CONCERTED ACTION
ENERGY PERFORMANCE
OF BUILDINGS

Implementation of the EPBD in Spain

STATUS IN DECEMBER **2014**

1. Introduction

In Spain, responsibility for the Energy Performance of Buildings Directive (EPBD) lies with the Ministry of Industry, Energy and Tourism, the Ministry of Public Works and Transport, and regional administrations.

Spain began to implement the energy certification of buildings in 2002, though different methodologies already existed for the energy evaluation of newly constructed buildings, as did requirements for energy efficiency in new buildings.

It was not until 2007 that the LIDER/CALENER tool, the official tool created to simulate and evaluate energy efficiency in Spanish buildings, was produced. Use of the tool became compulsory for practitioners, in order to demonstrate compliance with the Spanish regulations also issued in 2007 (Royal Decree 47/2007), in response to Directive 2002/91/EC.

From 2007-2012, energy certification in Spain was mandatory only for new buildings. In 2013 the requirement was extended to apply to the sale or rental of existing buildings (through Royal Decree 235/2013).

The Technical Code for Construction (Codigo Technico Edificación) was published in 2006. This document set out the rules and minimum requirements for new buildings. This included requirements for the envelope, the systems of production of cold and heat (heating system regulations), ventilation, etc.

As a supplement to the Technical Code for Construction 2006, a regulation (Royal Decree 1027/2007) on heating systems was published in 2007. It is known as Regulation of Thermal Installations in Buildings (RITE)[1], and it addresses more technical issues related to heating and cooling systems. It not only established production systems' energy efficiency requirements, but also established the obligation to carry out maintenance and schedule inspections of air conditioning (AC) systems in buildings in Spain.

Since all laws and regulations, namely the Technical Code for Construction and RITE, must be updated every five years, there were several publications in 2013. In particular, Royal Decree 235/2013 set out the new procedure for building certification and the RITE (Royal Decree 1027/2007) was updated through Royal Decree 238/2013, with tightening of energy efficiency requirements, and the review of the scope of the maintenance system. The Technical Building Code was updated through the Order 1635/2013.

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2. Current status of Implementation of the EPBD

I. ENERGY PERFORMANCE REQUIREMENTS

I.i. Progress and current status

The 2006 publication (Royal Decree 314/2006) of the minimum requirements of energy efficiency for the construction of new buildings was a milestone because until then requirements of energy efficiency in building construction had only been set by general rules.

NATIONAL WEBSITES www.minetur.gob.es, www.fomento.gob.es, www.idae.es

[1] *RITE – Reglamento de Instalaciones Térmicas de los Edificios*

The Technical Code for Construction 2006 set out the requirements for heat transfer in new buildings, following an analysis of the climate conditions in the various regions of Spain (both for heating and cooling).These requirements therefore depend on several factors, e.g., the climatic zone and percentage of glazed area in the building envelope. The code also covers structural requirements and limitations to prevent moisture. Requirements are also applied to the production of heating and cooling systems and lighting, and to the use of Renewable Energy Sources (RES).

All these parameters have evolved in recent years, and the requirements have become more restrictive, in order to increase the energy efficiency of buildings. In 2013, these parameters were further updated following the completion of the cost-optimal study.

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

The rules and regulations governing energy efficiency requirements in Spain are contained in the Technical Code for Construction, which was last updated by Order 1635/2013. This document contains all the information necessary to meet the minimum requirements for energy efficiency in new buildings, as well as energy rehabilitation of existing buildings.

These minimum requirements are related to all aspects of the thermal envelope of the building, systems of cold and heat production (supported by the specific and technical document RITE) and renewable energies, and they have been specifically calculated following the methodology and criteria established by the Energy Efficiency Directive (Directive 2012/27/EU - EED).

The methodology used for the preparation of these requirements included an analysis of the best solutions per type of construction in Spain, and simulated different scenarios of climates, types of construction and production systems using the LIDER/CALENER tool, the official tool created to simulate and evaluate energy efficiency in Spanish buildings. The tool results were then used to determine which limit values should be used in the normative documents Technical Code for Construction and RITE.

LIDER/CALENER is consistent with the established methodology and it is based on the European standards in force at the time of the creation of the programmes. It includes in its calculations the building envelope, thermal bridges, infiltrations, solar shading, thermal inertia, and hours of operation, as well as the technical characteristics of the heating and cooling systems.

The requirements are set in terms of both (non-renewable) primary energy consumption and CO_2 emissions. These values are calculated through the LIDER/CALENER tool and are based on the final energy consumption and the application of specific factors that are published officially by the Ministry of Industry.

Support guides, energy factors, support for the application of the regulations, as well as other documents of interest are published at the website of the Ministry of Industry, Energy and Tourism[2].

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

The cost-optimal calculations and comparison with current and future energy performance requirements in Spain were completed in 2013, in order to comply with the obligations established by Directive 2010/31/EU and Delegated Regulation 244/2012. The calculations were based on six reference buildings for existing buildings and ten reference buildings for new buildings, taking into account the existing building database and typical characteristics of buildings in Spain. The calculations also considered different orientations, six climatic zones and many individual measures defined for each subcategory of multiple building combinations, in order to find the cost-optimal values.

