MITSUBISHI ELECTRIC DIRECT
AIR CONDITIONING SYSTEMS

Information Guide

Guide to Part L

Direct Sales Offices

Birmingham
Tel: 0121 7412800
Fax: 0121 7412801

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MITSUBISHI ELECTRIC
AIR CONDITIONING SYSTEMS

Telephone: **01707 282880**
email: air.conditioning@meuk.mee.com web: www.mitsubishielectric.co.uk

UNITED KINGDOM Mitsubishi Electric Europe Air Conditioning Systems Division
Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, England.
General enquiries Telephone: 01707 282880 Fax: 01707 278674

IRELAND Mitsubishi Electric Europe Westgate Business Park, Ballymount, Dublin 24, Ireland.
Telephone: Dublin (01) 419 8800 Fax: Dublin (01) 419 8890 International code: (003531)

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This is an independent guide produced by Mitsubishi Electric to enhance the knowledge of its customers and provide a view of the key issues facing our industry today. The guide accompanies a series of seminars, all of which are CPD accredited. The changing face of construction in the 21st Century demands that designers, specifiers and suppliers work as teams to create better buildings - for occupants and the environment. Mitsubishi Electric aims to be a part of this by encouraging employees and customers to work together to increase their knowledge of the latest technology, legislation and markets.

Contents

Introduction to the Mitsubishi Electric Guide to Part L

Part L of the Building Regulations is undergoing a major change. The Government has set higher standards than ever before for energy efficiency in both domestic and commercial buildings. As a result, the process of designing a building, and ensuring that it complies with Part L will become far more complex. In examining the proposed new Part L as it applies to commercial buildings, it is important to remember that much of what is proposed is still being deliberated – even though it is due for launch in January 2006.

Currently, there is little to indicate exactly how Part L will look when it becomes law. Usually after publishing an Approved Document, there is some hint from a minister on any proposed changes to be made before it becomes legislation. No such comments have been given so far. It is important therefore to stay up to date with developments, and use the Further Information section to find the latest news.

Construction in England and Wales is controlled by the Building Regulations. This set of laws deals with all aspects of building and refurbishment, from wiring and electrics to water and sewage. A letter denotes each section of the Regulations, for example Part P relates to wiring, Part F to ventilation.

With advances and changes in technology and techniques, the Building Regulations must be updated fairly frequently. This is done section-by-section, as developments and Government policy dictate. The next section due for renewal is Part L, which deals with conservation of fuel and power in the built environment. It was last updated in 2002. At the moment, the new Part L is in the form of an Approved Document (AD), but is scheduled to become law in January 2006.

Previous Mitsubishi Electric Guides have dealt with the UK Government's drive to cut carbon dioxide (CO^2) emissions, with a focus on making buildings more energy efficient as a key part of this policy. Part L is the Government's method of making these environmental ambitions a reality. The new Part L is also significant in that it will incorporate the requirements of the European Directive on the Energy Performance of Buildings (EPBD). For more on this see the Mitsubishi Electric Guide to the EPBD.

Part L concerns both commercial and domestic buildings, whether they are new-build or existing. Part L1 deals with domestic buildings. In this Guide we shall concentrate on commercial, non-domestic buildings that are covered under Part L2.

At the heart of Part L2 is the requirement that new non-domestic buildings will have to be around 25% more energy efficient than current standards. The legislation will force the construction industry to meet the new levels through:

- An improvement in energy efficiency, which varies between 15% and 20% depending on the type of building
- A benchmark provision of renewable energy systems. This benchmark is designed to save a further 10% of carbon dioxide emissions from buildings.

Renewable energy can be defined as energy flows, which occur naturally and repeatedly in the environment. These include solar, wind and energy from falling water. Other sources, which are considered 'renewable', are geothermal transfers and biomass (from plant or animal waste). Over the past few years, heat pumps have also been classed as 'renewable' energy and, although this isn't strictly the case, they are regarded as a highly efficient means of heat transfer.

It's important to note that the new Part L2 doesn't enforce the use of renewables, so it's not an obligation on designers. The Government recognises that simply using renewables cannot make CO^2 savings – buildings must also be energy efficient. Use of highly efficient building services equipment, such as air conditioning with excellent Coefficients of Performance (COP's), will also therefore play a key part in more environmentally sound buildings.

