Review of the Bulgarian legislation in the field of energy efficiency of buildings

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Where is Sliven

Sliven is in southeast Bulgaria

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Main building of the Faculty of Engineering and Pedagogy

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Energy efficiency of buildings - what is the essence of the problem?

Between 20-30% of final energy consumption is spent in households, most of it is used for heating and air conditioning.
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Final energy consumption by sectors in 2005 and 2007

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How to define the energy efficiency of buildings?

It can be defined as the quality of the microclimate in the buildings relative to the cost of energy is received:

\[ EnEf = \frac{Q \cdot MC}{En} \]

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One question for reflection?

If we think about that, what will be the energy efficiency of this building?
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Flashback of the regulations on energy efficiency in buildings

**Periods**

I period – up to Changes 1989
II period – after Changes 1989

Year

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Bulgaria in middle of XIX century

At that time energy efficiency was based on people’s past experience. Houses in Bulgaria during that period were made of stone, sun-dried brick and wood. The walls were usually overlaid with wood. Then the houses were characterized also by small windows to reduce heat losses and there were large eaves for sun protection.
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Bulgaria in middle of XIX century

~1850
1. Temporary instruction for design and implementation of thermal insulation in Building Constructions

Normative values of temperature drop between the internal air temperature and the temperature of the inner surface of the surrounding constructions.

Necessary values of thermal resistance of heat transmission $R^*$ (m$^2$h$^\circ$C/kcal) for premises in residential, public and industrial buildings with internal air temperature of 20 °C. Heat resistance, steam resistance and air transfer of constructions.
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Buildings from that period

Year

1960
2. Insulation in Building Construction. Standards for design

Normative values of temperature drop between the internal air temperature and the temperature of the inner surface of surrounding constructions.

Necessary values of thermal resistance of heat transmission $R^*$ ($m^2h^\circ C/kcal$) for premises in residential buildings with the internal air temperature of 20 °C.

Heat resistance and emission of moisture condition of surrounding constructions.

Air transfer standards of the surrounding constructions.

Necessary values of thermal resistance of heat transmission $R^*$ ($m^2h^\circ C$/kcal) for premises in residential buildings by internal air temperature of 20 °C and temperature of the surrounding constructions.

Heat absorption by floors.

Heat resistance and dimensioning moisture regime of surrounding constructions.

Air transfer standards of the surrounding constructions.
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Buildings from that period

Year

1969

Necessary values of temperature drop between the internal air temperature and the temperature of the inner surface of the surrounding constructions.

Minimum required thermal resistance of heat transmission $R^{ik}$ and temperature of the surrounding constructions.

Heat absorption by floors.

Moisture regime of surrounding constructions.

Air transfer standards of the surrounding constructions.
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Buildings from that period

Year

1977

1960
1964
1969
1977
1980
1987
1999
2004
2009
2015

Normative values of temperature drop between the internal air temperature and the temperature of the inner surface of the surrounding constructions.
Minimum required thermal resistance of heat transmission $R^*$, providing normal indicators of hygienic terms and limits on the overall coefficient of heat transmission $K_o$, W/m² for residential and public buildings depending on the circumferential surface of buildings.

...

... Heat resistance of the surrounding constructions. Dimensioning humidity regime of the surrounding constructions.
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Buildings from that period

Year

1980

Normative values of temperature drop between the internal air temperature and the temperature of the inner surface of the surrounding constructions.
Limits on the overall coefficient of heat transmission $K_o$, W/m² for residential and public buildings with conventional heating sources or new sources of energy depending on the ratio of the total surface divided by the heated volume. Minimum required thermal resistance of heat transmission $R_{ik}$.
Dimensioning moisture regime surrounding constructions.
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Buildings from that period
Since 1989 Bulgaria has experienced radical changes in social-economic life. Due to worsening economic situation there was a significant reduction in new construction and renovation of existing residential and public buildings. For a long time, more than 10 years there haven’t been any changes in the legal framework for energy efficiency of buildings.
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Energy strategy in Bulgaria

