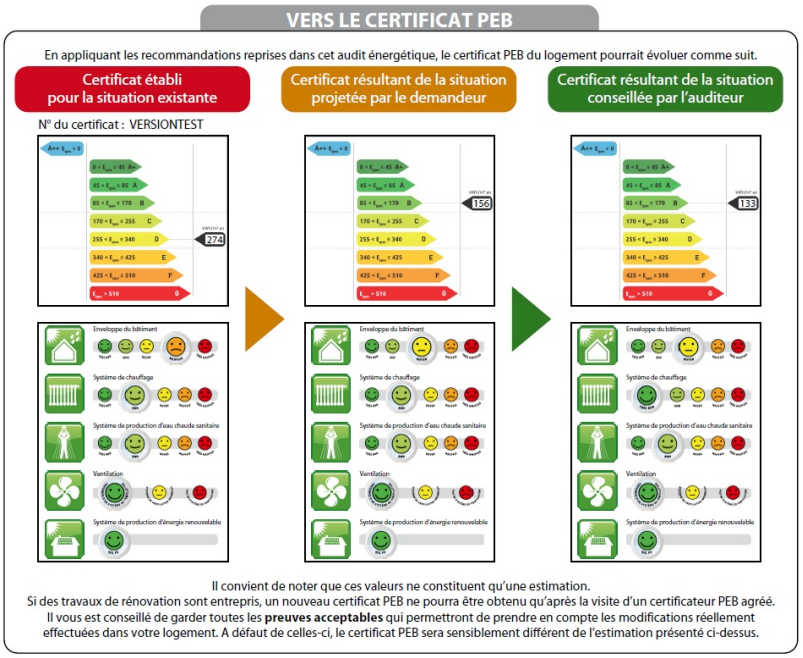
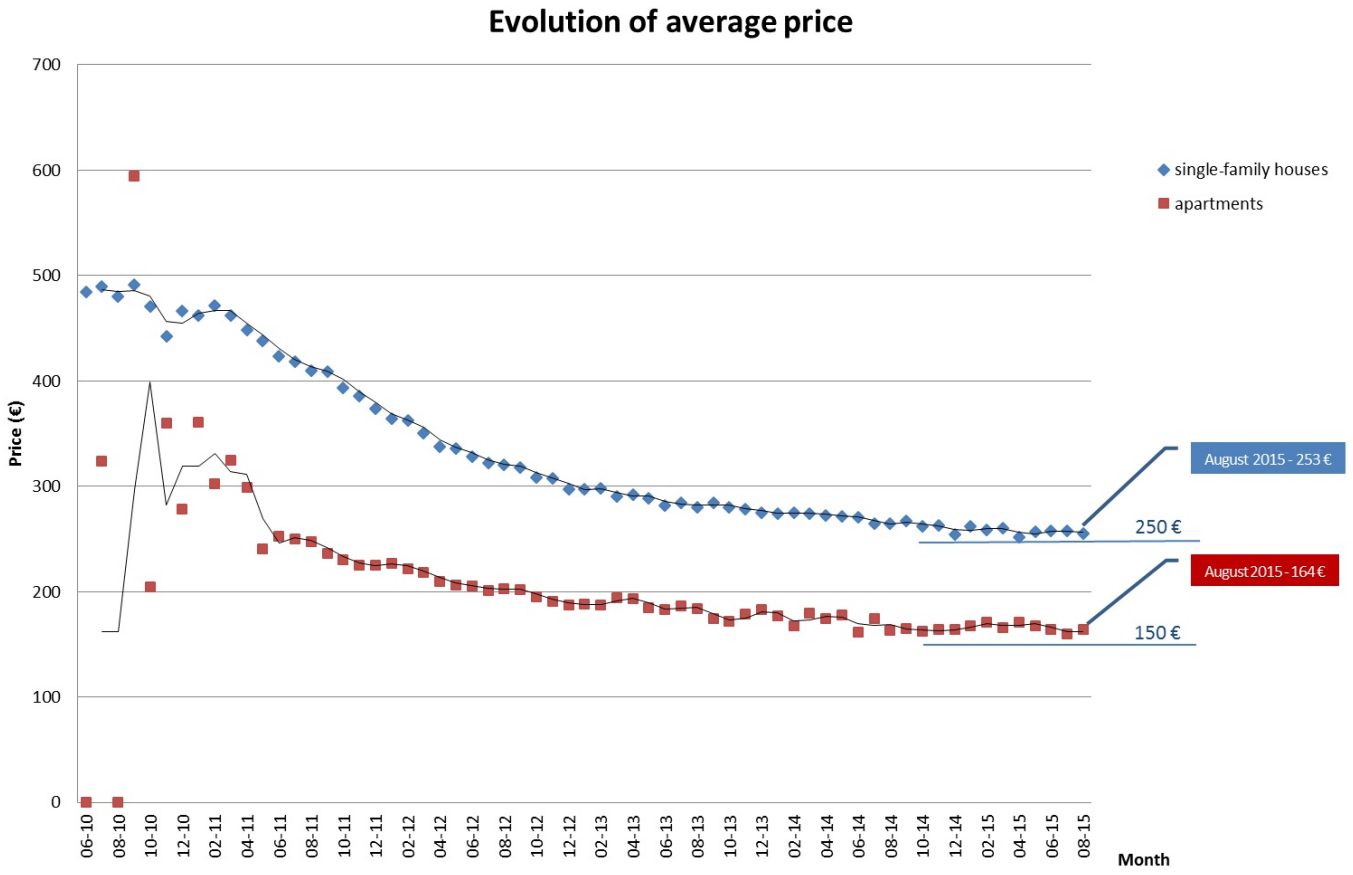