The exercise produced the cost-optimal primary energy consumption, which set the minimum requirements for the new Technical Building Code in 2013. The calculated cost-optimal weighted energy demands were met for all the climatic zones, except for the warmest one (α-zone, corresponding to the Canary Islands). In this region, the cost-optimal measures have not been implemented yet. The results for this case indicated that in five out of six buildings, the minimum requirement for energy demand for cooling (there is no heating demand in climatic zone α) is either less than 15 kWh/m^2.year, or lower than 15%

[2] *www.minetur.gob.es/energia/desarrollo/EficienciaEnergetica/CertificacionEnergetica/Paginas/certificacion.aspx*

of the outcome of the cost-optimal results. Thus, it is not justifiable to establish more demanding minimum energy performance requirements for existing buildings located in the warmest climatic zones. That fact is applied to several climatic zones based on the severity of the climate in summer.

Some conclusions for the new minimum requirements are as indicated in Tables 1 and 2.

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

National application of the NZEB definition

In Spain, the definition of Nearly Zero-Energy Building (NZEB) has not yet been established, although work was in progress at the end of 2014. The plan is to set out the NZEB values alongside the revision of the Technical Code for Construction, which will take place in 2016-2017 and will become compulsory in 2018.

Figures and statistics on existing NZEBs

Spain still does not have a definition of NZEB, therefore it cannot identify buildings that comply with these requirements.

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

Spain has developed and submitted a strategy for the energy efficient rehabilitation of the national building stock, which focuses on an analysis of the rehabilitation of the building sector in Europe and specifically in Spain[3].

Considering the barriers as well as opportunities for energy rehabilitation in Spain, the strategy has developed measures in order to achieve the final objectives of energy savings and reduced emissions, based on the following points:

> policy measures;
> administrative measures;
> measures of finance and operations;
> information and communication measures;
> measures to develop business strategies, specifically focusing on communities of building owners;
> specific measures to deal with energy poverty.

The goals set for Spain depend on certain scenarios and alternatives. In particular, the building sector has a global goal for the period from 2014-2020 that varies, depending on the forecast savings of final energy consumption for both residential and non-residential buildings, between 2.652 ktep and 7.087 ktep.

The Ministry of Finance and Public Administration is responsible for upholding the exemplary role of the public administration. The Spanish national institute for the diversification and saving of energy (IDAE) has prepared an inventory of the buildings that will be affected, the total number of which is 2,184 (as of June 2015). The strategy for the renovations takes into account the potential savings based on the measures recommended on the Energy Performance Certificate (EPC).

The Ministry also intends to amend the legislation of public sector contracts to apply Article 6 of the EED in such a way that the central administration only purchases products, services and buildings that have high energy efficiency. This would also depend on profitability, economic viability, sustainability in a broader sense, and technical considerations, as well as sufficient competition, ensuring the multiple options that consider the best technologies.

Table 1: Comparison of Thermal Transmittance (TT) of windows on existing buildings (W/m².K).*

Climatic zone	Optimal TT	Comparison with DB-HE** 2006		Comparison with DB-HE 2013	
		Required TT	Difference (%)	Required TT	Difference (%)
α3	4.33	5.7	31.6	5.7	31.6
A3	4.45	5.7	28.1	5.7	28.1
B4	4.45	5.7	28.1	4.2	-5.6
C2	4.45	4.4	-1.1	3.1	-30.3
D3	3.90	3.5	-10.3	2.7	-30.8
E1	3.90	3.1	-20.5	2.5	-35.9

*Optimal values are calculated as the average of optimal values of each selected building
**DB-HE: the basic document of the Technical Code for Construction

Table 2: Comparison of Thermal Transmittance (TT) of side walls on existing buildings (W/m².K).*

Climatic zone	Optimal TT	Comparison with DB-HE 2006		Comparison with DB-HE 2013	
		Required TT	Difference (%)	Required TT	Difference (%)
α3	1.47	1.22	-17	1.35	-8.2
A3	1.47	1.22	-17	1.25	-15
B4	1.47	1.07	-27.2	1	-32
C2	1.47	0.95	-35.4	0.75	-49
D3	1.47	0.86	-41.5	0.6	-59.2
E1	1.16	0.74	-36.2	0.55	-52.6

*Optimal values are calculated as the average of optimal values of each selected building

[3] ec.europa.eu/energy/sites/ener/files/documents/2014_article4_es_spain.pdf

II. REQUIREMENTS FOR TECHNICAL BUILDING SYSTEMS (TBS)

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

In Spain the regulation of buildings' technical requirements is included in the regulation of thermal facilities as part of the Royal Decree 238/2013.

This regulation is applied to fixed installations (e.g., lighting), Heating, Ventilation and Air-Conditioning systems (HVAC), and production of Domestic Hot Water (DHW), and is designed to meet the requirements for thermal comfort and indoor air quality. The requirements apply:

- to new buildings or renovations of existing buildings;
- to elements of existing buildings that are undergoing renovation (only the relevant parts).

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

The regulation of energy efficiency of Technical Building Systems (TBS) in Spain sets requirements depending on the type of system. In the case of heat production, RITE regulates HVAC systems, as well as pumps, fans, etc.

