

Review of Regulations and Changes (WP7)

COMPETITION PRIORITY

Internet-enabled monitoring and control of the built environment

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Review of Regulations and Changes (Work Package 7)

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Sean Doran
BRE

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Project Monitoring Officer

Introduction

The diffusion of high-speed internet technology such as 'broadband' across the built environment is creating much greater potential for the development of smart, internet-enabled buildings. The success of such buildings can, however, be influenced by legislation. This paper discusses some relevant legislation, examining how it could impact upon smart buildings. The following are discussed in turn:

1. The EU Energy Performance of Buildings Directive
2. Regulations for the conservation of fuel and power in buildings
3. The Data Protection Act
4. The Disability Discrimination Act

1. The EU Energy Performance of Buildings Directive

On 4 January 2003, Directive 2002/91/EC of the European Parliament and of the Council came into force. The aim of that Directive is to promote improvement in the energy performance of buildings. Member states of the EU are required to bring into force provisions and regulations to achieve compliance with the Directive^[Ref 1]. Among other things the EPBD requires that energy performance certificates be made available whenever buildings are sold, constructed or rented out and, in the case of large public buildings, energy performance certificates will have to be displayed. Two types of ratings are described in the directive, namely *asset ratings* and *operational ratings*.

The Directive asks member states to integrate environmental protection requirements into their policies and actions (item 1 of the Directive). It recognises demand-side management of energy as an important tool for influencing energy markets and for enhancing security of energy supply (item 4 of the Directive) and seeks to have measures implemented in the building sector, where there is considered to be 'great unrealised potential' for energy savings (item 7 of the Directive). It also encourages the energy performance certification of buildings to describe actual energy-performance of a building (item 16 of the Directive).

The Directive requests that public authority buildings and buildings frequently visited by the public to set an example through energy certification on a regular basis, including actual measured temperature to discourage the misuse of heating, air-conditioning and ventilation systems but at the same time safeguarding a comfortable indoor climate (item 16 of the Directive).

The Directive also invites member states to employ other means or measures to encourage enhanced energy performance and good energy management, taking into account the intensity of use of buildings (item 17 of the Directive). Moreover, the Directive also seeks, for larger buildings, regular maintenance of heating (Article 8 of the Directive) and air-conditioning systems (Article 9 of the Directive), maintaining their correct adjustment in a way that will lead to optimal performance from the point of view of the environment, energy and safety (item 19 of the Directive).

The Directive also requires (Article 7) the production of energy performance certificates which allow the energy performance of buildings to be compared against one another and recommendations for further energy improvement.

Clearly, the internet-enabled monitoring of buildings can contribute in a number of ways to EU member states complying with the aims of the Directive through its potential to monitor several aspects of a building's performance, including energy use, indoor temperatures (an indication of adequacy of heating and air conditioning), air quality (an indication of adequacy of ventilation) and by the remote monitoring of indicators of efficiency (e.g. boiler flow and return temperature or temperature of air that is fed through ducting).

The internet-enabled technology will provide not a theoretical measure of the energy performance of a building but its working performance, taking account of the actual performance of building services, the actual realised performance of insulation and air-tightness and the actual behaviour of occupiers and users. For the purposes of satisfying regulations its main benefit is for large buildings or buildings that are energy-intensive but, in addition to this, it can also help estates managers to have a quantified measure of the performance of their stock, facilitating identification of the potential areas where energy wastage can be reduced. It may also offer a convenient and economical way of obtaining operational ratings across a building stock.

2. Regulations for the conservation of fuel and power in buildings

Asset ratings

Statutory Instrument no. 991 (2007) for England & Wales sets out rules in regard to energy performance certificates on the sale or rent of buildings. It states that such certificates (known as EPCs, must be made available to a prospective buyer or tenant.

An *asset rating* means a numerical indicator of the amount of energy estimated to meet the different needs associated with a standardised use of a building, calculated according to the methodology approved by the Secretary of State pursuant to regulation 17A of the Building Regulations 2000(7). It relates to the design of the building itself but is *not* a measure of its actual energy consumption in practice. An internet-enabled system, therefore, would not be useful in assessing an asset rating.

The EPBD does not stipulate the actual improvement to energy efficiency which buildings should achieve, as this is left to the decision of member states. It stipulates that a *methodology* for assessing energy efficiency be established. The UK's response to the EPBD has been to establish energy calculation tools; one tool for dwellings (called SAP) and one tool for buildings other than dwellings (called SBEM). These calculation procedures provide asset ratings rather than operational ratings and do not depend on energy monitoring.