Figure 15: Projected certificate results after renovation works presented in an energy audit.

Figure 16: EPC for residential buildings – evolution of average price.



[10] *energie.wallonie.be >> Particuliers >> Acheter, vendre, louer: le certificat PEB >> Liste des certificateurs PEB agréés or energie.wallonie.be/fr/acheter-vendre-louer-le-certificat-peb.html?IDC=8789*

lease agreements must be registered with the Federal Administration. Although statistical information is not available, this obligation is now well-known among the general public, and is well followed.

So far, if the EPC is missing, an administrative fine of 2 €/m² with a minimum of 250 € and a maximum of 25,000 € is legally prescribed. The administration has not applied this rule yet, because of the difficulty in determining the specific amount of the fine, since it requires access to the building.

From May 2015, an administrative fine of 1,000 € will be imposed in case of absence of the EPC at the time of transaction. The fine will be doubled in the case of recidivism within three years.

Quality Assurance (QA) of EPCs

The public administration is the competent authority which has the responsibility to independently control a statistically significant percentage of the certificates issued annually. Quality controls of existing residential buildings began in 2012 by manually checking the EPCs of the QEs, through data mining the certificate database. As a result, the first procedures concerning infringement were issued.

In 2012, the administration requested 15 control actions, with the result that one assessor had to undergo a new training, and another saw his accreditation revoked.

This first Quality Assurance (QA) procedure was not applied, because it required a high degree of knowledge about certification, the structure of the database and how to extract data from it, etc. Furthermore, this method was found to be inefficient in rapidly detecting inconsistent data, or problems with the QE's work.

Therefore, it was decided to develop an automatic tool that would increase efficiency and systematise quality checks, with respect to the objectives of the EPBD requirements (checking a statistically representative number of EPCs). This tool is based on a web application (called Web control) and it was finalised at the end of 2013.

Its main functionalities are:

- screening of suspicious EPC data (based on improved data analysis during the first control) and identifying the certificates concerned;
- randomly selecting certificates from each QE for a post control;
- providing an interface for exchange between QEs and controllers;
- archiving control documents related to assessors.

The process first verifies the validity of the data of each certificate stored in the database by screening any abnormal records. Then, EPCs are identified by whether or not they contain invalid or abnormal data or values. That means that EPCs which include errors or inconsistent values are pinpointed for further action (Table 7).

The controller views a summary panel where s/he finds information on each QE, e.g., the total number of EPCs prepared, the number of EPCs with inconsistencies, and the EPCs selected randomly for control. The controller also has access to the EPC details through another panel that indicates the type of inconsistencies. In all cases, the controller has the possibility to make a more accurate check of the input data, by directly launching the certification software, or looking at the EPCs themselves.