Progressive liberalization and normalization of the economy and the willingness of Bulgaria to be actively involved in Common European process and the continued rise in prices of energy has brought about a state energy efficiency strategy and launch the phase of European standards implementation in this area. By the proposal of the Council of Ministers in 1999 and 2002, Bulgarian National Assembly accepted the Energy Strategy of the country.
7. Regulation 1 For Designing Thermal Insulation of Buildings

The maximum values of the heat transfer coefficient of external structural elements of buildings $k_m$, and maximum normative values of the overall coefficient of the building as a whole $K_{m\text{ max}}$, depending on the ratio $A/V$. Minimum thickness of heat insulation - 5cm. Protection from sunshine in the summer. Moisture resistance of heated buildings.
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Buildings from that period

Year

1999
TERRITORY REGULATION LAW
With effect from 31.03.2001

This law regulates the social relations associated with planning, design and construction investment in Bulgaria, and sets restrictions on the property for constructional purposes.
This law regulates the public relations aspects of the activities of production, import and export, transfer, transit, distribution of electricity, heat and gas, transport of oil and petroleum products by pipeline, trading electricity and heat and gas and the powers of state bodies in defining the energy policy, regulation and control.

This law regulates the social relations associated with the implementation of state policy for improving energy efficiency in consumption of energy and provision of energy services.

This law repealed the LAW ON ENERGY EFFICIENCY (promulgated, SG. 18 of 2004, amend., No. 74, 2006, issue. 55 of 2007).

The maximum values of the coefficient of heat transmission $U_{\text{max}}$ for different surrounding constructions.

The maximum annual values of heat consumption for heating of $1 \text{ m}^2$ useful living space depending on the form factor and day-degree in the internal air temperature higher than $19 \ ^\circ \text{C}$.

The maximum values of the coefficient of specific heat losses from thermal to non-residential buildings according to the form factor and the percentage of glazing with regulations of indoor air temperature higher than $19 \ ^\circ \text{C}$.
8. Regulation 7 for heat preservation and energy saving of buildings.

..... The maximum annual values of usage of heat consumption on 1 m$^3$ of administrative buildings, heated more than three months a year.
Technical requirements for moisture resistance.
Thermal transmittance and water resistance.
Protection of glass facades from sunshine.
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Map of Climate zones in Bulgaria
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Buildings from that period
9. Regulation №5: For the Technical Passports of Constructions

This Regulation determines the scope and content of technical passports of buildings and structures, and since 2008 the order of making and content of energy passports of buildings as part of technical passports.
Energy passport of the building must contain at least the following information:

Value of the integrated energy performance of buildings and normative value, including specific annual energy consumption in kWh/m². expressed in primary energy consumption or the total annual energy consumption in MWh, or expressed in primary energy consumption, CO₂ emissions savings.

Classification of the building and its belonging to the class of the scale of energy. Heated area. Gross heated volume. Geometrical and thermal characteristics of the surrounding buildings structures and elements and assessment of their condition.

Energy sources, the values for annual energy consumption of the technical installations for heating and hot water, measures to improve the energy performance of buildings and their feasibility assessment.
Energy passport of a building is made in order to assess compliance and establish the energy performance of buildings regulatory requirements for energy efficiency and the current situation of energy consumption of buildings.

Energy passport of a new building must be made before its practical use. Energy passport of an existing building is composed by individuals or legal authorities who meet the requirements of the EEA, based on data from the report (summary) conducted a survey of their building. Classification of buildings depending on the class of energy is Class A (more efficient) to Class G (less efficient).
Energy passport

Energy passport consists of four pages, inseparable one from each other, drawn after each survey. The scale of energy passports for investment projects for new buildings (before practical use) or for existing buildings contain two columns:
In the first column (the current status) introduces the estimated primary energy consumption of the building in compliance with the requirements of Regulation № 7 from 2004 or the value (measured and calculated) of energy after an appropriate investigation.
The second column introduces the estimated value of the energy of the most cost-effective combination of ESM.
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<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
</tr>
</thead>
</table>