Operational ratings

For large public buildings (with a floor area exceeding 1000 m²) there are further requirements over and above the basic requirement for an Energy Performance Certificate. It is necessary for buildings which provide public services to a large number of people to display an energy certificate that has both an *asset rating* and an *operational rating*. Such a certificate is known as a Display Energy Certificate. The energy performance on such a certificate is to be displayed graphically in terms of energy-performance bands from **A** to **G**, with **A** being the highest performance. This is similar to the format used on 'white goods' such as new fridge-freezers, washing machines. The operational rating is a measure of how efficiently a building is actually operated and managed, and is based on actual metered energy use over a 12 month period. The buildings covered by the need to provide these more detailed energy certificates tends to include buildings funded by public money, such as PFI projects, hospitals and educational buildings.

There is also a duty to provide advisory reports (clause 16 of Statutory Instrument 991 (2007), E & W) for buildings with a total useful floor area of over 1000 m² occupied by public authorities and by institutions providing public services to a large number of persons and therefore frequently visited by those persons so that ways of saving energy will be identified.

It would appear, therefore, that internet-enabled monitoring of buildings can, in some cases, assist in the determination of operational ratings, helping to comply with legal requirements. The internet-enabled technology can also assist in sub-metering (monitoring energy consumptions against different energy use categories), leading to more detailed information about energy consumption.

In addition to fulfilling the requirement of obtaining operational ratings it is likely that the internet-enabled technology could pave the way for the development of future national regulations aimed at assessing energy use of buildings in practice. This would therefore present an opportunity to help further the national need to reduce carbon emissions. The exploitation of this potential will, however, depend on decisions made by the Government bodies responsible for regulation.

Other points relating to building regulations

Over the years the general direction of building regulations on conservation of fuel and power has been to demand ever higher levels of energy efficiency in new buildings. The trend has also been in the direction of permitting greater degrees of flexibility in how energy efficiency is to be achieved. In recent years, for example, regulations have led to the option of using renewable energy devices as a means of being permitted slightly less stringent levels of insulation or heating efficiency and over the next decade it is anticipated that more new buildings are likely to incorporate renewable energy devices as a means of satisfying the regulatory requirements. Making full use of renewable energy devices has, however, been recognised as being dependent upon the effective matching of supply

and demand energy and this may be facilitated through various mechanisms, including intelligent-building technology (which can implement load-shifting) as well as more conventional energy-storage technologies.

3. The Data Protection Act

In establishing internet-enabled technology or carrying out research in the field of internet-enabled technology it is necessary to be aware of the requirements of the Data Protection Act, which applies when data is being collected from buildings.

The key principles of the Data Protection Act are as follows:-

- Data may only be used for the specific purposes for which it was collected.
- Data must not be disclosed to other parties without the consent of the individual whom it is about, unless there is legislation or other overriding legitimate reason to share the information (for example, the prevention or detection of crime). It is an offence for Other Parties to obtain this personal data without authorisation.
- Individuals have a right of access to the information held about them, subject to certain exceptions (for example, information held for the prevention or detection of crime).
- Personal information is not to be kept for longer than is necessary.
- Personal information is not to be transmitted outside the EEA unless the individual whom it is about has consented or adequate protection is in place, for example by the use of a prescribed form of contract to govern the transmission of the data.
- Subject to some exceptions for organisations that only do very simple processing, and for domestic use, all entities that process personal information must register with the Information Commissioner.
- Entities holding personal information are required to have adequate security measures in place. Those include technical measures (such as firewalls) and organisational measures (such as staff training).

The Act would appear to have the greatest ramifications for housing, where services providers will have a duty to ensure a reasonable level of security in accessing data. In particular it is important that information about the occupiers is treated with sufficient care and to prevent such data from being accessed illegally. While the Act can at times be difficult to interpret it would seem prudent that all systems, at least for domestic buildings, should have secure web access to prevent easy access by intruders.

4. The Disability Discrimination Act

The Disability Discrimination Act 1995 makes it unlawful to discriminate against persons in respect of their disabilities when providing goods and services, employment, education and transport.

The 1995 Act states, in Article 15, that if any physical feature of a building or premises puts a disabled person at a "substantial disadvantage" in comparison with persons who are not disabled the organisation should take "steps as is reasonable". The 1995 Act places duties on service providers and requires "reasonable adjustments" to be made when providing access to goods, facilities, services and premises. In its current implementation, however, there is no requirement or expectation for buildings to incorporate services which are commonly associated with smart buildings.

