Title of the measure:	POR 22 – Buildings codes on thermal performance characteristics (Decree-Law 118/2013, August 20th)

General description

The Energy Performance of Residential Buildings (REH) published in 2013 is a revision of the 2006 legislation, mainly the Regulation on the Characteristics of the Thermal Performance of Buildings (RCCTE - Decree-law 80/2006).

This new version establishes stricter conditions for building design in compliance with the European Directive n.º 2010/31/UE in what concerns to, for example:

- Building components requirements for new and renovated buildings;
- Technical systems requirements (heating, cooling, ventilation and hot water production) also for new and renovated buildings;

Like its previous version, the REH also establishes requirements regarding maximum energy needs, determined according the different climatic zones (winter and summer) for heating, cooling.

This version of the REH was also improved in order to accommodate the better methodologies and the incorporation of CEN standard references. Improvements in climate data, clear view of performance references for both building components and techinal systems and a better aggregation of the legislative package were also important developments.

Reference levels for building envelope for both new and renovated buildings were revised and a road map was established in order to better prepare the market. After 31st of December 2015 tighter values will apply leading these buildings to a high level of performance, the one required for the nearly-zero energy buildings. This concept is also valid for technical systems which have a similar approach.

The legislation compliance is achieved, among other aspects, by establishing annual nominal energy needs for heating, cooling and hot water production which needs to be fulfilled (ANNEX 1). These values are determined taking into consideration reference conditions in terms of indoor environment. Additionally, the legislation establishes maximum primary energy needs for every building. This indicator is also used for evaluating the building energy label.

Following the 2006 legislation, the REH considers mandatory the installation of solar collectors for domestic hot water production in all new buildings which have the suitable solar exposition. It is also foreseen the possibility to replace solar collectors for other sources of renewable energy, as long as it is used for domestic hot water production.

New buildings must comply with REH whenever a permit is request and also when undergoing major renovations (renovate buildings envelop and/or technical systems with a costs exceeding 25% of the total existing building's value, without considering land cost).

Impact evaluation

Methods

The General Directorate for Energy and Geology (DGEG) is the entity in charge of the supervision of the building energy certification system (SCE) in what concerns to its impact and implementation.
The Portuguese Energy Agency (ADENE) is the entity in charge of managing the SCE and its central registry. It also acts as an observatory, managing and evaluating the results of the SCE and the impact from the legislation.

The following table presents the impact observed from the period 2008-2013 and also the expected impact until 2020.

Results

Ex-post evaluation	2008-2010	2011	2012	2013	Accumulated
Final Energy (Toe) (Fuels/Electricity)	57 473	4 884	2 920	2 442	67 719

Notes:

1) Source: PNAEE- National Action Plan for Energy Efficiency, which transpose for national European Directive n.º 2006/32/CE relate to energy consumption efficiency aiming achieving the "20-20-20" goals.

1.1 The results for 2008-2013 period reflects the effect of energy building codes and labelling in new buildings which have come in force in national legislation from 2006 in compliance to European Directive n.º 2002/91/CE

2) Ex-post evaluation reflects the implementation of POR 10 - Regulation on HVAC systems in Buildings (RSECE), 2006, described in residential measure list

Interaction of measures

Mitigation interaction with:

(i) Household sector measures: POR 21 (Energy Certification in Buildings); POR 4 (Boilers Efficiency Directive)

(ii) General Cross-Cutting measures: POR 7 (National Action Plan for Energy Efficiency (PNAEE); POR 8 (Energy Efficiency Fund);

Reinforce interaction with:
(i) Household sector measures: POR 6 (Solar Hot Water Programme for Portugal)
(ii) General Cross-Cutting measures: POR 10 (Plan for Promoting Efficiency in Electricity Consumption 2013-2014; POR 11 (Plan for Promoting Efficiency in Electricity Consumption 2017-2018); POR 12 (Portugal 2020) and POR 13 (Efficiency in end-use energy and energetic services)

Means and outputs

No information available.

Data about energy savings

The energy savings up to now is 67 719 of final energy, from 2008 until 2013.

Sources of uncertainties about energy savings

No information available.

Historical data

The Regulation on the Characteristics of the Thermal Performance of Buildings (RCCTE), approved by the Decree Law 40/90 of February 6th, was the first legal instrument in Portugal to lay down minimum energy requirements.

Under the framework of E-4 Programme (Energy Efficiency and Endogenous Energies) launched (September 2001) by the Portuguese Ministry of the Economy, RCCTE was update and revised in order to promote the energy efficiency in buildings. This regulation revision was performed in accordance with Directive 2002/91/EC of 16th December, on the Energy Performance of Buildings, that imposes among other conditions the periodical establishment and update of regulations for Decree law n.º 80/2006, April 4th, being a more demanding tool with better control in its practical implementation.

