

SUSTAINABLE ARCHITECTURE

SUSTAINABLE ARCHITECTURAL DEVELOPMENTS

ENERGY EFFICIENCY

Regulation in the UK and the EU

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Energy Performance of Buildings Directive (EPBD) 2002

Introduction of:

Building energy performance. Calculation method

- Each member State to specify
- For the UK – SAP (Domestic) / SBEM (Non-domestic)

Minimum energy performance requirements

- For new and existing buildings
- UK Building Regulations Part L was updated

Energy Performance Certification

- Compulsory
- By accredited energy assessors

Inspection of boilers and air-conditioners

- Prescriptive



Energy Performance of Buildings Directive (EPBD) 2002

Building energy performance. Calculation method

Standard Assessment Procedure (SAP)

- For Energy Rating of dwellings, applicable to:
 - New construction of dwellings
 - Extensions with more than 25% glazing-to-floor area
 - Barn conversions
 - Commercial to domestic conversions
 - Conversion of a single dwelling into flats or apartments
- Developed by BRE based on BRE Domestic Energy Model (BREDEM)
- Adopted by the UK Government as the methodology for calculating the energy performance of dwellings
- Calculations required to demonstrate compliance with part L of the Building Regulations
- SAP 2012 version to be used
- SAP 10 version that will replace SAP 2012 (already published)



Energy Performance of Buildings Directive (EPBD) 2002

Building energy performance. Calculation method

Standard Assessment Procedure (SAP)

Calculations:

- **Energy consumption** per unit floor area.
- **Energy cost rating** adjusted for floor area (the SAP rating) expressed on a scale of 1 to 100, where a lower rating indicates higher running costs.
- **CO2 emissions** adjusted for floor area (Environmental Impact rating or EI rating) expressed on a scale of 1 to 100, where a lower rating indicates higher running costs.
- **The Dwelling Emission Rate (DER)** which is a similar indicator to the Environmental Impact rating, but where CO2 emissions are expressed in $\text{kg/m}^2/\text{year}$.
- **The Dwelling Fabric Energy Efficiency (TFEE)** which is the actual energy performance for a new dwelling expressed as the amount of energy demand in units of kilowatt-hours per square metre of floor area per year ($\text{kWh}/(\text{m}^2.\text{year})$).



Energy Performance of Buildings Directive (EPBD) 2002

Building energy performance. Calculation method

Standard Assessment Procedure (SAP)

Baseline:

TER (Target Emission Rate) is based on a notional dwelling of similar size and shape to the proposed one. The TER sets the minimum acceptable standard of performance. The DER must not exceed the TER.

TFEE (Target Fabric Energy Efficiency) is the minimum energy performance requirement for a new dwelling. It is expressed as the amount of energy demand in units of kilowatt-hours per square metre of floor area per year (kWh/m².year) The DFEE rate must not exceed the TFEE.



Energy Performance of Buildings Directive (EPBD) 2002

Building energy performance. Calculation method

Standard Assessment Procedure (SAP)

Calculations based on:

- Construction materials and thermal insulation of the building fabric.
- Air leakage and ventilation equipment.
- Efficiency and control of heating systems.
- Solar gains.
- Choice of fuel for space and water heating, ventilation and lighting.
- Space cooling.
- Renewable energy technologies.

A **Design SAP report** must be submitted as part of a Building Regulations application before the construction begins

An **As-Built SAP report** must be submitted once the construction is complete



Energy Performance of Buildings Directive (EPBD) 2002

Energy Performance Certificate (EPC)

Energy Performance of Buildings (England and Wales) Regulations 2012

The EPCs set out the energy efficiency rating of buildings

Required when buildings are built, sold or rented:

- If they have a roof, walls and use energy to condition an indoor climate
- If a building contains separate units (e.g. a block of flats) each unit needs an EPC



Energy Performance of Buildings Directive (EPBD) 2002

Energy Performance Certificate (EPC)

Buildings that do not need an energy performance certificate include:

- Places of worship.
- Temporary buildings.
- Stand-alone buildings with a floor area of less than 50 square metres.
- Industrial and agricultural buildings with low energy requirements.
- Protected/listed buildings, where compliance with energy efficiency requirements would unacceptably alter their character or appearance.
- Rented dwellings that continue to be occupied by the same tenant since before 1 October 2008.
- Buildings that are suitable for demolition.



Energy Performance of Buildings Directive (EPBD) 2002

Energy Performance Certificate (EPC)