If the investigation concludes that a control procedure should be launched, for example due to frequently occurring errors, the controller notifies the QE of his errors and requests that he checks and sends documentation that prove the data measured and the results indicated on the EPC.

If necessary, wrong EPCs are corrected before the controller approves them and ends the control procedure. Whether the QE is penalised or not depends on the frequency, quantity and type of errors, as well as their impact on the EPC outcome, particularly on the label of the building.

Table 7: Number of EPCs selected for control by the web application relative to the total EPCs in the database. • AI means certificates with inconsistent data or values • AI means randomly selected certificates with inconsistent data or values • SI means without inconsistent data or values • SI* means randomly selected without inconsistent data or values*

		certificates with SI status			certificates with AI status		
Year	**Number of certificates**	**SI**	**SI***	**% (SI+SI*)**	**AI**	**AI***	**% (AI+AI*)**
2011	**65,011**	34,089	1,766	55%	27,722	1,434	45%
2012	**74,991**	45,454	2,355	64%	25,813	1,369	36%
2013	**65,037**	46,640	2,483	76%	15,114	800	24%
2014	**67,157**	32,000	2,095	51%	30,897	2,165	49%

The first control cases were undertaken through the Web control application in December 2013. During that month, 6 requests for explanation were sent to QEs concerning 71 EPCs. Of those, 70 EPCs needed to be modified due to errors in collected data. Only 1 EPC had no errors.

In 2014, 71 requests for explanation were sent to QEs. Of the 1,075 certificates checked, 201 certificates needed to be modified, 334 certificates had no errors, 279 certificates were approved with only minor errors, and 540 included suspicious data and were designated for further control (Table 8).

III.ii. Progress and current status on public and large buildings visited by the public

Overview

The Executive Order of 24 November 2011 regulated the certification of public buildings. This executive order was abrogated on 1 May 2015 and replaced by the Decree of 2013 and the Order of the Government of 2014.

Statistics to determine the number of public buildings will be obtained later on.

Format and content of the EPC

The EPC indicates the energy class of the building according to its type. This figure is based on operational rating converted into primary energy per m^2. The EPC also contains a graph showing the real consumption of electricity and fuels in the last 3 years, and other specific indicators. An EPC model was not yet available at the end of 2014, so no EPCs have been issued for display yet.

Frequency of updating

The EPC of public buildings is valid for 5 years. The Walloon Region adopted a simplified calculation method based on an operational rating. The energy consumption indicators must be updated every year and subsequently registered in the database.

Costs

The cost of the EPC is indicated on the EPC itself if it is produced by a QE. The cost will depend on the size and complexity of the building and is expected to be between 300 € and 1,500 €. The price to establish the first EPC of a building will be higher than the subsequent certificates, which will simply update the first.

Assessor corps

For external private citizens to become accredited to certify public buildings, these persons must meet the same conditions described earlier for the other types of experts.

In order for a firm to become accredited, there must be at least one accredited individual working at the company.

Natural persons who work for a public authority can also become accredited. However, such experts only have the competence to issue EPCs for the public authority they work for. These internal experts must also meet the same conditions described earlier for the other types of experts related to training and exams.

Quality Assurance (QA) of EPCs

After the control system is implemented, an administrative fine of 1,000 € shall be imposed in case of failure to display a valid EPC.

III.iii. Implementation of mandatory advertising requirement

The execution order adopted on 15 May 2014 and modified by the execution order adopted on 18 December 2014, was launched in January 2015 and sets the requirement to include the EPC indicator(s) in advertisements. Requirements for the display of indicators are set out in the Ministerial Order of 23 December 2014.

The indicators and identification numbers to display vary depending on the type of media being used. At most, the indicators that must be included in advertisements are:

> the energy label (Figure 17);
> E_{spec} expressed in kWh/m^2.year;
> E_{total} expressed in kWh/year.

Additionally, the EPC identification number can also be required.

Year	Control folder	Certificates checked	Certificates with error	Certificates without error	Certificates with suspicion of error (under checking)
2013	6	71	70	1	0
2014	71	1,075	201	334	540

Table 8: Number of EPCs checked by the administration.

Inclusion of indicators is initially the responsibility of the owner (seller, or lessor), but also of the professional representative (lawyer, or real estate agent). Publishers, who have no role in the sales process, do not bear any responsibility.

