# Appendix 3: Built Environment & Residential

## A 3.1 Legislation / Regulation

### Building Regulation – Part L

The tightening of energy conservation has already begun with the Department of Environment and Local Government deciding not to phase in the requirements of the 2002 building regulation pat L until 2005 but to insist on greater energy conservation immediately.
The increased conservation in new buildings will make a considerable contribution to $CO_2$ reduction in the future. By 2005 there will be 8,000 more houses built under the new regulations. These houses will be approximately 30% more energy efficient than those before. Typical energy savings per house (based upon a 3-bedroom semidetached) will be 6,500 kWh / pa, and reduced emissions of 1.89 tonnes of $CO_2$.

Building Regulations 2002, Technical Guidance Document L, Conservation of fuel and energy in dwellings, 2002, Government Publications

### Evolution of Building Regulations Part L

Energy efficiency has been important in buildings for some time now, culminating in a separate section on 'Fuel Conservation and Energy' part L. The history of this section is given below.

**Before 1976, the energy crisis focuses attention on standards.**
The first regulations were introduced in 1976 and became known as “The Blue Book". However the regulations were not obligatory, and a private developer could build houses to the local "custom and practice". For this reason many houses were still being built without any insulation during the 70's and 80's.

**1976 - 1990 Building regulations become common place.**
Total revisions to the building regulations are made every 5 - 6 years. The regulations are still "recommendations" at the centre of a voluntary code of practice, but their adoption is becoming common place. Virtually all buildings have insulation as standard.

**1990 Building Controls Act - 1990**
The Building Controls Act of 1990 gives legislative effect to all future building regulations. In future it will be an offence not to comply with the building regulations.

**1991 First Building regulations to be a "Statutory Instrument"**
The 1991 building regulations are the first to have legislative effect. Heat loss may be determined by "U" value for each building element or overall "U" value.

**1997 Revised Building Regulations**
"U" values are reduced in order to further reduce heat loss from buildings. Energy rating of buildings is introduced on a voluntary basis to comply with EU SAVE directive 93/76/EEC.

**2002 Revision of part L (conservation of fuel and energy)**
The building regulations are not revised in full. Part L is revised to reflect the need to comply with internationally legal agreements, under the Kyoto commitments

## A 3.2 Energy Performance Buildings Directive (EPBD)

The EU Directive on the Energy Performance of Buildings (EPBD) contains a range of provisions aimed at improving energy performance in residential and non-residential buildings, both new build and existing.

The EPBD obliges specific forms of information and advice on energy to be provided to building purchasers, tenants and users. The intention is that this information and advice will help consumers to make informed decisions leading to practical actions to improve energy performance.

Key provisions of the Directive are:

- Minimum requirements for the energy performance of all new buildings
- Minimum requirements for the energy performance of large existing buildings subject to major renovation
- energy certification of all buildings (with frequently-visited buildings providing public services being required to prominently display the energy certificate)
- Regular mandatory inspection of boilers and air conditioning systems in buildings.

As part of the Directive, a Building Energy Rating (BER) certificate, which is effectively an energy label, will be required at the point of sale or rental of a building, or on completion of a new building. The BER will be accompanied by an "Advisory Report" setting out recommendations for cost-effective improvements to the energy performance of the building. However there will be no legal obligation on vendors or prospective purchasers to carry out the recommended improvements.

**How does the Energy rating work?**
The Building Energy Rating certificate contains the Building Energy Rating, which rates the building's energy efficiency on a scale from A (very energy efficient) to G (not energy efficient). An independent qualified assessor must provide the BER.
Then, if a building is constructed, sold or let, the builder, owner or landlord must supply the building's BER to a prospective purchaser or tenant.
Each building will have to be audited individually in order to categorise it. The BER will be valid for a maximum of ten years and must be accompanied by an Advisory Report.
A public service building over 1,000 square metres in size must display the BER in a prominent place that is visible to the public. For new buildings, the BER will be based on energy-use calculations using data from drawings and specifications pertaining to the premises. This will allow the continued sale or letting of property off the plans. In relation to existing buildings, the BER will be assessed on an energy-use calculation using data obtained from a physical survey.
Any application for planning permission involving a new building will need to be assessed against the new requirements.

In Ireland, the directive is expected to impact on over 150,000 sale or rental transactions per year in the residential market. The Directive has been transposed into national law in January 2006.