As an example, the regulation of heat production systems is developed using an approach based on performance or objectives, laying out the requirements that must be met by the systems, but without imposing the use of a particular technical solution, or preventing the introduction of new technologies and concepts, in terms of design (Table 3).

In this sense, rather than regulate the overall system, the regulations set limits on energy performance and energy losses in distribution. In the latest update to this regulation (Royal Decree 238/2013), the following changes were made:

- increase in requirements for thermal insulation of pipes, equipment, accessories and ducts;
- global distribution losses are limited to 4% of the maximum carrying capacity of the pipework or ductwork used;
- development of two procedures (simplified or alternative procedure) for the calculation of the thickness of thermal insulation, according to the nominal thermal power of generation of cold or heat installed.

For fans, the Specific Fan Power (SPF) is regulated, according to the power absorbed by the motor divided by the transported fluid flow rate (Table 4).

Lighting is regulated in a specific section of the Technical Building Code. In this case, a minimum lighting efficiency is required and the maximum power installed is limited.

The efficiency indicator is called "VEEI"[4] and is a function of the power, the area, and the medium illuminance in the room. As an example, an office lighting system has to meet the requirements set in Table 5.

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

In Spain any requirements concerning the energy efficiency of installations affect both new installations and parts that have been replaced during the renovation of existing systems.

Table 3: Minimum performance requirements for boilers according to Royal Decree 238/2013.

Boiler	Efficiency at rated output		Part load efficiency	
	Average water temperature (ºC)	Energy performance (%)	Average water temperature (ºC)	Energy performance (%)
Gas boilers	70	≥90 + 2 log Pn*	≥ 50	≥97 + log Pn*
Liquid fuel boilers	70	≥90 + 2 log Pn*	≥ 40	≥86 + 3 log Pn*

*Pn: rated power

Table 4: Specific Fan Power.

Category	Specific Fan Power W/(m³/s)
SFP 1	SFP ≤ 500
SFP 2	500 < SFP ≤ 750
SFP 3	750 < SFP ≤ 1,250
SFP 4	1,250 < SFP ≤ 2,000
SFP 5	SFP > 2,000

Table 5: Lighting efficiency indicator and maximum allowed installed power for office lighting systems.

	VEEI (minimum)	Pmax (W/m²)
Office lighting systems	3	12

[4] *VEEI = P * 100 /(S*Em) - Lighting efficiency indicator, where P is power installed (W), S is surface (m²) and Em is medium illuminance*

In the case of a facility or building that is being renovated over more than 25% of its floor area, the requirements shall apply under the following conditions:

> incorporation of new subsystems of climate control, or modification of existing ones;
> incorporation of new systems of DHW production, or modification of existing ones;
> replacement or expansion of the equipment generating heating or cooling;
> change of type of energy used and the incorporation of renewable energy;
> change in the use of the building.

In all these cases, the refurbished system must meet the requirements set in the RITE, both in terms of performance and maximum allowable losses. These requirements apply to both the entire system, and to each partial section.

In the case of a simple generator exchange, the system must still comply with the performance requirements, but it does not qualify as a refurbishment project.

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

The installation of thermal conditioning systems in Spanish buildings must include a technical report, which details all information concerning the dimensioning and control of the installation. The report must also include an analysis of the alternatives to the selected system (e.g., other technologies, connection to district heating and/or cooling, etc.).

This analysis applies only to large installations of more than 70 kW.

All new facilities must comply with the requirements of energy input from RES, according to the Technical Code for Construction. Among the requirements, the Code requires a study of the best alternatives to cover all the energy demand for buildings using RES, wherever technically and economically reasonable. In particular, for large installations that require more than 70 kW heating and/or cooling power installed and with a useful floor area over 1,000 m^2, the designers should consider the implementation of RES with special attention to the use of biomass, as well as heat pumps to provide for 100% of the building's heating needs.

The Spanish legislation also differentiates the scope of the analysis of dimensioning and control according to the power needs and the floor area of the building, including all the sizing, building management systems or controls, and the analysis of alternatives. For large systems there are additional requirements, including more complex control systems, maintenance, etc. The air quality system is controlled by sensors that measure CO_2 or Volatile Organic Compounds.

II.v. Encouragement of intelligent metering

Metering of consumption, especially those aspects related to energy, is included in Spanish legislation, which allows for flexibility in the use of different metering systems.

The Spanish government has taken action in two directions:

> On the one hand, regulations such as the Royal Decree 1110/2007 regulate and promote the introduction of smart metering in the residential market (for electricity consumption). This regulation calls for the replacement of the current analogue meters with intelligent or smart meters that can be integrated into a remote management and measurement system implemented by the electricity companies.
> On the other hand, promotion of the use of intelligent or smart meters has been undertaken in the form of publications, e.g., guides published by IDAE.

For measurement of thermal consumption, all buildings must have fuel counters, as well as energy counters in the heating and cooling networks. New houses belonging to a block and with centralised heating and AC systems must have individual counters for each house.

Spain is preparing the publication of a Royal Decree which will regulate thermal consumption metering according to the EED and accounting for thermal consumption in centralised heating systems, whereby identifying intelligent measurement systems as the ideal for this type of metering.

Figure 1: Spanish guides for smart consumption metering.

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

In line with the development of consumption metering systems, work is also being done to promote the integration of intelligent metering systems. All national regulations (updated in 2013) allow for flexibility in the incorporation of this type of technologies.