Leaving out energy performance indicators in advertising is a punishable offence. The legal provision should be interpreted broadly, so that poor communication of the indicators (i.e., too small to be legible) and thus failure to achieve the objectives of the regulation is also punishable.

Figure 17: Prescribed format for the energy label included in advertisements.

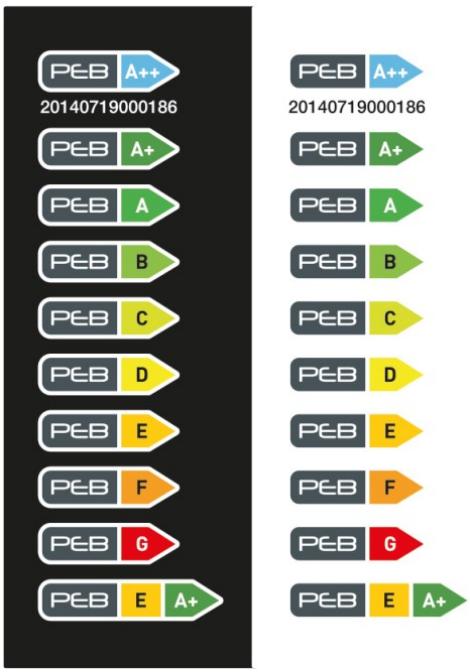


Figure 18: Banner on immoweb website to promote the EPC.

Figure 19: EPC information campaign for indicators in advertisements.

The decree foresees a fixed administrative fine of 500 € when the energy performance indicator(s) on the EPCs are not mentioned in the advertisement. The fine is doubled in case of recidivism within 3 years. Controls are performed by the regional energy administration. More than 170 real estate agencies have been controlled since the obligation was introduced.

III.iv. Information campaigns

In the Walloon Region, there is continuous information about EPCs, requirements, energy efficiency, etc., available, targeting the general public.

Various publications are regularly updated and reprinted by the Walloon Region. They can be downloaded from the website energie.wallonie.be.

The Department of Energy and Sustainable Buildings publishes a quarterly magazine '*Energie4*'. The EPBD is regularly discussed there (e.g., a brief overview of requirements was included in December 2013, an article on the EPC indicators included in advertising was included in December 2014, etc.).

An advertisement was published on the most significant property sale/rental website (immoweb.be) to promote the EPC (Figure 18).

In December 2014, there was an advertising campaign on the EPC indicators using various media including the internet, the daily press and magazines (Figure 19).

The Walloon Region also developed partnerships with different media, as a way to inform the public regularly. These include e.g.:

> '*Architrave*' - *magazine* for architects: two articles about requirements and energy efficiency in 2013, two articles about the EPC and one article about requirements in 2014.

> '*SudPresse*' - daily press: two features about requirements and energy efficiency in 2013, two others in 2014, and one more about the EPC.

> Video clips (1'30") about energy, sometimes concerning the energy performance of buildings, are regularly broadcast in the news on the Belgian public television and are also available on YouTube (Figure 20).

The energy performance of buildings is also regularly addressed in the Belgian broadcasts *"Une Brique dans le Ventre"* (RTBF) and *"Clé sur Porte"* (RTL).

III.v. Coverage of the national building stock

At the end of 2015, more than 23% of the residential building stock has been included in the database since June 2010 (Figure 21). No information is yet available for non-residential buildings.

IV. INSPECTION REQUIREMENTS – HEATING AND AIR-CONDITIONING (AC) SYSTEMS

The Walloon Region has adopted the inspection option for heating and Air-Conditioning (AC) systems.

IV.i. Progress and current status on heating systems

The inspection of heating systems was included in an Executive Order of 29 January 2009 and adapted by the Executive Order of 15 May 2014. The Government of the Walloon Region approved this order to prevent the atmospheric pollution produced by central systems for heating, and to reduce their energy consumption. This order replaced the royal order in force since 1978 for the inspection of liquid or solid fuel boilers.

According to the *"Décret du 05 juin 2008 relatif à la recherche, la constatation, la poursuite et la répression des infractions et les mesures de réparation en matière d'environnement"*, control of compliance with the Executive Order of 29 January 2009 is the responsibility of the Department of Environmental Police and Controls of the Walloon Region. This decree also defines the penalties that may be imposed on persons violating these regulations.