A major change under the new Part L2 is how building energy performance is calculated. Previously, under Part L 2002, this was done by the elemental method. Under the new Part L, there will be a National Calculation Methodology (NCM). The NCM procedure for demonstrating compliance of non-domestic buildings is to calculate the energy use for a proposed building, and compare it with the energy use of a comparable 'notional' building. Free software has been designed by the Building Research Establishment to make this process easier *(see page 4 for more details)*

The thinking behind this change is that the NCM gives designers and developers flexibility. They can aim to reduce energy use with better insulation, or use of renewable energy systems, or perhaps with more efficient building services plant. However, there are lowest minimum standards for the energy performance of building fabric, heating, cooling and lighting.

Designers looking for in-depth technical detail on how to comply with Part L2 won't find it in the legislation. Instead, the Government is looking to professional bodies to provide the detail, for example, Technical Manuals from the Chartered Institute of Building Services Engineers (CIBSE).

There is a great deal still to be decided about how Part L2 will work in practice, particularly in the area of building energy performance. With only a short time to clarify such matters, the Government will have to work hard to ensure that everyone in the industry knows exactly how this will work.

Ticking the Boxes: Complying with Part L

Since Part L is still in the Approved Document phase, some details have yet to be clarified, and this applies particularly to methods of compliance with the new regulations. Currently, the theory is that new commercial buildings will have to demonstrate compliance with Part L2 by going through a seven-step process, based on minimising energy use in the building as a whole.

As already stated, the elemental method will be replaced by National Calculation Methodology (NCM). The procedure for demonstrating compliance with the Building Regulations for buildings other than dwellings is to calculate annual energy use for a proposed building and compare it with the energy use of a comparable 'notional' building. Both calculations make use of standard sets of data for different activity areas, and call on common databases of construction and service elements. The same process will be used to produce an Asset Rating, in accordance with the EPBD (see the Mitsubishi Electric Guide to EPBD for details).

In view of the complexity of the whole building energy calculation, the Government has funded development of NCM software by the Building Research Establishment. The software (launched in May 2005) is called Simplified Building Energy Model (SBEM). It has a basic user interface called iSBEM. This computer program provides an analysis of a building's energy consumption. SBEM calculates monthly energy use and carbon dioxide emissions of a building given a description of the building geometry, construction, use, along with hvac and lighting equipment.

In simple terms, the compliance process begins by calculating the CO^2 emissions at the design stage of the proposed new building, using a 'notional' model of a building that is similar to the one proposed. This should give a general indication of the CO^2 emissions which might be expected from a typical building of that type.

Using figures from stage one, the legislation prescribes an 'improvement factor'. For example, for a heated and mechanically ventilated building, the improvement factor is 20% and the renewables benchmark provision is 10%. Designers can use a combination of these to meet the overall emissions reduction target of 27% for commercial buildings.

The flexibility in this system will be very important to building designers. It is not always appropriate or possible to use renewable energy, so designers can specify more energy efficient building services systems, such as heat recovery ventilation, to reach their targets.

The next step is to demonstrate that it won't overheat. These calculations would be based on CIBSE criteria. The main aim of this is to cut down on subsequent retrofitting of additional air conditioning at a later date. This is unlikely to be as efficient as a system that has been specified and included from the design stage. Once a design has been adopted, the national methodology software would be used to show that the building meets energy performance targets.

After completion, the building must 'reasonably achieve the design intent'. Three reports will have to be signed off by a 'competent person':

- Building pressure test feedback
- Satisfactory ductwork tests
- Completion of inspection and commissioning to a satisfactory standard.

Finally, Part L2 deals with efficient running of the building by requiring a completed building log-book (this includes the Energy Performance Certificate, as described in our previous Mitsubishi Electric Guide to the EPBD). Mitsubishi Electric is the first manufacturer to introduce log books for each sealed system. The building must also include 'appropriate energy meters' with guidance for the building managers on how to use them. Advanced building management systems will become even more important as building managers are required to have information on the performance of equipment in their buildings.

Compliance with the new Part L2 will not simply be a case of ticking the right boxes (although there is a certain amount of this). The new legislation encourages a continuous engagement with buildings as users of energy – they must be constantly monitored, and where possible regularly upgraded, to ensure that they are as efficient as possible.

Does your building tick the boxes?

The following list is an indication of some of the requirements of Part L2 of the building regulations, as they apply to new buildings…

Design and construct to conserve fuel and power to minimise CO^2 emissions that result from use of cooling, heating and hot water systems, lighting, fans, and pumps.

Limit heat gains and losses through the building fabric, as well as from pipes, ducts and vessels used for space heating or cooling and hot water storage.

Avoid excessive solar gains through design and construction techniques, to minimise the need for unnecessary, or inefficient cooling.