The calculation methodology for energy certification accounts for the use of control systems for lighting in non-residential buildings. The certification methodology includes these requirements.

Additionally, the government has also published guides relating to these systems. Specifically, IDAE has produced a guide titled "How to save energy by installing automation systems in your home", which informs and promotes the installation of such energy saving equipment.

Also the “Practical Guide to Energy Efficient and Responsible Consumption”, published in 2007 by the IDAE, contains related information. The guide includes contact information of professionals and businesses that can implement these systems in houses, as well as an example of improved installations, which include AC, lighting and zoning controls, and can achieve savings of up to 17% on heating, and 80% on lighting.

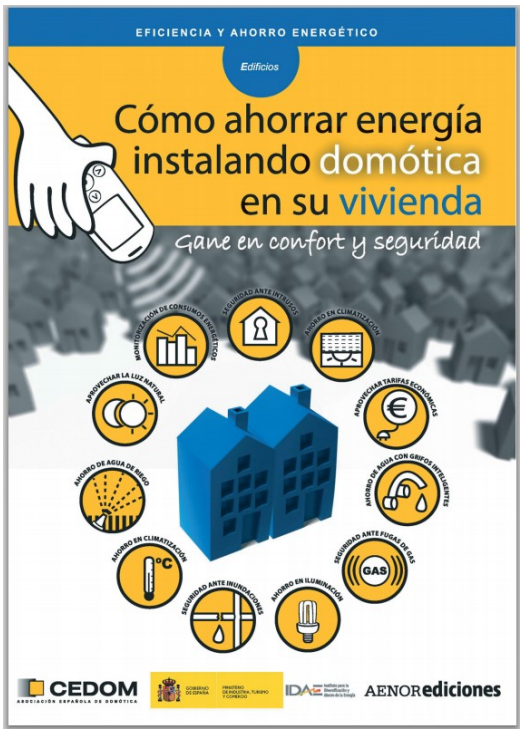


Figure 2: Spanish guide for automation systems in residential buildings

III. ENERGY PERFORMANCE CERTIFICATES (EPCs) REQUIREMENTS

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

Overview and administration system

The mechanism established in Spain for the implementation of the EPC for buildings includes the establishment of a national (instead of a regional) obligation that describes which buildings must have the certificate, which are exempt, and where they need to be registered.

Once carried out by qualified experts, EPCs must be registered in the respective region, through its registration office, which in turn will undertake the necessary controls to ensure the required level of quality.

Regional registries feed their own databases, and periodically (every 6 months) send the information to the central administration, where all the information is being automatically centralised at the national level. All the information is used to generate statistics that are publicly available on the official web site of the Ministry of Industry, but the databases themselves are not public.

How flats are certified in apartment buildings

Certification can be either for a whole building, or for part of it. In the first case, if the heating and cooling systems are common, certification is directly applied for the entire building. In the case of individual installations, qualified experts can simplify the EPC using the characteristics of similar apartments in the same building.

Additionally, it is possible to certify only one apartment in a building. In this case, the features of the external envelope and the real areas will be used. For an individual apartment with its own AC system, the EPC is based on its specific characteristics. If the building has a centralised AC system, the EPC uses the characteristics of the centralised systems with a power in proportion to the overall area of the conditioned spaces.

Format and content of the EPC

EPCs in Spain contain information concerning the location of the building, information about the competent technician, building features as dimensions, transmittance, installed power, etc., partial and global energy indicators, and finally the values of indicators with proposed energy efficiency improvements.

EPC activity levels

Table 6 shows the number of EPCs by region, for both new and existing buildings.

Typical EPC costs

The cost of EPCs in Spain derives from the free market and is very variable. Because of the need to certify public buildings, the Ministry of Finance and Public Administration has recommended rates for the issue of EPCs (average values in Table 7). These fees are based on estimates of the work to be carried out and are representative for other non-residential buildings.

Figure 3:
Spanish EPC cover page and label.

CERTIFICADO DE EFICIENCIA ENERGÉTICA DE EDIFICIOS EXISTENTES

IDENTIFICACIÓN DEL EDIFICIO O DE LA PARTE QUE SE CERTIFICA:

Nombre del edificio	Sede IDAE		
Dirección	C/ Madera 8, 28008. Madrid Madrid (Madrid)		
Municipio	Madrid	Código Postal	28002
Provincia	Madrid	Comunidad Autónoma	Comunidad de Madrid
Zona climática	D3	Año construcción	1990
Normativa vigente (construcción / rehabilitación)	NBE-CT-79		
Referencia/s catastral/es	0251702VK4705A0001RZ		

Tipo de edificio o parte del edificio que se certifica:

o Vivienda
o Unifamiliar
o Bloque
o Bloque completo
o Vivienda individual
• Terciario
• Edificio completo
o Local

DATOS DEL TÉCNICO CERTIFICADOR:

Nombre y Apellidos	[redacted]	NIF	[redacted]
Razón social	IDAE	CIF	-
Domicilio	c/ Madera		
Municipio	Madrid	Código Postal	28002
Provincia	Madrid	Comunidad Autónoma	Comunidad de Madrid
e-mail	[redacted]		
Titulación habilitante según normativa vigente	Ingeniero Industrial		
Procedimiento reconocido de calificación energética utilizado y versión:	CEX v1.0		