The order also requires that a post-control of certified technicians is carried out by accredited control bodies.

After the inspections, the reports include recommendations for cost-effective improvements to the heating system.

Overview, technical method and administration system

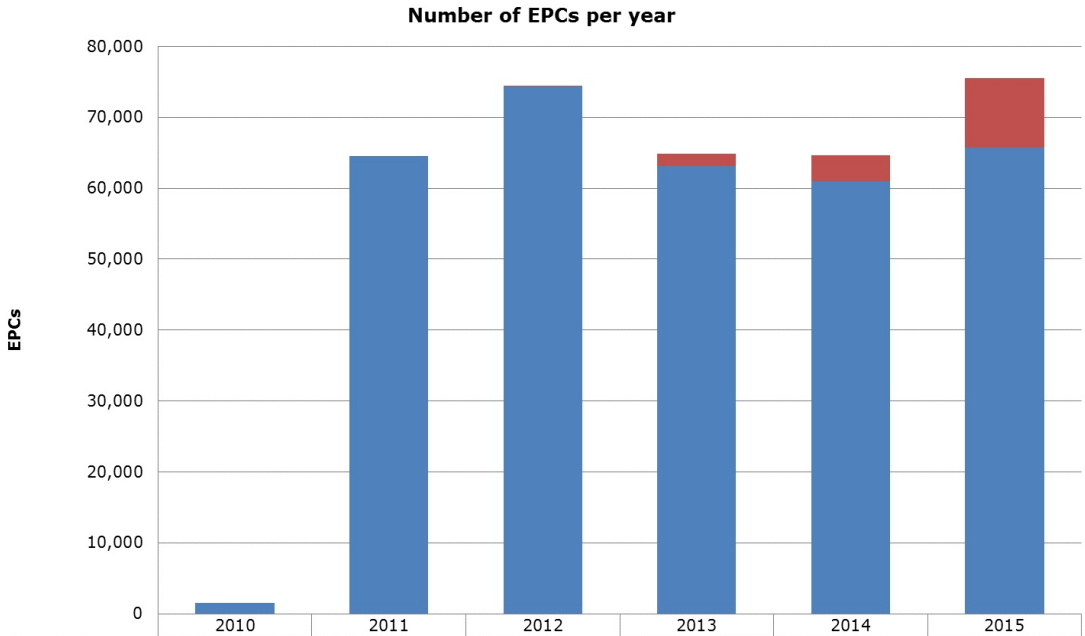
Inspections include two parts: a boiler efficiency assessment and a boiler sizing assessment. Inspections are mandatory at least every year for oil and solid fuel boilers, every two years for gas boilers with a rated power higher than 100 kW, and every three years for gas boilers with a rated power less than or equal to 100 kW.

The assessment of the boiler sizing is not repeated, as long as no changes were made to the heating system, or as regards the heating requirements of the building.

The Executive Order of 15 May 2014 mandates that inspections are carried out with a calculation tool or software provided by the administration.

Figure 20: Video information campaigns about the EPBD.

Figure 21: Number of EPCs issued per year.



	2010	2011	2012	2013	2014	2015
New houses			12	1,720	3,620	9,752
Existing houses	1,476	64,540	74,351	63,177	60,990	65,732

Arrangements for assurance, registration and promotion of competent persons

Inspections are carried out by accredited technicians, who must complete training and pass an exam. Training is differentiated by type of boiler (liquid, or gas). Accreditation of the training courses is managed by the Air Climate Agency (AWAC), both during the application process, and later during controls of the recognised technicians who pass the exam.

At the end of October 2014, approximately 2,600 technicians are certified to inspect gas fuel boilers, and roughly the same number for liquid fuel boilers.

Currently, 13 training centres are recognised for providing training to technicians inspecting liquid fuel boilers, and 9 for inspecting gas fuel boilers.

All useful information is available at the site of the Air Climate Agency[11].

Enforcement and penalties

In order to facilitate the control of certified technicians, the inspection reports they are required to provide to the administration are recorded in a register.

Penalties may lead to suspension or revocation of technicians' accreditation. However, the penalties for inspectors were not implemented as of the end of 2014.