### Energy Systems

<table>
<thead>
<tr>
<th>System</th>
<th>Energy Source</th>
<th>Annual Energy Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>58.3 kWh/m²</td>
<td>16972 kWh</td>
</tr>
<tr>
<td>Ventilation</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cooling</td>
<td>3.1</td>
<td>902</td>
</tr>
<tr>
<td>Hot Water</td>
<td>11.7</td>
<td>3411</td>
</tr>
</tbody>
</table>

### Energy Intake

- Initial energy intake: 21444.5 kWh
- Final energy intake: 1960 kWh

### Energy Efficiency

- Annual energy for heating and ventilation: 0.007 kWh/m²
- Annual energy for cooling: 0.000 kWh/m²

### Energy Consumption

- Energy consumption: 2008 kWh

## Energy Conservation Measures

### Indoor Energy Intake

<table>
<thead>
<tr>
<th>Energy Intake</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI1</td>
<td>SI2</td>
</tr>
</tbody>
</table>

### Outdoor Energy Intake

<table>
<thead>
<tr>
<th>Energy Intake</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>PI1</td>
<td>PI2</td>
</tr>
</tbody>
</table>

## Energy Efficiency

- Efficiency increase: 20%

Regulation amend:
Regulation № RD-16-294 from 2008 and Regulation № 21 from 2004 for energy efficiency audits;
Regulation № RD-16-295 and № 19 from 2004 for certification of buildings for energy efficiency.
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10. Regulation № RD-16- 1057

This regulation specify:
1. arrangements for carrying out energy efficiency audits and certification of buildings;
2. arrangements for issuing energy performance certificates;
3. categories of certificates.
The first observation and certification of building is carried out within three years of its practical use.

All buildings with unfolded area over 1000 m² are due to obligatory certification.
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10. Regulation № RD-16- 1057

... Certification for energy efficiency of buildings is to verify the current status of energy consumption in buildings, energy performance and their compliance with the scale of classes of energy from the Regulation...
...

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Energy performance certificates are issued with category “A” or category “Б”.

Obtaining a certificate of building makes the building tax free for a specific period of time depending on the category.
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| Year | 2009 |

<table>
<thead>
<tr>
<th>Ограждащи конструкции и елементи</th>
<th>Площ, м²</th>
<th>Коefфициент на термоизолационе</th>
<th>Дисперсия, Вт/м²К</th>
<th>Референц, Вт/м²К</th>
</tr>
</thead>
<tbody>
<tr>
<td>Стени</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Прозорци</td>
<td></td>
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<tr>
<td>Покрив</td>
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<tr>
<td>Пад</td>
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</tr>
</tbody>
</table>

Оценка на състоянието:

<table>
<thead>
<tr>
<th>Системи за отопление, вентилация, охлаждане и гореща вода</th>
<th>Общ разход на хармония</th>
<th>Общ разход на гореща вода</th>
</tr>
</thead>
<tbody>
<tr>
<td>Отопление</td>
<td>kg/km²</td>
<td>kg/km²</td>
</tr>
<tr>
<td>Вентилация</td>
<td>kg/km²</td>
<td>kg/km²</td>
</tr>
<tr>
<td>Охлаждане</td>
<td>kg/km²</td>
<td>kg/km²</td>
</tr>
<tr>
<td>Гореща вода</td>
<td>kg/km²</td>
<td>kg/km²</td>
</tr>
</tbody>
</table>

Оценка на състоянието:

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11. Regulation № RD-16-1058 from 10th December 2009 on indicators for energy consumption and energy performance of buildings