Key dates for EPBD implementation are:

- July 2006: Alternative energy systems assessment for large new buildings
- January 2007: Building Energy Rating (BER) and advisory report for new dwellings
- January 2008: BER and advisory report for new commercial dwellings
- January 2008: Inspection of air-conditioning systems
- January 2008: Energy efficiency scheme for boiler/heating systems
- January 2008: Public display of BER in large public service buildings
- January 2009: Public display of BER in existing large public service buildings
- January 2009: BER and advisory existing dwellings rented or sold

Link: www.epbd.ie

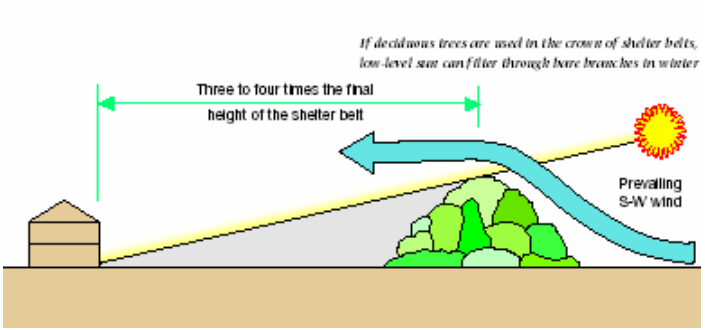
## A 3.3 Passive Solar Design

Sunlight through windows is a useful source of energy for houses and can reduce the need for conventional heating. Simple design techniques to utilise sunlight can be applied at both the estate layout and individual house planning design stages of a housing scheme. Both local climate and microclimate affect energy use, for example:

- lower temperatures in the north of Ireland increase heat loss
- winds on exposed sites reduce temperatures and increase ventilation heat loss
- shaded sites can reduce 'solar gain' and increase the use of space heating.

Passive solar design can save energy and increase thermal comfort as follows.

- Attention to site layout and window design can reduce space heating demand by up to 10%, compared with an average new dwelling.
- A well-designed passive solar dwelling not only saves energy but also contributes to a pleasant environment by providing warm and naturally lit living-rooms.
- Passive solar design does not add to house or estate build costs. Some sites, however, will not be suitable for passive design due to access limitations and/or overshading.




**Low Energy Design**

The low-energy design principles provide a cheap and effective way of reducing energy use before construction even starts:

- Site considerations: Minimise over-shading from trees and other buildings wherever possible.
- Compact design: Sprawling layouts are less energy efficient than compact designs. Architectural features can still be added to compact designs to create visual interest while not significantly increasing energy use. This is particularly evident in large detached homes.
- Dwelling orientation: The main living areas such as the living room and bedrooms should be on the south side to make best use of heat and light from the sun. This will lower energy bills and provide bright, attractive rooms. Other areas such as kitchens, bathrooms or utility rooms should be located on the northern side of the dwelling.1
- Window areas: 60-75% of the total window area should face south, with adequate glazing for day lighting purposes elsewhere. Again, this helps to create a feeling of brightness in the main living areas.

- Window type: The use of high thermal performance windows to Best Practice standard will enable occupants to feel comfortable even when sitting close to windows. Heat loss will also be minimised.

- Insulation: New dwellings need to comply with the thermal performance standards set out in the relevant building regulations. However, in the case of existing housing, standards of insulation can be improved through simple, cheap, quick and effective measures such as topping up loft insulation; or where appropriate, retrofitting cavity wall insulation. These measures should last for the lifetime of the building. They require no maintenance or adjustment to generate energy savings. Therefore they will help reduce the requirement for top-up energy from non-renewable sources, and reduce the installed capacity and cost of renewable systems. Other measures that might be considered include fitting external wall or floor insulation, although the costs involved are likely to be significantly higher. Insulation should, wherever practical, be distributed around the exposed elements of a dwelling. This helps to minimize overall heat loss and thermal bridging (which can lead to condensation problems).

- Heating: Heating systems must be sized correctly for the actual heat loss from the dwelling (with allowance for warm-up). Oversizing is likely to waste energy, whilst undersizing will not achieve the desired temperature. Heating controls must be able to respond to incidental and solar gains and provide adequate heating to all parts of the dwelling (21°C in living room, 18°C in the rest of the house).

- Ventilation: Air infiltration through the building fabric should be minimised. Ventilation should be adequate, and through purpose-designed controllable openings such as trickle ventilators and extractor fans. For guidance on recommendations for improving energy efficiency in new and existing housing, refer to the Summary of Specifications for England, Wales and Scotland published by Energy Efficiency Best Practice in Housing.

## A 3.4 Insulation

**Wall:**
External or cavity insulation allows the internal wall to act as a thermal store, absorbing heat during the day and releasing it at night-time, reducing fluctuations in room temperature throughout the day. Internal insulation isolates the thermal mass from the room. This reduces both the response time of the heating system and the energy required reaching comfort levels in the room. Occupancy patterns, the response time of the central heating and its controls, and the optimal thermal mass of the building will determine the appropriate action. When considering wall insulation, first it should find out whether the house will have cavity walls or solid walls. If it has cavity walls, then cavity insulation is likely to be the most cost-effective insulation method. If cavity insulation is not an option, then the more expensive options of either internal or external insulation may be considered. It is not possible to fill the cavity in a wall constructed simply of 9-inch hollow blocks.

- Cavity wall insulation
- Internal insulation
- External insulation

**Roof:**
If it doesn't have insulation in the roof, up to 30% of the heat could escape, costing the money and contributing to atmospheric pollution and global warming. If it has already insulated the roof, it may want to replace it or add another layer to improve its performance and bring it up to current Building Regulations Standards.