In December 2013 entered in force the Decree Law n.º 118/2013, August 20th that revises and update the Decree law n.º 80/2006, April 4th in compliance with the Directive nº 2010/31/UE, of 19th May.

References

- www.p3e-portugal.com
- Decree-law 40/90, of February 6th;
- Decree-law 80/2006, of April 4th (RCCTE 2006);
- Decree-law 79/2006, of April 4th (RSECE 2006);
- Decree-law 78/2006, of April 4th (SCE – Buildings Energy Certification System, 2006);
- Decree-law 118/2013, of August 20th (SCE – Buildings Energy Certification System);
- Law n.º 58/2013, of August 20th (Professional qualifications of SCE technicians);
- Ordinance n.º 349-A/2013 of, November 29th (Establishes the buildings category of energy certification (CE) as well as the types of certificate model, the taxes of CE register in the SCE internet platform and the criteria for quality verification of energy certification process.
- Ordinance n.º 349-C/2013 of December 2nd (Establishes the required documents for the construction and use permit);
- Ordinance n.º 353/2013 of December 4th (Establishes the building cost per square meter)
- Order n.º 15793-C/2013 of December 3rd (Publishes the energy certificate layout for residential and non-residential buildings);
- Ordinance n. 349-B/2013 of November 29th (REH solutions requirements for residential buildings);
- Order n.º 15793-D/2013 of December 3rd (Publishes the final energy conversion factors to primary energy and CO_2 emission system under energy certificate process);
- Order n.º 15793-F/2013 of December 3rd (Publishes the climate data);
- Order n.º 15793-H/2013 of August 20th (Establishes the rules for the accounting of renewable energy under energy certificate process);
- Order n. 15793-E/2013 of December 3rd (Establishes the rules of simplified calculations methods to be applied in existing buildings);

- Order n.º 15793-I/2013 of December 3rd (Publishes the methodology of nominal energy household demands);
- Order n.º 15793-k/2013 of December 3rd (Publishes the thermal parameters of constructions solutions);
- Order n. º 15793-G/2013 of December 3rd (Establishes the proceedings for testing and acceptance of facilities as well as the guidance of minimum information required to be included in the Maintenance Plan)
- Order 8892/2015, of August 11st, (Defines the classification methodology to adopt for lifts, conveyors and escalators to be installed in commercial buildings and services in order to assess compliance with the minimum energy efficiency requirements according to ISO 25745 standard)
- Order 7113/2015, of June 29st, (Responsible for publishing quality verification of the selection criteria of the processes and methods of checking the quality of the certification processes carried out by the technicians of the Building Energy Certification System (SCE), particularly the Qualified Experts)
- Order 14985/2015, of December 17th, (Defines the methodology to be used for determine the values (Qusable) and Seasonal Performance Factor used in the calculation methodology of the renewable energy contribution from heat pumps).
- Order 3156/2016, of March 1st, (Replaces the calculation program of the determination of the energy produced by the solar thermal system and solar photovoltaic system, under the Building Energy Certification System).

Besides all above listed diplomas, it was also published in April 30th the Decree-law 68-A/2015 that establishes requirements on energy efficiency and CHP, transposing for national legislation the European Directive 2012/27/UE.

Last update: 19 June 2018

Annex 1: Energy needs calculation method

In similarity with the regulations 1990 and 2006, the REH lays down minimum energy consumption requirements, determined according the different season, winter and summer, respectively for heating and cooling purposes. The country was divided into three distinct winter and summer areas, but the country division is different from RCCTE 2006 version, now taking in consideration 18ºC as a reference temperature in winter and exterior average temperature in summer which the criteria is: $\theta_{ext,\,v} \leq 20°C$; $20°C < \theta_{ext,\,v} \leq 22°C$ and $\theta_{ext,\,v} > 22°C$. The recent climatic data and the new software tools that allow the combination of the available climatic and orographic data.