Regulation amend consistently:
Regulation № RD-16-296 since 2008 and Regulation № 18 since 2004 on the energy characteristics of objects.
This Regulation specifies:
1. conditions and procedures for determining indicators of energy consumption and energy performance of buildings;
2. identical methodology for the formation of indicators for energy consumption and energy performance of buildings;
3. rules for making a scale of classes of energy.
The calculation of energy performance aims at:
1. estimating consumption, energy saving and heat preservation in buildings;
2. determining the level of energy efficiency in buildings;
3. assessing each investment project to construct a new building, reconstruction, major upgrade, major repair or reconstruction of an existing building with energy efficiency requirements;
4. making of an energy passport and certificate of buildings...
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11. Regulation № RD-16-1058

Class limits of energy consumption in buildings

<table>
<thead>
<tr>
<th>Limits (from- to)</th>
<th>Class of energy consumption</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP &lt; 0,5 EP_{max,r}</td>
<td>A</td>
<td>High energy efficiency</td>
</tr>
<tr>
<td>0,5 EP_{max,r} &lt; EP ≤ EP_{max,r}</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>EP_{max,r} &lt; EP ≤ 0,5 (EP_{max,r} + EP_{max,s})</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>0,5 (EP_{max,r} + EP_{max,r}) &lt; EP ≤ EP_{max,s}</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>EP_{max,s} &lt; EP ≤ EP_{max,s}</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>1,25 EP_{max,s} &lt; EP ≤ 1,5 EP_{max,s}</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>1,5 EP_{max,s} &lt; EP</td>
<td>G</td>
<td>Large energy consumption</td>
</tr>
</tbody>
</table>
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11. Ordinance № RD-16-1058

Where:
EP – Energy Performance of Buildings (total specific energy consumption values in the thermal performance of buildings surrounding construction and elements, and the effectiveness of all elements are defined by their current status in the observation of building)

EP_{max,r} - total specific energy consumption values in the thermal performance of buildings surrounding construction and elements, and the effectiveness of all elements are defined by existing regulations at the time of observation

EP_{max,s} - total specific energy consumption values in the thermal performance of buildings surrounding structures and elements, and the effectiveness of all elements are defined by existing regulations at the time of entry into practical use
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Buildings from this period
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Reference values of the coefficient of heat transmission of different types of surrounding constructions. Compared to 2004, coefficients of heat transmission are recommended, and directed towards energy consumption...
Technical indicators for energy efficiency in the design of buildings and assessment of projects in compliance with energy efficiency requirements are defined as:

- new buildings - total annual energy consumption for heating, cooling, ventilation, hot water and lighting of 1m$^2$ of total heated area of the building ($A_f$) in kWh/m$^2$;
- existing buildings - total annual energy consumption for heating, cooling, ventilation, hot water and lighting of 1m$^2$ of total heated area of the building ($A_f$) in kWh/m$^2$, or one 1m$^3$ heated volume ($V_s$) in kWh/m$^3$;
- Protection of glass facades from sunshine.


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Annual energy consumption (Q) in kWh for heating, cooling, ventilation and hot water is calculated by the following balance equation:

\[ Q = Q_H + Q_V + Q_W + Q_C - Q_r \]

Where:
- \( Q_H \) - annual energy consumption for heating, kWh;
- \( Q_V \) - annual energy consumption for ventilation, kWh;
- \( Q_W \) - annual energy consumption for heating water for household needs, kWh;
- \( Q_C \) - annual energy consumption for cooling, kWh;
- \( Q_r \) - annual regenerated energy in the building, kWh.
2. When designing - Prepare part “Energy Efficiency” the investment project, the total annual energy consumption must comply with the minimum of:
- Class-B  - for new buildings;
- Class-C  - existing established during the period 1991-2009 incl.;
- Class-D  - existing in use until 2009 incl.
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Stages in the audit for energy efficiency in buildings

2. The introduction into service of the building (or already in use building)- prepare yourself “ENERGY PASSPORT”, giving energy and energy efficiency class and according to current status.
3. After minimum 3 years of building usage an energy auditing will be made and a "CERTIFICATE" for the energy performance of buildings will be prepared.
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“All we need is love” ...
and energy to use sensibly

Thank you for your attention!