CALIFICACIÓN ENERGÉTICA OBTENIDA:

CALIFICACION ENERGÉTICA GLOBAL
EMISIONES DE DIÓXIDO DE CARBONO
[kgCO₂/m² año]

El técnico certificador abajo firmante certifica que ha realizado la calificación energética del edificio o de la parte que se certifica de acuerdo con el procedimiento establecido por la normativa vigente y que son ciertos los datos que figuran en el presente documento, y sus anexos:

Fecha: 28/06/2013

Firma del técnico certificador

Anexo I. Descripción de las características energéticas del edificio.
Anexo II. Calificación energética del edificio.
Anexo III. Recomendaciones para la mejora de la eficiencia energética.
Anexo IV. Pruebas, comprobaciones e inspecciones realizadas por el técnico certificador.

Registro del Órgano Territorial Competente:

CALIFICACIÓN ENERGÉTICA
DEL EDIFICIO TERMINADO ETIQUETA

DATOS DEL EDIFICIO

Normativa vigente construcción / rehabilitación: NBE- CT- 79
Referencia/s catastral/es: 0251702VK4705A0001RZ
Tipo de edificio: Terciario
Dirección: C/ Madera, 8
Municipio: Madrid
C.P.: 28004
C. Autónoma: Madrid

ESCALA DE LA CALIFICACIÓN ENERGÉTICA

	Consumo de energía kW h / m² año	Emisiones kg CO₂ / m² año
A más eficiente		
B		
C	289	72
D		
E		
F		
G menos eficiente		

REGISTRO

01/06/2023
Válido hasta dd/mm/aaaa

ESPAÑA
Directiva 2010 / 31 / UE

Assessor corps

The qualifications required for the certification of experts are laid out in the Royal Decree 235/2013. A degree in architecture or engineering is required in order to obtain the qualification to inspect both residential and non-residential buildings. Private entities can also be registered, provided that they have the necessary qualified workers. The requirements are explained in a simplified document available from the website of the Ministry of Industry, Energy and Tourism[5].

Although there is no specific exam or course, assessors must have the necessary knowledge of the procedures and methodology to produce EPCs.

Table 6:
Number of EPCs issued in Spain (2014).

	Nº of EPCs for new buildings	% of EPCs for new buildings	Nº of EPCs for existing buildings	% of EPCs for existing buildings
ANDALUCIA	609	4.31%	88,308	13.68%
ARAGÓN	-	0.00%	32	0.00%
ASTURIAS	17	0.12%	3,993	0.62%
BALEARES	188	1.33%	18,017	2.79%
CANARIAS	181	1.28%	32,172	4.99%
CATALUÑA	5,530	39.11%	195,089	30.23%
C LEON	72	0.51%	27,700	4.29%
C MANCHA	17	0.12%	10,507	1.63%
EXTREMADURA	3,015	21.32%	1,072	0.17%
GALICIA	65	0.46%	399	0.06%
MURCIA	154	1.09%	16,233	2.52%
NAVARRA	747	5.28%	5,926	0.92%
PAIS VASCO	125	0.88%	17,085	2.65%
RIOJA	283	2.00%	5,388	0.83%
VALENCIA	2,951	20.87%	128,888	19.97%
MADRID	176	1.24%	91,368	14.16%
CANTABRIA	10	0.07%	3,182	0.49%
TOTAL	*14,140*	*100%*	*645,359*	*100%*

Floor area (m²)	Price (€)
0-80	184.34
80-150	222.69
150-250	339.61
250-500	633.22
500-800	929.29
800-1,200	1,264.50
1,200-3,000	1,596.81
3,000-5,000	2,286.95
5,000-8,000	2,665.84
8,000-10,000	3,056.70
over 10,000	3,233.4 + 0.2 €/m²

Table 7:
Average price paid to obtain an EPC, published by the Ministry of Finance.

[5] *www.minetur.gob.es/energia/desarrollo/EficienciaEnergetica/CertificacionEnergetica/Normativa/Documents/Respuestas_a_preguntas_frecuentes_CEE_18_11_13.pdf*

Compliance levels by sector

In Spain, there is no centralised analysis of the EPC data by building type. This is because the information that is recorded and then entered into the certification database does not contain data concerning the type of building.

The database is currently being expanded to allow for some additional features. From 2015 onwards, it will be possible to begin to register and include more parameters of each certified building. Among these are: type of building, insulation levels, generation systems, energy performance characteristics of systems, etc.

Enforcement with building owners and real estate actor

The Royal Decree 235/2013 establishes the obligation for building owners to provide information on the buildings' energy efficiency before any sale or rental agreement is signed.

The role of the regions, as well as notaries, is to ensure compliance with the requirements. Spain has published penalties for non-compliance, through Law 8/2013 of 26 June 2013 on urban rehabilitation, regeneration and renewal. By the end of 2014, it had already brought-in more than 200 fines.

Quality Assurance (QA) of EPCs

The control system, the number of EPCs inspected, the percentage of inspections of EPCs, and the procedures are different for each region. As a minimum, a documentary control is undertaken for 100% of the records.