Furthermore, the owner of a boiler is punishable for not performing inspections. Sanctions are provided for in the Environmental Code (Decree of 27 May 2004 and Executive Order of 17 March 2005). The issuance of a statement for infringement is rare (about 2 to 3 statements per year). Controls are operated by the pollution repression unit of the Walloon Region, up to now mainly in response to complaints.

Quality control of inspection reports

The Executive Order of 29 January 2009, as amended by the Executive Order of 15 May 2014, provides that each year, a statistically significant proportion of reports must be controlled by the inspection body accredited, on the basis of a random selection.

In 2013, 486 certificates were checked. No checks were performed in 2014.

Inspection activity figures

In 2013, about 747,000 inspection certificates, including reports, were issued. In 2014, this figure is about 756,000.

IV.ii. Progress and current status on AC systems

The Government of the Walloon Region approved two executive orders, one on 12 July 2007 and another on 18 October 2012, respectively, to prevent pollution at the time of installation and entering into service of fixed air-conditioning (AC) systems using fluoride cooling, as well as in case of maintenance, repair or upgrade on those systems. These legal texts have however yet to be completed to take into account energy aspects.

Once the system is implemented, accredited AC experts must complete specific training at an accredited training centre in order to be able to carry out energy inspections on AC systems. Controls of accredited AC experts are mandated to be performed by an accredited control body. Energy-related trainings should complement this scheme.

Overview, technical method and administration system

Those executive orders mandate energy inspections and evaluation of the energy performance of the AC unit by accredited experts, in order to ensure its proper functioning and sizing, in relation to the cooling needs of the building.

Inspections must be undertaken by accredited technicians who have undergone training and passed an exam. Training accreditations are managed by the Air Climate Agency (AWAC).

Currently, 9 training centres are accredited to provide training for certified technicians.

The Air Climate Agency website also contains all the useful information for AC system inspections.

Enforcement and penalties

In order to facilitate inspection of certified technicians, inspection reports must be recorded in a register that certified technicians have to provide to the administration. As far as inspections on specific energy aspects are concerned, they have not yet begun and no report has yet been filed. The frequency of inspections will depend on the power of the device.

Penalties may lead to suspension, or revocation of technicians' accreditation.

Quality control of inspection reports

Article 58/2 of the Executive Order of 12 July 2007 allows the president of the

[11] *www.awac.be*

Air and Climate Agency to, at any time, order an inspection to any accredited inspection body, to check if the AC inspections are in compliance with the existing legislation. This check may also include a verification whether the AC inspectors meet the legal requirements in terms of training and recognition.

QA for AC inspections is the same as for heating systems, but it has not yet begun. A review of regulations is currently underway, and is being conducted by the three regions together.

3. A success story in EPBD implementation

In September 2003, a voluntary action called *"Construire avec l'Energie (CALE)"* was initiated by the Walloon Region to prepare for the transposition of the EPBD. The aim of this action was to build houses which are more energy efficient than required by the regulation. The first phase of this action, called CALE 1, was based on a charter describing five energy performance criteria, including two of a qualitative nature, related to heating and hot water. The document also contained the procedure to become a CALE expert, and the procedure to be used to submit a project. The action also provided training and business support measures to move towards more energy-efficient buildings. At the end of the process, houses that match the technical criteria of the CALE action receive a certificate ("Building with energy") that states their achieved performances.

Open to all owners and professionals in the building sector, this action granted a subsidy of up to 2,000 € for all projects that met the criteria.

In 2007 and again in 2010, the technical criteria of the CALE action were strengthened twice, in order to raise the bar for performance beyond the requirements of the regulation (Table 9).

The CALE action can be summarised in figures as follows:

- 51 information sessions and 68 technical training modules;
- 1,198 business partners (768 architecture firms - or 914 architects - 62 offices and 222 companies);
- 1,412 dossiers (houses or apartment buildings - or 1,661 units) submitted for analysis to CALE experts: 367 houses in CALE 1, 836 in CALE 2 and 489 in CALE 3;
- 860 "Building with energy" certificates issued through November 2014.

