

Download summary of regulation Part L1A – Conservation of Fuel and Power in Dwellings.

WHAT IS PART L ABOUT?

Introduced in April 2006 the latest version of Part L seeks to reduce fossil fuel consumption and cut down the emissions of carbon dioxide (a greenhouse gas which contributes to global warming) from a building by reducing the amount of energy needed to heat, cool, ventilate and light it and supply hot water. This is measured in terms of the rate of carbon dioxide emission. Part L describes how a target carbon dioxide emission rate should be calculated and how it can be met.

The following ways of reducing the energy demand are interdependent in Part L and so are considered together when working out the rate that carbon dioxide will be emitted.

- Reducing the demand for heating by cutting heat loss through the fabric by means of insulation, and use of suitable windows and doors and minimising air leakage; and reducing the demand for cooling by insulating pipes and cylinders, and giving the building suitable orientation and shading;
- Providing energy efficient means to supply and control heat, hot water, ventilation, cooling and lighting;
- Ensuring that these are properly commissioned and that instructions are given so that they can be operated efficiently.

The current target is to reduce carbon dioxide emissions from a dwelling to 20% lower than the level set by the 2002 Approved Documents to Part L

[All pages]

PART L REQUIREMENT

- L1. Reasonable provision shall be made for the conservation of fuel and power by:
- a. limiting heat gains and losses
 - i. through thermal elements and other parts of the building fabric;
and
 - ii from pipes, ducts and vessels used for space heating, space cooling and hot water services;
 - b. providing and commissioning energy efficient fixed building services with effective controls; and
 - c. providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

[subscription pages]

APPROVED DOCUMENTS

[Approved Document Part L1A \[click to view/download\]](#) gives guidance on reasonable provision to meet these regulations in new [dwellings](#). (Refer to [AD L1B](#) – work in existing dwellings, [AD L2A](#) – new buildings that are not dwellings, [AD L2B](#) – work in existing buildings that are not dwellings)

WHAT IS NEW

- The elemental method is no longer an acceptable alternative (except for existing buildings) and a whole building approach is required. The energy performance of a newly constructed dwelling is to be measured by reference to the amount of carbon dioxide emitted per square metre per year calculated using [SAP](#).
- Emissions are now expressed in units of carbon dioxide instead of units of carbon
- The [target carbon dioxide emission rate \(TER\)](#) (the target energy performance) should be 20% better than a dwelling meeting the standards of the previous AD Part L1 (2002).
- The actual [dwelling carbon dioxide emission rate \(DER\)](#) should be no greater than the [TER](#)
- The [air permeability](#) is used in energy calculations and is to be confirmed by tests upon completion
- An [Energy Performance Rating](#) is submitted as part of Building Control submission
- The use of [compliance checklists](#) – [self certification schemes](#) – etc
- A declaration by a [suitably qualified person](#) that the services have been correctly commissioned on completion
- Owners are to be handed an [operating manual](#) on completion
- The introduction of second tier documents such as the [Domestic Heating Compliance Guide](#), [Low or Zero Carbon Energy Sources: Strategic Guide](#), [Accredited Details](#) (see [REFERENCES](#))

HOW TO DEMONSTRATE COMPLIANCE

The simplest way of demonstrating compliance is to set out from the beginning of the project to complete the [Appendix A: Checklist \[click to view/download\]](#). A worked example is included in AD L1A. Although optional, it is recommended that the designer and constructor ensure that they understand the target requirement and its implications on detailing and workmanship before construction commences so that the necessary quality checks can be made and signed off by the appropriate person ([authorised SAP assessor](#), [authorised competent person](#), builder etc) during the construction process.

- Meet carbon dioxide emission target (calculations based on using [SAP 2005](#)).
 - [Dwelling Emissions Rate \(DER\) ≤ Target Emissions Rate \(TER\)](#)
 - The DER is declared on the [Energy Rating](#) which is to be fixed in a conspicuous place ([Energy Performance Certificate](#) from June 2007)
- Meet the worst acceptable standards (however these will need to be exceeded to meet the requirement for 20% improvement above 2002 standards) for:

- Envelope insulation (walls, floor, roof, windows, roof windows, rooflights and doors) – note that care is needed to avoid [thermal bridging](#)
- [Air permeability](#) – less than $10\text{m}^3/(\text{hr.m}^2)$ @ 50 Pa (although note that where no more than two dwellings are being erected, pressure tests can be avoided if the calculation of DER assumes $15\text{m}^3/(\text{hr.m}^2)$ @ 50 Pa). Testing regimes are not so onerous if [accredited details](#) have been used
- Efficiency of building services - described in the [Domestic Heating Compliance Guide](#) for heating and hot water (boiler not less than 86% [SEDBUK](#) value) and insulation of pipes ducts and vessels. There are requirements for mechanical ventilation ([GP 268](#)) and fans (Table 3 in AD L1A), cooling (energy efficiency classification no worse than Class C) and provision of a proportion of energy efficient interior and exterior lighting.
- Control of summer overheating – note the need to provide adequate daylight as described in [BS8206 part 2 Code of Practice for daylighting](#)
- Quality of construction and [commissioning](#)
 - As built performance consistent with DER - This is supported by:
 - [Air Permeability](#) tests, Does pressure test meet standard required in the [DER SAP](#) calculation?
 - confirmation that key features required by [SAP](#) for the design have been incorporated,
 - confirmation that [accredited details](#) have been used (if not then evidence that details comply with [BRE IP 1/06](#))
 - satisfactory documentary evidence of site checks
 - [Commissioning](#) completion certificate
 - Provisions for energy efficient operation
 - Provision of [O&M information](#) and [SAP](#) rating(part of home information pack)

SOME TECHNICAL ISSUES

Overheating

As the insulating performance of fabric improves to reduce heating requirements, the risk of overheating increases. Cooling systems increase energy consumption so care must be taken to reduce the risk of overheating from [solar gain](#) externally, and from internal sources such as lighting, cooking, hot water systems, hot water pipework and so on. The affects of [Solar gain](#) is dependent on building orientation, window size, thermal capacity, ventilation and whether or not there is external shading. If windows are too small and external shading too effective there will be an increased need for internal lighting and consequent increase in energy consumption, so there are a number of conflicting considerations to be carefully balanced. If night time ventilation is to be used in conjunction with thermal mass to reduce overheating, then this should be adequately explained in the [owner's operating manual](#). ([Energy efficiency Best Practice in Housing: Reducing Overheating – A Designer's Guide – Energy Savings Trust](#) and [Solar Shading of Buildings BR 364, CRC Ltd, 1999](#))

Thermal Bridging

This usually occurs at eaves, lintels or junction of floors with walls because the continuity of insulation is disrupted (or partially disrupted) and as a consequence heat flow through the external fabric at that location is greater than through the external fabric generally. These disruptions should be avoided because they reduce the thermal performance of the building as a whole, and also increase the risk of condensation on wall surfaces and within the structure. The [Accredited details](#) show how thermal bridging can be avoided. (Refer to [BRE Report 262, Thermal Insulation: avoiding risks, 2002](#) and [Limiting Thermal Bridging](#) and [Air Leakage: Robust Construction Details for Dwellings and Similar Buildings, TSO](#))

Air permeability

Air leakage accounts for up to 40% loss in energy efficiency performance. Any benefit gained from increasing the amounts of insulation and improving energy performance of boilers is lost unless the amount of uncontrolled air leakage is reduced. Uncontrolled airleakage occurs through porous materials and around junctions between materials in the external fabric including loft hatches, pipes, doors, windows, floor/wall floor/ceiling and so on. The design of these details should be thought through at design stage and appropriate membranes and seals incorporated to block possible air paths. (Refer to [Accredited Details](#), [Limiting Thermal Bridging and Air Leakage: Robust Construction Details for Dwellings and Similar Buildings, TSO](#), [SEDA Design and Detailing for Airtightness – www.seda2.org](#), [BRE Information Paper IP 01/00](#))

The maximum design air permeability in most cases is $10\text{m}^3/(\text{hr.m}^2)$ @ 50 Pa.. It is likely that better performance will be required to ensure that DER meets or is better than TER. The only relaxation is if you are building only one or two dwellings where $15\text{m}^3/(\text{hr.m}^2)$ @ 50 Pa may be used to calculate DER as an alternative to providing test results less than 1 year old for a building of a similar type.

Other than in this circumstance air permeability will have to be tested to [BS EN 13289](#) on a sample of dwellings on completion and shown to match the design assumption. Chimneys, flues, ventilators and trickle vents are blocked during tests. If the construction standard does not meet the design requirement stated in the DER remedial work will be required and the building retested, although there is a limited relaxation in place till October 2007 – the rules for this are explained in AD L1A.

Self-Certification Schemes

For certain types of building work such as installing a boiler or a lighting system or even replacing a glazed door, window or rooflight then if this work is carried out by an [approved competent person](#) then a [building notice](#) or the deposit of full plans to the Building Control Body is not required. However when notice or deposit of plans is required for a new dwelling (or extension), then certificates for certain parts of the work can be provided by an approved competent person as part of the submission in support of the [Appendix A checklist \[view or download\]](#).