Control of EPCs is carried out first of all by taking into account the percentages of the different ratings (A, B, C, etc.) in the EPCs and in each autonomous community, and tracking advertising for the sale or rental of buildings.

According to the different regions, (autonomous communities CCAA), different control types are applied:

> visual control of 100% of the certificates: every EPC is visually checked to ensure that it is complete;

> detailed control of the EPC: analysis and review of the digital file with data for the energy rating calculation, on-site visit to the building, and, if applicable, recalculation and recertification;

> external control prior to the registration of the EPC. The developer must delegate technical control to an authorised agent who must verify the building data used to issue the certificate. It is also the work of these agents to fully verify the results contained in the EPC. To implement this option, the process requires that

- the external agents produce a global quality control plan to cover the whole construction process;
- at the end of construction, they make a detailed check of the EPC to ensure that it corresponds precisely to what has been built.

According to data available in July 2014, the quality control system has carried out control (over a total of 567,000 EPCs in Spain) as follows:

> 560,000 visual controls;

> 5,000 detailed controls;

> 2,000 external controls.

These figures indicate that 100% of the EPCs have been checked, and about 1% subjected to detailed quality control procedures. Additionally, there are two autonomous regions that, in addition to the EPC, require the presentation of a document of compliance from an accredited control entity that they use as quality control.

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

The certification and display of EPCs for public buildings and large buildings visited by the public is still under development at the end of 2014.

III.iii. Implementation of mandatory advertising requirement

The obligation to announce any sale or rental of buildings with an energy efficiency label has been regulated in Spain since 2013.

The entry into force of the obligation to publish the EPC coincided with the obligation to certify buildings for sale or rent. As a result, it is not possible to determine the effect of the obligation to publish the results on the number of EPCs in Spain.

The specific obligation to publish the results is linked to the type of advertising. For example, in the case of advertising in newspapers or magazines, it is not necessary to incorporate the complete EPC label, but to show only the information concerning the rating of the property in terms of CO_2 emissions and primary energy consumption, both numerically and with the letter that corresponds to the rating scale.

The reality in Spain is that in many cases the information displayed states 'under development', which implies that the EPC issue has been contracted but has not yet been completed.

III.iv. Information campaigns

In Spain, information campaigns for citizens, as well as for different agents involved, have been developed by IDAE, including a campaign of education and information, with activities in various fields including:

- presentations and workshops in the various regions and at professional associations;
- guides, manuals and explanatory documents on the requirements, mechanisms and obligations for the energy certification of buildings;
- online training courses, specifically for citizens, and other courses for managers and real estate agents.

These activities are complemented by additional dissemination activities in each of the regions (e.g., websites, workshops, media communication, etc.).

All these campaigns have been developed since 2012 and many of them are still on-going. Both documents and courses remain active and are updated when changes are introduced.

Figure 4:
Spanish education and information campaign.

Figure 5:
Online training.

III.v. Coverage of the national building stock

Analysis of the Spanish building stock indicates that there are approximately 19 million certifiable homes in Spain, counting primary homes, plus secondary housing that is used more than 4 months each year.

The regional distribution of certificates is shown in Table 8.

For existing buildings, the percentage of EPCs per region is indicated in Figure 7.

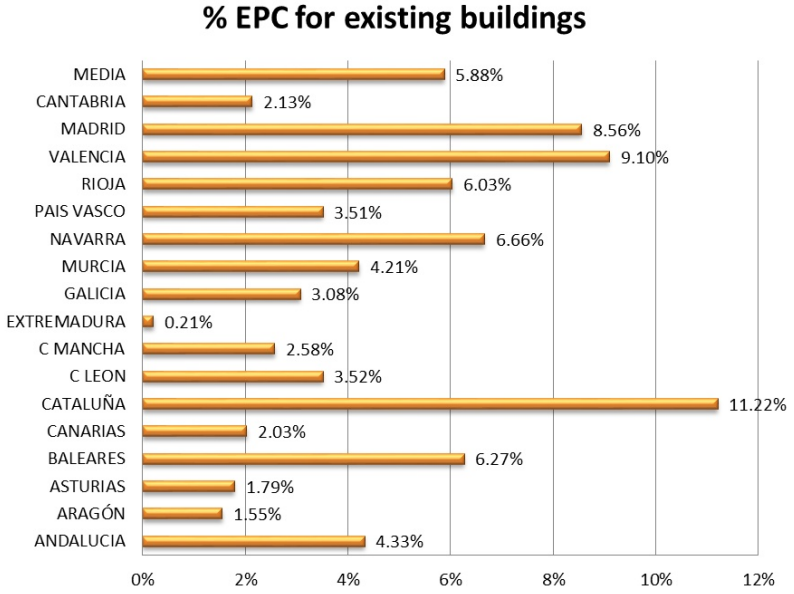
It is predicted that the number of EPCs will increase sharply in the coming years, until the market is regularised, since many buildings were already either for sale or rent before the Royal Decree 235/2013 entered into force, and so still do not have a valid EPC.

Figure 6:
'Information and frequently asked questions for energy certification of buildings' (April 2013).

Table 8.
EPC coverage per region (2014).

