The burning of fossil fuels to produce energy and the subsequent release of carbon dioxide (CO₂) have made a significant contribution to global warming. The UK Government has set a target of reducing CO₂ emissions by 60% by 2050, with half of these savings coming from reduced energy demand. Energy consumption in buildings accounts for nearly half of all energy used in the UK. Reducing energy consumption of buildings will not only reduce CO₂ emissions and depletion of non-renewable fossil fuels, but will also lower operational costs.

The embodied energy of most buildings (the energy required to manufacture the component parts of the building) is far outweighed by the operational energy (the energy required to operate the building) over its lifetime. For an air-conditioned office building, the operational energy is between 5 and 10 times greater than the embodied energy over a 60 year design life. Building designers can make the greatest impact on energy consumption by minimising the operational energy required by buildings.

One of the most effective ways of reducing operational energy consumption is by improved thermal performance of the building envelope. The issue of thermal performance is applicable to all buildings that are heated i.e. commercial buildings, industrial buildings and residential buildings.

Legislation
The EU Energy Performance of Buildings Directive (EPBD) aims to promote improved energy performance of buildings. This EU Directive was implemented in England and Wales by the revised Part L of the UK Building Regulations Conservation of fuel and power which came into effect in April 2006.

In the past, compliance with Part L of the Building Regulations has been defined in the corresponding Approved Documents in terms of the thermal transmittance (U-value) and air leakage of individual building elements. Limiting values for both parameters were given in the Approved Documents. Traditionally, U-values were seen as the primary means of improving thermal performance, resulting in a gradual increase in insulation thickness over several years to meet the ever stricter requirements. Limits on air leakage were also included in the Approved Documents, but were not strictly enforced in practice.

The 2006 revision of Approved Document L differs from the previous approach in that building designers are required to demonstrate an improvement in energy performance compared to the requirements of the 2002 Regulations, but they are given the freedom to choose how to achieve this improvement. The energy performance is quantified in terms of the CO₂ emissions associated with the operational energy requirements of the building.

New Approved Documents for Part L were published in March 2010 and will replace the current editions on 1 October 2010. These new documents continue the trend of reducing the operational energy used in buildings. Many of the changes in the new documents are aimed at improving compliance and more clearly distinguishing between requirements and guidance.

The energy requirements are a function of many aspects of the building design, such as the detailed design of the cladding, the availability of natural light and the type and efficiency of building services installed.

Since 2006 Part L has considered the performance of the whole building, rather than the thermal properties of the individual elements of the building envelope. It is, therefore, no longer sufficient to specify cladding components or even whole systems based solely on manufacturers’ published data. Instead, compliance with the Regulations must be demonstrated using a whole building calculation model, such as the Simplified Building Energy Model (SBEM) for non-dwelling buildings or Standard Assessment Procedure (SAP) for dwellings.

Minimum performance criteria in terms of U-values and air leakage are still included in the Regulations, but compliance with these limits is no longer sufficient in itself.

Future regulatory changes will inevitably continue the trend towards improved thermal efficiency.

Theory
The thermal efficiency of a building envelope is a function of three characteristics:

1. U-Values - the thermal performance of the planar elements (e.g. wall, roofs, windows).
Further Sources of Information

1. SCI-P352 Sheet 1 – Energy Efficiency
2. SCI-P380 Avoidance of Thermal Bridging in Steel Construction
3. SCI-P346: Best practice for the specification and installation of metal cladding and secondary steelwork
4. SCI-P386 Code for Sustainable Homes: How to satisfy the code using steel technologies
5. P367: Energy Efficient Housing using Light Steel Framing
6. Approved Documents L1 and L2
7. SIGNS Jun 2006 - Achieving airtightness with metal cladding systems
8. SCI-EP36 Best Practice in Steel Construction - Residential Buildings
9. Guidance for the design of metal roofing and cladding to comply with Approved Document L2 published jointly by MCRMA and EPIC.