The types of work and the qualifications of the approved competent person for the purposes of self-certification are described in Schedule 2A published in all four parts of the Approved Document to Part L.

If the work is not carried out by an approved competent person, then the works described in Schedule 2A will require notice or deposit of plans and be subject to Building Control Office approval.

Solar Gain

See also [Overheating](#). Solar gain is dependent on window size, window and building orientation and shading. The effects of solar gain can be minimised by use of low-E glass, external shading such as eaves, balcony overhangs, blinds, shutters, awnings, louvres, brise soleils and even managed vegetation. Internal blinds are not nearly as effective.

Avoid large areas of glass facing west, but use south facing windows with shading designed to allow solar gain from the low sun in winter and avoid it in summer. If windows are too small they will increase the need for energy for internal lighting.

(Refer to [Energy efficiency Best Practice in Housing: Reducing Overheating – A Designer’s Guide – Energy Savings Trust](#) , [Solar Shading of Buildings BR 364, CRC Ltd, 1999, BS 8206 Part 2 Code of Practice for daylighting and Designing with Rooflights to Satisfy ADL2 \(2006\), NARM technical guidance](#))

Energy efficient lighting

Tungsten GLS lamps are very inefficient at converting electricity into light, so much so that the governments of a number of countries (eg Australia) are considering making it illegal to sell them by 2010. The solution is to provide a proportion (see next paragraph) of fittings which can only take compact fluorescent lamps or other fluorescent lamps (or LED lights when they are further developed to produce enough light of a suitable colour) instead of Tungsten GLS or Tungsten Halogen lamps. (Note the suggestion in the AD L1A to use high frequency and not mains frequency fluorescent lamps in garages, where there is a risk of stroboscopic interaction with vehicle engine parts) .

The number is a minimum of one energy efficient light fitting per four fixed light fittings or, if greater, one energy efficient light fitting per 25m² of dwelling floor area. The area of garages and lamps in store rooms (refer to [GIL 20, Low energy domestic lighting, EST 2006](#)) are excluded from this calculation.

U values

The U value is the rate of heat flow through an element. Hence the less the rate of heat flow, the lower the value. The U values described in Table 2 of AD L1A are ‘limiting’ U values which means that the value can be lower (better) but not higher (worse). This is to dissuade the use of super efficient plant to offset mediocre thermal performance in the fabric. The recommended hierarchy to conserve energy is to set the fabric performance as high as possible, then produce the heating, hot water, ventilation, cooling and lighting as efficiently as possible, then, having achieved that, contemplate the use of low or zero carbon energy sources. This approach allows for future improvements in energy performance by change of heating type.

Most of the U values that are needed can be found in the [SAP](#) calculation tool, but if not use the SAP 2005 website. (Refer to [BR 443, Conventions for U value calculations](#))

TER

The Target (carbon dioxide) Emission Rate (TER) is the mass of carbon dioxide emitted per square metre of floor area per year as the result of the provision of heating, cooling, hot water, ventilation and internal fixed lighting. So it does not include the energy used for cooking, or for running lifts or the energy used by household appliances.

The Target is established by calculating (using [SAP](#)) the carbon dioxide emissions rate of a notional dwelling of the same size and shape as proposed using the Part L 2002 default elemental standards (with adjustments to reflect the primary fuel source) and then applying an improvement factor (currently 20%).

DER

This is the mass of carbon dioxide emitted per square metre of floor area per year calculated using [SAP](#) for the actual design for the thermal envelope and the energy performance of the proposed heating, cooling, hot water, ventilation and internal fixed lighting for the dwelling.

Although not a requirement of the AD L1A, this will need to be finalised before final construction drawings are commenced so that the designer can be confident that (subject to adequate workmanship) the DER of the constructed building will be equal to or better than [TER](#). (This being the mandatory requirement of the Regulations.) The DER will be recalculated for Building Control submission incorporating the results of the [air permeability](#) tests on completed dwellings.

Low or Zero Carbon

Low or Zero Carbon systems can contribute to reducing dwelling carbon dioxide emissions and help to meet the target. There is much debate on what is really meant by low or zero carbon, however for the purposes of Part L, they are systems which do not use fossil fuels to provide energy for hot water, heat and light. Examples are solar hot water, photovoltaic power, bio-fuels (wood fuels and oil blends), combined heat and power and heat pumps. (Refer to [Low or Zero Carbon Energy Sources – Strategic Guide \[view or download\]](#))

Commissioning

The requirements for commissioning are set out in the [Domestic Heating Compliance Guide \[view or download\]](#) and are specific to the system being installed (gas, gas-fired warm air, LPG, Oil-fired and so on). The purpose is to ensure that systems and associated controls, pipework and pumps are running as efficiently as possible, that the owner knows how to operate the system as efficiently as possible, and that where appropriate a regulation compliance certificate or commissioning record has been

provided. If the installer is not a person registered with an approved competent person scheme, then they should notify the building control body before commencing with the work.