	Nº of EPCs for new buildings	Nº of EPCs for existing buildings	Total Nº of EPCs	Nº of buildings	%
ANDALUCIA	1,040	147,204	148,244	3,400,289	4.33%
ARAGÓN	33	8,863	8,896	573,089	1.55%
ASTURIAS	52	8,474	8,526	473,235	1.79%
BALEARES	268	28,464	28,732	453,984	6.27%
CANARIAS	150	16,900	17,050	832,859	2.03%
CATALUÑA	2,030	332,588	334,618	2,965,246	11.22%
C LEON	207	42,912	43,119	1,219,892	3.52%
C MANCHA	35	24,545	24,580	952,379	2.58%
EXTREMADURA	3,015	1,072	4,087	510,247	0.21%
GALICIA	150	38,413	38,563	1,248,866	3.08%
MURCIA	221	26,202	25,389	595,296	4.21%
NAVARRA	775	16,737	17,567	251,737	6.66%
PAIS VASCO	285	28,454	28,739	809,532	3.51%
RIOJA	59	8,847	8,906	146,675	6.03%
VALENCIA	4,578	201,586	206,164	2,215,777	9.10%
MADRID	239	197,332	197,571	2,305,472	8.56%
CANTABRIA	8	5,372	5,380	251,784	2.13%
TOTAL	*13,145*	*1,133,965*	*1,146,131*	*19,251,631*	*5.88%*

Figure 7:
EPC coverage for existing buildings per region.



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

Spain has applied the inspection option in response to Articles 14 and 15 of the EPBD. This was initially done in 2007 (for Article 8 of Directive 2002/91/EC) and updated in 2013 by the Regulation of the Thermal Systems of Buildings (Royal Decree 238/2013).

This document contains the implementation of a schedule of inspections to verify the correct operation of the facilities and to produce a report with advice on ways to improve energy performance.

The responsibility to undertake the inspections lies with the regions.

IV.i. Progress and current status on heating systems

Overview, technical method and administration system

Heat generation systems that use boilers must be inspected in Spain if the power is over 20 kW, and then the inspection shall include:

- analysis and evaluation of performance;
- the official record of maintenance inspection;
- inspection of the solar power installation, if any, and inclusion of the evaluation of the minimum solar contribution to the production of DHW and solar heating.

It is also necessary to inspect the complete heat generation system, especially when the heating or cooling system is more than fifteen years old, and the inspection includes, at a minimum, the following:

- inspection of the entire system (not just the boiler);
- analysis of the official record of maintenance inspection;
- production of a report in order to advise the owner, proposing improvements or modifications to the installation, to improve its energy efficiency and consider incorporating solar energy.

In the latter case, the technical measures will be justified on the basis of their energy, environmental and economic profitability, supported by a cost-effectiveness calculation.

These inspections are carried out every 2-4 years, according to the region.

Figure 8. Madrid information campaign on inspections.

Arrangements for assurance, registration and promotion of competent persons

The responsibility for the registration of the inspectors lies with each region. The regions are in charge of ensuring the quality of the inspection and the registration of the inspection report. In the 10 years since the implementation of inspections, the regions have developed different systems and mechanisms to carry out this work.

Most regions use the existing infrastructure of inspections carried out by maintenance companies (e.g., industrial safety), which undertake general maintenance activities that can include this type of inspection.

Promotional activities

Different regions have launched information campaigns concerning inspections of buildings' heating systems.

Enforcement and penalties (activity level and statistics on penalties already levied)

There is currently no information available on enforcement and penalties.

Quality control of inspection reports

Every region performs an individual control of every registered inspection report.

Inspection activity figures

Inspections are carried out by competent technicians who, according to the heating systems' regulation, have passed a training test and hold a professional license that enables them to undertake such work.

The inspector must possess four qualifications, obtained through independent tests: installer of central heating and sanitary hot water systems, installer of AC systems, maintainer of heating and DHW systems, and maintainer of AC systems. If someone holds only one of these, there should be a supplementary training course, taught by an accredited entity.

Costs and benefits

The cost of inspection ranges between 50 € and 120 € depending on what type of installation is being inspected. The benefit to be gained of the inspection depends on what type of corrections are required, and on the type of installation.

IV.ii. Progress and current status on AC systems

There is an obligation to regularly inspect cool generators of rated thermal input greater than 12 kW, and the inspection includes:

> analysis and evaluation of performance;
> the official report of maintenance inspection;
> inspection of the solar power installation, if any, and inclusion of the assessment of the contribution of the solar cooling system.

3. A success story in EPBD implementation

One of the main success stories of the implementation of the EPBD in Spain has been the development and implementation of programmes aimed at energy savings in buildings. One of them is the "PAREER" programme[6], described below.

In 2013, work began on the development of a grant-financing scheme for building renovation in Spain. The programme concentrated on the areas that required substantial effort from the public administration in order to save energy, and focused on residential buildings, thus promoting the rehabilitation of the Spanish building stock.

This programme facilitates and promotes (since its implementation in 2013) the energy rehabilitation of buildings with energy-saving measures based on the EPBD calculation methodology and the application of cost-optimal criteria.

The main criterion for eligibility is the building's EPC, and application of the energy performance recommendations appearing on the certificate. It is necessary to demonstrate that, after the renovations, the EPC rating will increase at least one level.