While the bulk of the measures needed to satisfy the Act relate to the physical design of the building, particularly for wheelchair users, there may be potential for the internet-enabled technology to assist disabled persons, but such opportunities to assist disabled persons may not relate directly to the requirements of the Act. The Act has, however, been subject to a number of changes since 1995 with the aim of improving conditions for disabled persons and, given this precedent, it seems likely that further changes to the Act may arise in the next few years.

The Disability Discrimination Act 2005 extended the 1995 Act to place a duty on public authorities to promote equality for disabled people. Section 49A of the 2005 Act requires that every public authority shall in carrying out its functions have due regard to the following:

- (a) the need to eliminate discrimination that is unlawful under the Act;
- (b) the need to eliminate harassment of disabled persons that is related to their disabilities;
- (c) the need to promote equality of opportunity between disabled persons and other persons;
- (d) the need to take steps to take account of disabled persons' disabilities, even where that involves treating disabled persons more favourably than other persons;
- (e) the need to promote positive attitudes towards disabled persons; and
- (f) the need to encourage participation by disabled persons in public life.

Whilst there is, of course, no specific reference to smart building technology, the emergence of smart building technology in some public buildings could lead to its provision being regarded as a norm, providing an impetus for aspects of smart building technology to be extended to all public buildings, such as in relation to items (d) and (f) above.

In general terms the Disability Discrimination Act is intended to provide access to goods and services for persons rather than making specific requirements about a building and in that regard it is unlike the more prescriptive building regulations, however the aims of the Act are partly supported through building legislation such as:

1. BS DD 266 Design of Accessible Housing - Lifetime home - Code of Practice (DD266:2007)
(From 2013 all new homes will need to be built to the Lifetime Homes standard)
2. BS 8300 Design of buildings and their approaches to meet the needs of disabled people. Code of practice (BS 8300:2001)
3. Approved Document M of the Building Regulations for England & Wales
(www.planningportal.gov.uk)
(this regulation generally relates to the architectural design of the building rather than the electronic services within it)
4. Section 4 of the Building Standards for Scotland (www.sbsa.gov.uk)
(this regulation generally relates to the architectural design of the building rather than the electronic services within it)

In addition to the impact upon regulations and standards the principles of disability access are leading to Government support for Local Authorities to provide extra-care housing to allow older people and those with long-term conditions to live in a home of their own. Such housing, however, needs to provide the necessary level of care and in practice this will often involve the use of electronic technology to provide telecare and telehealth. In practice, however, telecare and telehealth services

are not uniform nationwide and such services could have a greater impact if there were more standardisation to increase the cross-compatibility of smart devices and more standardisation of the way in which such *smart home* devices communicate with each other.

Additional note regarding DD 266:

DD 266 gives recommendations for the design of housing, whether in the form of flats or individual houses. It covers car parking, access routes to dwellings and entrances and circulation routes, including lifts. It also gives recommendations on electrical, sanitary, heating and ventilation services, windows, doors and the provision of key rooms and spaces, particularly WC, bathroom, kitchen and storage facilities. DD 266 explains how, by following the principles of *inclusive design*, housing (whether newly built or to be converted or refurbished) can be made sufficiently flexible and convenient to meet the existing and changing needs of most households, and thereby give disabled persons and older persons greater choice over where they live.

Additional note regarding BS 8300:

This British Standard gives guidance for the design of new buildings to address the needs of disabled people. The guidance also applies to assessing the accessibility and usability of existing buildings. Listed and historic buildings are determined on a case-by-case basis.

This British Standard applies to the following types of building:-

- a) transport buildings, industrial buildings, car-parking buildings and factories
- b) administrative and commercial buildings (e.g. courts, offices, banks, post offices, shops, department stores and shopping centres, and public service buildings, including police stations)
- c) health and welfare buildings (e.g. hospitals, health centres, surgeries and residential homes)
- d) refreshment, entertainment and recreation buildings (e.g. restaurants, concert halls, theatres, cinemas, conference buildings, community buildings, swimming pools and sports buildings)
- e) religious buildings (e.g. churches)
- f) educational, cultural and scientific buildings, (e.g. schools, universities, colleges, zoos, museums, art galleries, libraries and exhibition buildings)
- g) dwellings and other residential buildings (e.g. hostels, hotels, residential clubs, university and college halls of residence, nursing homes and prisons)

This British Standard does not, however, apply to dwellings or residential buildings designed exclusively for use by disabled people.

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References

[Ref 1] SBSA Circular V6 (www.sbsa.gov.uk)