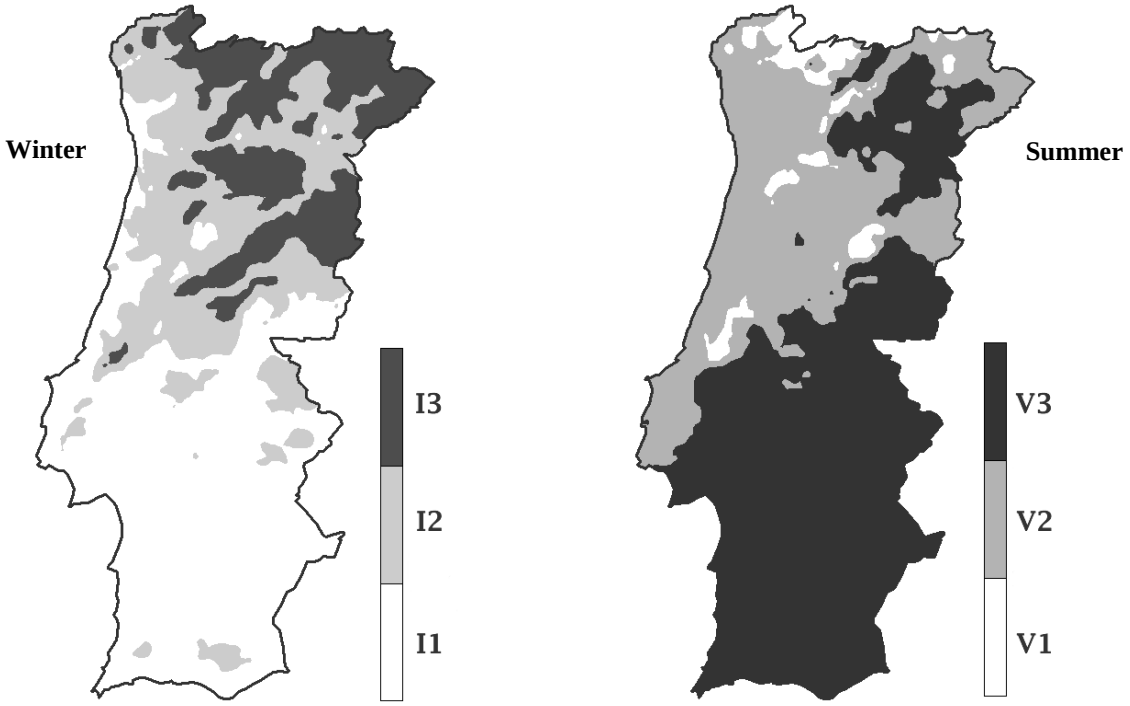

Figure 1 – winter and summer climatic division

1 – HEATING NEEDS

Nic building ≤ Ni reference => Compliance of the regulation

i) Nic building = (Qtr,i + Qve,i – Qgu,i)/Ap (energy needs for heating: kWh/m^2.year)

Qtr,i – Heat losses by envelop elements
Qve,i – Heat losses by ventilation
Qgu,i – Heat gain from lights, equipment and solar gains from glazes

Ap – Useful floor area

ii) Ni reference = (Qtr,i_{ref} + Qve,i_{ref} – Qgu,i_{ref})/Ap (reference energy needs for heating: kWh/m^2.year)

Qtr,i_{ref} – Heat losses by reference envelop elements values
Qve,i – Heat losses by reference ventilation values
Qgu,i – Heat gain from lights, equipment and solar gains from glazes reference values
Ap – Useful floor area

(Heat losses by envelope elements rely on the parameter U – Thermal conduction coefficient (W/m2.ºC))

Reference thermal conduction coefficient – [U-W/m2.ºC]

U_{ref} [W/(m2.ºC)]		Climate Zone					
Portugal - Mainland							
Current area of the surrounding:		With the entry into force of the Decree-Law No. 118/2013 Regulation (From 1 December 2013)			After 31 December 2015		
		I1	I2	I3	I1	I2	I3
in contact with exterior or not useful spaces with coefficient loss reduction b_{tr}>0.7	Vertical opaque elements	0,50	0,40	0,35	0,50	0,40	0,35
	Horizontal opaque elements	0,40	0,35	0,30	0,40	0,35	0,30
in contact with other buildings or not useful spaces with coefficient of loss reduction b_{tr}≤0.7	Vertical opaque elements	1,00	0,80	0,70	0,80	0,70	0,60
	Horizontal opaque elements	0,80	0,70	0,60	0,60	0,60	0,50
Windows (U_w)		2,90	2,60	2,40	2,80	2,40	2,20
Elements in contact with ground		0,50			0,50		
Portugal Autonomous Regions (Madeira and Azores)							
Current area of the surrounding:		With the entry into force of the Decree-Law No. 118/2013 Regulation (From 1 December 2013)			After 31 December 2015		
		I1	I2	I3	I1	I2	I3
in contact with exterior or not useful spaces with coefficient loss reduction b_{tr}>0.7	Vertical opaque elements	0,80	0,65	0,50	0,70	0,60	0,45
	Horizontal opaque elements	0,55	0,50	0,45	0,45	0,40	0,35
in contact with other buildings or not useful spaces with coefficient of loss reduction	Vertical opaque elements	1,60	1,50	1,40	0,90	0,80	0,70
	Horizontal opaque elements	1,00	0,90	0,80	0,70	0,70	0,60

b_{tr}≤0.7							
Windows (U_w)		2,90	2,60	2,40	2,80	2,40	2,20
Elements in contact with ground		0,50			0,50		