The basic operation of the scheme, which is promoted by the Ministry of Industry, Energy and Tourism, and implemented by the Institute for the Diversification and Saving of Energy (IDAE), funds up to 90% of work and renovations on heating and air-conditioning (AC) systems and on the thermal envelope of the building, to reduce the energy demand. Between 20% and 30% of the support (only for the thermal envelope renovation costs) is under the form of a grant, in order to reduce the payback period of the investment. The rest must be reimbursed by the building owners within a maximum of 12 years.

This programme is endowed with 125 M€ and currently holds over 450 records, with eligible costs above 50 M€ for the rehabilitation of such projects.

Activities included in this area are as follows:

> Type I: Thermal envelope
> Type II: Heating and lighting
> Type III: Biomass
> Type IV: Geothermal energy.

Programa PAREER
Ayudas para la Rehabilitación Energética de Edificios
MINISTERIO DE INDUSTRIA, ENERGÍA Y TURISMO
IDAE Instituto para la Diversificación y Ahorro de la Energía

Figure 9: A successful energy rehabilitation programme for buildings in Spain.

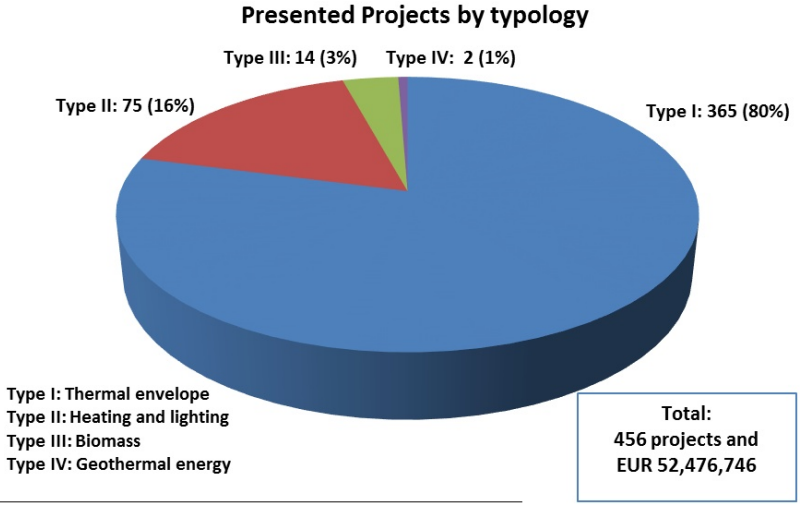


Figure 10: Projects submitted under the PAREER Programme.

[6] *www.idae.es/index.php/id.858/relmenu.409/mod.pags/mem.detalle*

In all of these areas, the main criterion for eligibility is the implementation of the EPC recommendations, resulting on the improvement of at least one letter in the energy rating scale of the EPC.

This programme can be considered a success in the implementation of the EPBD, as it actively promotes progress towards high quality EPCs, the inclusion of specific measures for improvement laid out for each building, and the improvements are undertaken following the cost-optimal calculations done in accordance with the official methodology.

It also promotes energy rehabilitation for buildings that need it most, due to the need to improve the energy rating by at least one level to bring performance in line with cost-optimal.

Additionally, the programme creates a culture of cooperation between professionals in the building sector, citizens, and real estate agents, and improves the network of companies dedicated to improving energy efficiency, and forces them to apply objective criteria of energy efficiency to the work they carry out.

Finally the programme has brought social benefits as, in addition to improving the comfort and economy of families and reducing their energy bills, it also generates jobs, something needed in a country with much skilled labour in the construction and renovation of buildings.

4. Conclusions, future plans

The recent work on the development of regulations related to energy saving directives must be revised and updated in the near future.

Most of the actions derived from Directives 2002/91/EC and 2010/31/EU, have already been implemented. However, based on the experience acquired in the past twelve years (both nationally and from other Member States through the Concerted Action EPBD), there are still many areas for improvement.

In the coming years, Spain will address certain key actions for achieving the energy saving and emissions reducing goals by 2020, and lay the groundwork to secure the objectives by 2030.

First is the definition and implementation of Nearly Zero-Energy Buildings (NZEBs). This is still work in progress, because Spain will reach these standards through a gradual approach. The latest milestone is in 2016-2017, when the rules for constructing new buildings will be drafted and enforced. The contribution of Renewable Energy Sources (RES) to NZEBs has yet to be defined, in particular regarding the minimum values to be applied.

There will also be a review of the regulations for heating systems. This will include tighter requirements in terms of energy efficiency (for both the generator and the complete system) in order to encourage those systems that could achieve better performance and lower consumption. All types of solutions will be considered: individual generators, heating/cooling networks, cogeneration, integration of RES, etc. The regulations will also include additional requirements for maintenance, control and inspection.

Also worth mentioning is the hard work that remains in order to extend and improve the energy certification of buildings process, bringing the percentage of certified buildings to 100% as soon as possible, while still ensuring quality. This will require (in addition to improving the work of the regions) more publication, communication and awareness-raising campaigns, as well as training for citizens, estate agents, and building administrators, without forgetting the key role of technical certifiers.

At this point, it is also important to adapt the methodology for calculation, using the new rules that will better coordinate methodologies for all MSs in the coming years, through CEN standards that are being revised.

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ec.europa.eu/energy/intelligent

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