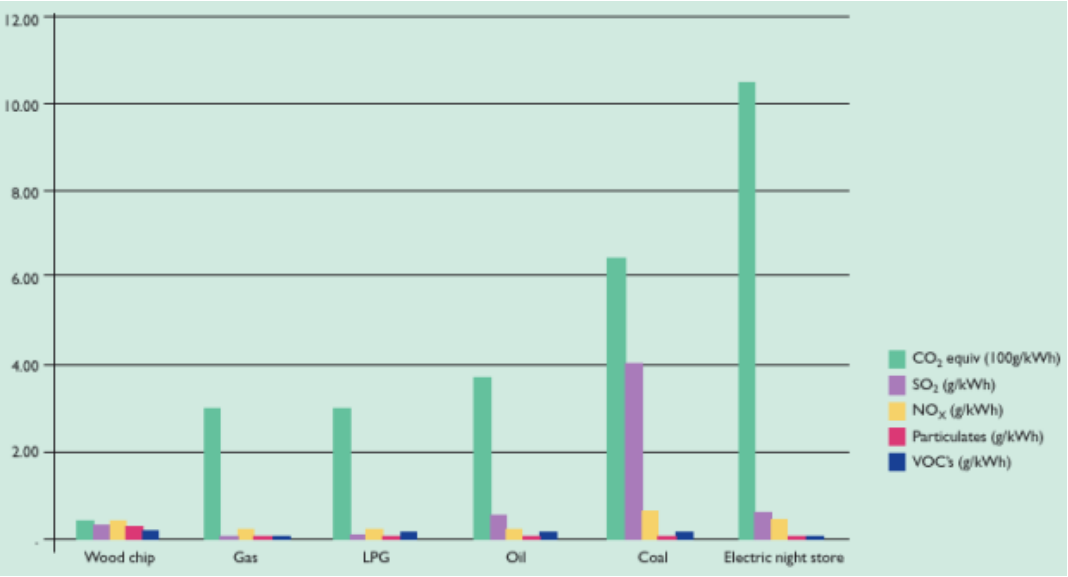
Insulating the 50 sq.m. (540 sq.ft.) attic space of a typical house costs around 500€ and could save approximately 90€ a year (up to 20% of the fuel bill) so it would pay for itself in less than three years. Insulating a flat roof of the same size could cost about 750€ and will pay for it in around five

years. As well as saving the money, it will be helping to reduce the emission of carbon dioxide and other environmentally polluting substances.

## A 3.5 Heating Systems

For low running costs and reduced environmental impact, it is essential to reduce fossil fuel consumption and choose an efficient heating system that is correctly sized, installed and commissioned.

Fuel types
- Solid fuel: Turf, Wood, Coal
- Oil: Kerosene, Gas oil
- Gas: Natural gas, LPG
- Electricity: Day rate electricity, Off-peak supply
- Sustainable fuels: Solar energy, Wood* (*Wood fuel from managed forests) and Wind energy




- **Avoiding unnecessary heating**

Heating stairwells and corridors in flats is unnecessary, adding to both construction and running costs. In private houses, conservatories and glazed passages linking areas can be very expensive to heat. Heating should not be installed in these zones and external-quality doors should separate them from habitable areas.

**Heating Control**

It is necessary to emphasise the importance of controlling the outputs from all heat producing appliances so that they equate with the needs of the occupants. Heat energy must be used in the correct quantities and at the times required. Generating too little heat energy results in lack of comfort while employing too much energy will cause waste and fuel bills that are too high.

Effective control of the space heating and domestic hot water supply systems in a house will ensure that comfort conditions are achieved at the minimum cost. Heat energy should be used only when and where it is required. Additional automatic control measures that would improve the energy efficiency in the house may be identified and installed where appropriate. Where a new installation is proposed, as many as possible of the applicable energy saving control measures shown in this report should be included.

- Control of the heat generator:

For the efficient and safe operation of a fuel burning heat generator, the following points should be considered:

- Boiler/burner on-off (Ideally the space heating and domestic hot water supply circuits should be separate. A time clock or programmer will allow the householder ensure that the boiler will operate to provide heat only when required.)
- Air-fuel mixture (If too much air is used by the burner then an unnecessary amount of heat will be lost up the flue.)
- Temperature of flow water (within the correct range of 70–80ºC)

- Control of the heat distribution system

In a typical heating system using water as the heating medium, the normal method of controlling the distribution of heat energy to the heat emitters is by means of a pump. In order to optimise the energy efficiency of the heating system it should be fitted with both time and temperature control so that the pump is activated and heat distributed when and where it is required.

- Control of the space heating

Water is the most common distribution medium in a heating system and heat is generally emitted to the rooms in the house via radiators, convectors (fan assisted radiators) or underfloor heating. There will be occasions when heating is not required in particular parts of the building. The householder may isolate the heat emitters in these areas either manually or automatically.

- Control of the domestic hot water supply system