Rating from A to G

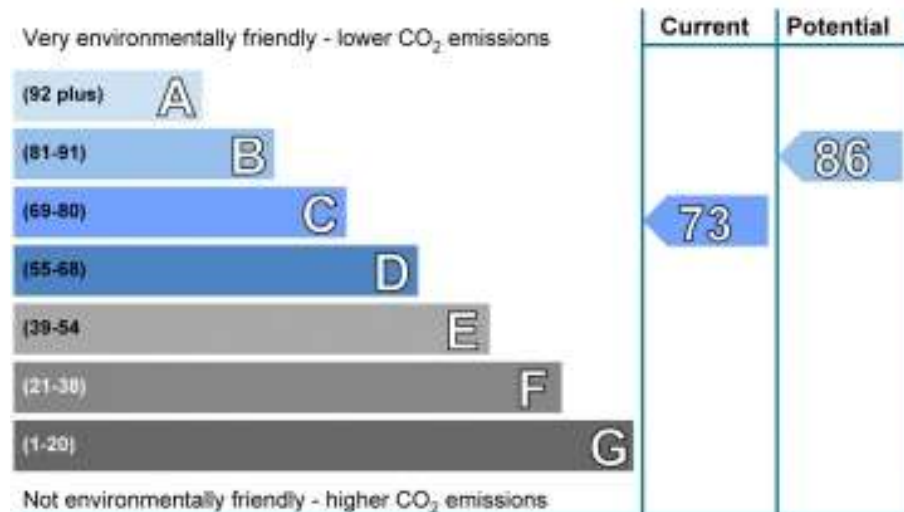
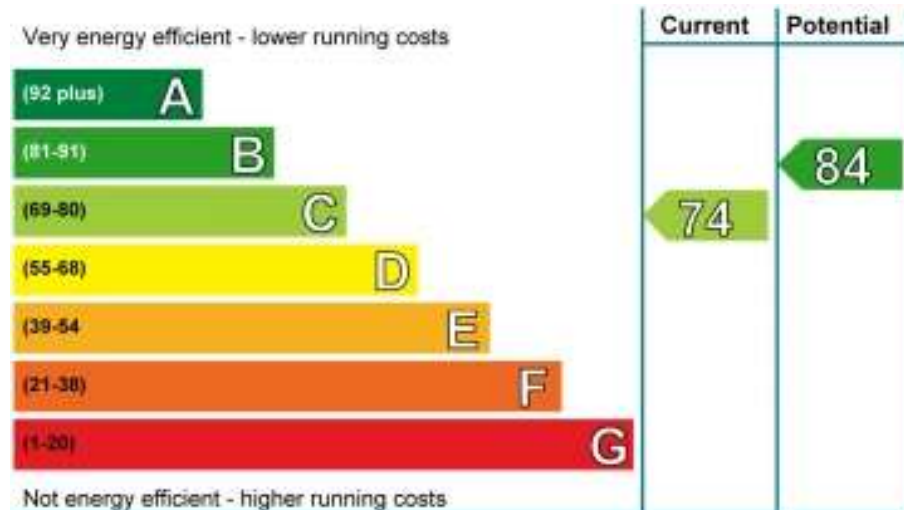
A: Very efficient

G: Very inefficient

Provided by accredited energy assessors,
and provide:

- Recommendation report
- Identification of Green Deal financing

Valid for 10 years





Energy Performance of Buildings Directive (EPBD) 2002

Energy Performance Certificate (EPC)

No requirement to follow the recommendations, but the Energy Act 2011 stipulates that:

- Requires landlords to improve the energy efficiency of domestic properties to at least band 'E' EPC rating by 2018 otherwise they will not be able to lease the property to new or renewing tenants.
- These ruled will be extended to cover all domestic leases by the year 2020 and all non-domestic leases by 2023.
- Residential tenants will have the right to request consent for necessary improvement works to properties they are already occupying from April 2016
- Some property types will be exempt (e.g. listed buildings)

The Regulations will be enforced by local authorities. Non-compliant properties might incur penalties of:

- Up to 4,000GBP for domestic properties
- Up to 150,000GBP for non-domestic properties



Energy Efficiency Directive 2012

Specific measures:

- energy distributors or retail energy sales companies have to achieve 1.5% energy savings per year
- EU countries can opt to achieve the same level of savings through other means, such as improving the efficiency of heating systems, installing double glazed windows or insulating roofs
- the public sector should purchase energy efficient buildings, products and services
- every year, governments in EU countries must carry out energy efficient renovations on at least 3% (by floor area) of the buildings they own and occupy
- energy consumers should be empowered to better manage consumption. This includes easy and free access to data on consumption through individual metering
- national incentives for SMEs to undergo energy audits
- large companies will make audits of their energy consumption to help them identify ways to reduce it
- monitoring efficiency levels in new energy generation capacities.



UK Building Regulations. Approved Document L

Regulation 26 states “where a building is erected, it shall not exceed the target CO2 emission rate for the building...”

Schedule 1 – Part L Conservation of Fuel and Power. Provision for conservation of fuel and power shall be made by:

- Limiting heat gain and losses
- Providing efficient building services
- Having effective controls and properly commissioned
- Information provided so that the building can be operated efficiently

Four parts to Approved Document L:

- L1A. New dwellings
- L1B. Existing dwellings
- L2A. New buildings other than dwellings
- L2B. Existing buildings other than dwellings



UK Building Regulations. Approved Document L

Key criterion described in Approved Document L:

- The designed carbon emission rate
 - Dwelling Emission Rate (DER) for self-contained dwellings and individual flats (excluding common areas)
 - Building Emission Rate (BER) for buildings other than dwellings
 - must not exceed the Target Emission Rate (TER)
 - Both are expressed in kgCO₂/m² per year
- Fixed building services should achieve a reasonable standard of energy efficiency.
- Limiting fabric parameters
- Solar gains should be limited.



UK Building Regulations. Approved Document L

Key criterion described in Approved Document L:

- As-built performance consistent with the DER. This includes air-permeability testing and appropriate commissioning of building services systems.
- Provision for energy efficient operation by providing the building owner with information enabling them to operate the building in a way that uses no more fuel and power than is reasonable (preparation of a building log book).



UK Building Regulations. Approved Document L

EXERCISE

Answer the questions given according to the BRUKL document sample.