The team in charge of setting requirements and procedures, and for analysing projects related to CALE was composed of the Belgian Building Research Institute (coordinator), with partners from the *"Institut wallon de Formation en Alternance et des Indépendants et Petites et Moyennes Entreprises"*, *"Université Catholique de Louvain-la-Neuve"*, *"Université de Liège"* and *"Université de Mons"* and the *"Confédération de la Construction Wallonne"* and *"Union Wallone des Architectes"*, that represent construction contractors and architects.

Action phases	CALE 1 (feb. 2004 - sept. 2007)	CALE 2 (oct. 2007 - dec. 2009)	CALE 3 (jan. 2010 - dec. 2011)
BUILDING SHELL	Wall insulation ($U \leq U_{max}$ regulatory) and $U_{windows} \leq 2.0$ W/m².K	Wall insulation ($U \leq U_{max}$ regulatory) and $U_{windows} \leq 2.0$ W/m².K	Wall insulation ($U \leq U_{max}$ regulatory) and $U_{windows} \leq 2.0$ W/m².K
	Global insulation level K ≤ 45	Global insulation level K ≤ 45	Global insulation level K ≤ 35
	No requirement relating to airtightness	No requirement relating to airtightness but possible to take into account in the EPB calculation	airtightness : $v_{50} \leq 6$ m³/h.m²
VENTILATION	Compliance with regulation (NBN D50-001)	Compliance with regulation (NBN then AGW 17.04.2008)	Compliance with regulation (AGW 17.04.2008)
SYSTEMS	Heating/SHW : with label (HR+, Optimaz, …)	-	-
GLOBAL ENERGY PERFORMANCE INDICATOR	-	$E_w \leq 100$ $E_{spec} \leq 170$ kWh/m².year	$E_w \leq 70$ $E_{spec} \leq 120$ kWh/m².year
OVERHEATING	-	Compliance with future regulation (index I ≤ 17,500 K.h)	Compliance with regulation (index I ≤ 17,500 K.h)

Table 9: Phases of CALE action.

A book titled “Building with energy, the happiness of living” presents a selection of 20 buildings, from hundreds that have received the “Building with energy” certificate (Figure 22).

Figure 22: Cover of the book "Building with energy, the happiness of living".

4. Conclusions, future plans

In the Walloon Region, regulations in compliance with the Energy Performance of Buildings Directive (EPBD) have been in place since 2007, and are currently well-known among architects and engineers, as well as building contractors. As an example, several years ago, practical solutions to construct thermal bridges were known to only a few architects and engineers, whereas today they are often used by building contractors. This is also the case for airtightness and other quality issues. Also, awareness among the general public concerning the importance of a well-insulated building with efficient energy systems has increased. Energy certificates and energy audits also contribute significantly to the increase in awareness, as do the voluntary actions led by the region in the field of energy performance of buildings, and the financial incentives (energy investment tax credits, allowances, 0% interest loans for energy investments, etc.).

However, despite this gradual increase in awareness during the first phase of the enforcement of the regulation, the region has to intensify controls, by finalising the software tools, and by dedicating more human resources to this end. This is also in line with the requirements of Directive 2010/31/EU. The Government adopted the EPBD Decree at the end of 2013 and a new set of executive orders in order to comply with the new directive.

The Walloon Region has worked on an extension of the study on cost-optimality. This new study, available in January 2015, aims at providing an overview of the residential and commercial building stock and the identification of cost-effective approaches for renovation in line with Article 4 of the Energy Efficiency Directive (EED).

The Walloon Region is also developing a new tool for the integration of Renewable Energy Sources (RES) in relation to EPBD requirements (feasibility study tool) to be available in 2015. A new set of training sessions for Qualified Experts (QEs) is also under development, to delve deeper into technical details related to systems, airtightness, RES integration, and thermal bridges. The Walloon Region is also pursuing consultation with the building sector to finalise a roadmap to Nearly Zero-Energy Buildings (NZEBs) and to discuss solutions to improve the quality of works, and to secure further funding.

Co-funded by the Intelligent Energy Europe Programme of the European Union

The content of this report is included in the book “2016 – Implementing the Energy Performance of Buildings Directive (EPBD) Featuring Country Reports”, ISBN 978-972-8646-32-5, © ADENE 2015

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This individual report and the full 2016 book are available at www.epbd-ca.eu and www.buildup.eu