2 – COOLING NEEDS

Nvc building ≤ Nv reference => Compliance of the regulation

iii) Nvc building = (1-ηv). Qg,v/Ap (energy needs for cooling: kWh/m^2.year)

ηv – Utilization factor
Qgu,i – Heat gain from lights, equipment and solar gains from glazes
Ap – Useful floor area

iv) Nv reference = (1-ηvref). Qg,vref)/Ap (reference energy needs for cooling: kWh/m^2.year)

ηvref – Reference utilization factor
Qgu,i ref– Reference heat gain from lights, equipment and solar gains from glazes
Ap – Useful floor area

3 – DOMESTIC HOT WATER NEEDS

Qa building = (M_{DHW}.4187.ΔT.n_d)/3600000 (energy needs for DHW: kWh/m^2.year)

Qa – Energy need with conventional systems
M_{DHW} – Daily DHW consumption (litters)
n_d – Annual number of days with DWH
ΔT – Necessary temperature increase to DHW production

Qa doesn't have a reference value, is results from the real need of building.

4 – PRIMARY ENERGY

Ntc building ≤ Nt reference => Compliance of the regulation

v) Ntc building = (1-ηv). Qg,v/Ap (Primary energy needs: kWh$_{EP}$/m^2.year)

$$N_{tc} = \sum_j \left(\sum_k \frac{f_{i,k} \cdot N_{ic}}{\eta_k} \right) . F_{pu,j} + \sum_j \left(\sum_k \frac{f_{v,k} \cdot \delta . N_{vc}}{\eta_k} \right) . F_{pu,j} + \sum_j \left(\sum_k \frac{f_{a,k} \cdot Q_a / A_p}{\eta_k} \right) . F_{pu,j} + \sum_j \frac{W_{vm,j}}{A_p} . F_{pu,j} - \sum_p \frac{E_{ren,p}}{A_p} . F_{pu,p}$$	(Primary energy needs: $kWh_{EP}/m^2.year$)

N_{ic} - Energy needs for heating, supplied by system k [kWh/(m².ano)]

$f_{i,k}$ - Share of heating energy needs provided by system "k"

N_{vc} - Energy needs for cooling, supplied by system k [kWh/(m².ano)]

$f_{v,k}$ - Share of cooling energy needs provided by system "k"

Q_a - Energy needs for DHW, provided by system "k" [kWh/ano]

$f_{a,k}$ - Share of DHW energy needs provided by system "k"

η_k - Efficiency of system "k"

j - All forms of energy, renewable included

p - Renewable source of energy

$E_{ren,p}$ - Energy supplied from renewable form

W_{vm} - Electric energy necessary to fan Energia elétrica operation [kWh/ano]

A_p - Necessary temperature increase to DHW production [m²]

$F_{pu,j}$ e $F_{pu,p}$ Conversion factor to primary energy, [kWh_{EP}/kWh]

vi) Nt reference

$$N_t = \sum_j \left(\sum_k \frac{f_{i,k} \cdot N_i}{\eta_{ref,k}} \right) . F_{pu,j} + \sum_j \left(\sum_k \frac{f_{v,k} \cdot N_v}{\eta_{ref,k}} \right) . F_{pu,j} + \sum_j \left(\sum_k \frac{f_{a,k} \cdot Q_a / A_p}{\eta_{ref,k}} \right) . F_{pu,j}$$

(Reference primary energy needs: $kWh_{EP}/m^2.year$)

N_i - Reference energy needs for heating, supplied by system k [kWh/(m².ano)]

$f_{i,k}$ - Share of heating energy needs provided by system "k"

N_v - Reference energy needs for cooling, supplied by system k [kWh/(m².ano)]

$f_{v,k}$ - Share of cooling energy needs provided by system "k"

Q_a - Energy needs for DHW, provided by system "k" [kWh/ano]

$f_{a,k}$ - Share of DHW energy needs provided by system "k"

η_k - Reference of efficiency of system "k"

j - All forms of energy, renewable included

p - Renewable source of energy

$E_{ren,p}$ - Energy supplied from renewables

W_{vm} - Energy for ventilation [kWh/ano]

A_p - Useful area [m^2]

$F_{pu,j}$ e $F_{pu,p}$ Primary energy conversion factors, [kWh_{EP}/kWh]

In the specific case of major renovations, the ratio between nominal useful energy needs and primary energy of building and its reference value, is affected taking into account the construction year

Construction year	N_{ic}/N_i	N_{vc}/N_v	N_{tc}/N_t
Before a 1960	Not applicable	Not applicable	1,50
Between 1960 and 1990	1,25	1,25	1,50
After a 1990	1,15	1,15	1,50