Demonstrate that the building won't overheat.

Incorporate renewable and/or decentralised energy systems.

Pressure test the building.

Provide evidence of commissioning to show the process has been completed adequately.

Provide information for the building management to enable them to run the building efficiently. This includes provision of metering and log books.

Systems, equipment and controls should be selected so that the whole building carbon performance standard is achieved or bettered.

Cooling, ventilation and heating systems should have zone, timing and demand controls.

Ventilation ductwork should be constructed and assembled to be reasonably airtight.

Existing Buildings - Refurbish and Improve

The existing building stock will have more impact on the UK's carbon emissions than new build for many decades to come. This applies to both domestic and commercial buildings. The new Part L2 has been written to capture more refurbishment work on existing commercial buildings, and make them subject to the new Regulations.

All buildings over 1000m^2 will be included in the regulations if they undergo any of the following types of refurbishment:

- Extension
- Material alteration
- **Material change of use**
  (eg from a warehouse to a mixed-use development)
- **Provision, extension, alteration or revision of a controlled element, service or fitting**
  (eg installation of an air conditioning system)

Fundamentally, Part L2 will require improvements in the energy efficiency of the whole building, once sufficient refurbishment work has been proposed. So while it may not be the aim of the refurbishment to cut CO^2 emissions from the building, it will be one of the outcomes. The end result will be a steadily improving building stock, producing fewer CO^2 emissions.

As outlined in the Mitsubishi Guide to the EPBD, when an existing building is sold or rented, the current owner must supply expert recommendations on making the building more energy efficient. It is not compulsory for the new owner or tenant to carry these out immediately, but under Part L2 they will have to be added to any refurbishment works over a certain value.

The Government has been realistic in its approach to existing buildings. It's no good insisting on the highest possible standards of energy efficiency, if the cost is going to deter building owners from ever refurbishing their buildings again. The approach of Part L2 is to achieve worthwhile improvements at a reasonable cost. The owner must only implement measures with a payback of less than seven years. Of course, it may be that people wish to go further in order to improve the buildings energy efficiency certification rating, as such measures will save on the long-term running and maintenance costs.

There is an important clause relating to building services, which states that whenever an element of building services is subject to substantial repair, or replacement, an improvement in energy efficiency (and hence CO^2 emissions) must be made. Particular attention is given to efficiencies at part load.

The Government has included in its draft Part L documentation a section on the possible future of such legislation. Since the Building Regulations are regularly updated, Government wants to give the construction industry some hints on where the next key changes may lie. One area that is highlighted is building control systems. While improvement in the energy efficiency of plant and equipment is still possible, developments in controls provision could create new steps forward in the energy efficiency of the whole building.

Also, as the UK climate changes and warmer weather creates a need for year-round cooling, the opportunities offered by free cooling technology become more attractive. Using night cooling to reduce the temperature of a building overnight by flushing out the previous day's hot air reduces the amount of time a mechanical cooling system needs to be turned on. Alongside the need to ensure that a building doesn't overheat, it seems clear that hybrid or mixed-mode systems with good building control software present a sensible way forward.

While airtightness is already addressed in the current Part L2, it seems very likely that increasingly stringent rules will be applied in future. The draft document states that: "improving airtightness should be seen as a major objective over the next few years." This will be a major challenge to the construction industry. While the theoretical knowledge of how to create airtight buildings already exists, the industry has yet to show that it can put this into practice on every project. Also, use of energy efficient ventilation will be important for comfort of occupants.

Overall, the new Part L2 will not only affect the design and construction of buildings, it will force facilities management much further up the corporate agenda than it has ever been. With legislation forcing regular checks on energy efficiency, and refurbishment projects under scrutiny for sustainable credentials, building owners will be obliged to consider carefully whole life cycle costs and energy efficiency.

Further Information

The Approved Document for Part L2 can be found at:
www.odpm.gov.uk under Building Regulations

For more on the new National Calculation Methodology, see: **www.diag.org.uk**

This is currently a beta-test version of iSBEM, so you can download the software and also provide feedback online to the Building Research Establishment. Please note, you must have Microsoft Access (1997 onwards) installed on your pc in order to download iSBEM.

For other features and comments on Part L, and to keep up to date with developments, see:

www.bsjonline.co.uk
www.bre.co.uk
www.building.co.uk

If you missed the CPD seminar on **The Energy Performance of Buildings Directive**, you can call your Mitsubishi Electric Regional sales office to arrange an in-house presentation of this information.

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