Approved Competent Person

Schedule 2A reproduced in all four parts of the Approved Document to Part L, describes the type of work that can be self-certified without notification or deposit of plans to the Building Control Body and the qualifications or registration requirements of approved competent persons who are entitled to self-certify in each of those circumstances.

This definition can also be extended to include those whose authority is required to complete the [Appendix A Checklist \[view or download\]](#), such as the authorised SAP assessor, approved cost consultant and so on.

Energy efficient Heating

The requirements are described in the [Domestic Heating Compliance Guide \[view or download\]](#). For example a gas boiler requires a [SEDBUK](#) rating of not less than 86%, space heating and hot water systems should be fully pumped, automatic bypass valves should be provided (in accordance with manufacturer's instructions) and there are detailed requirements for hot water storage, system preparation and water treatment, commissioning, controls, zones, insulation of pipes and so on. Other methods of heating and other fuels have different requirements. There is no alternative but to refer to the compliance guide for details in each case.

THE FUTURE

It is anticipated that as the Government strives to meet its targets to reduce carbon dioxide emissions by 50% by the year 2050 [CHECK] and zero-carbon homes by 2012 that the TER standards will be set higher and higher towards achieving the ultimate goal of zero carbon development. Exemplar projects and best practice initiatives (such as the Code for Sustainable Homes) will demonstrate what can be achieved and to some extent, set the pace.

Published off-the-shelf approaches which meet the requirements for energy efficiency (ie with satisfactory SAP ratings) would avoid the need for iterative recalculation at design stage.

[all pages?] [Some terms will have a limited definition only with link to technical pages for more detailed explanation eg TER]

GLOSSARY (To be in central database and become an on-line dictionary – to be completed – many of these will be duplicates of the Technical issues section – so it may be a case of creating appropriate links)

Approved Document

Target Carbon Dioxide Emission Rate (TER) Dwellings

Dwelling Carbon Dioxide Emission Rate (DER)

DER

TER

Air Permeability

Energy Performance Rating

SAP

Compliance Checklists

Self certification schemes

Suitably qualified Persons

Operating Manual

Energy Performance Certificate

Accredited details

SEDBUK

{other}

REFERENCES [abstracts available to all pages]

AM10 Natural Ventilation in
Non-Domestic Buildings, CIBSE
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BRE Digest DG 498 Selecting
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BRE Good Building Guide 37
Insulating roofs at rafter level:
Sarking insulation

BRE Information Paper IP 1/06
Assessing the effects of thermal
bridging at junctions and around
openings (2006)

BRE Report BR 262 Thermal
insulation: avoiding risks, BRE
(2001)

BRE Report BR 364 Solar shading of buildings 2001 (1999)

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BRE Report BR 448 Airtightness
in commercial and public
buildings (2002)

BS 5250:2002 Code of practice
for control of condensation in
buildings.

BS 5803-5:1985 Thermal
insulation for use in pitched.
roof spaces in dwellings.

BS 6229:2003 Flat roofs with
continuously supported
coverings. Code of practice.

BS 8206-2:1992 Code of practice
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BS EN ISO 13788:2002
Hygrothermal performance
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Building Bulletin BB87
Guidelines for Environmental
Design in Schools, DfES (2003)

Building Regulations and historic
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CE129 Reducing overheating – a
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Trust (2005 edition)

CE66 Windows for new and
existing housing, Energy Saving
Trust

Code of practice for loft
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CWCT/CAB report on curtain walling

Domestic Heating Compliance Guide, ODPM/NBS (2006)

Draft Building Bulletin 101 Ventilation of School Buildings, DfES

DW/143 A Practical Guide to Ductwork Leakage Testing, HVCA (2000)

Energy performance standards for modular and portable buildings, MPBA (2006)

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GIL 20 Low energy domestic lighting, EST (2006)

GIL 20 Low energy domestic lighting. The benefits of compact fluorescent lamps in housing – a monitored study

GIL 65 Metering energy use in non-domestic buildings (2004)

GPG 268 Energy efficient ventilation in dwellings – a guide for specifiers on the requirements and options for ventilation, EST (2006)

Guide A: Environmental design, CIBSE (2006)

www.cibse.org

HVAC Guidance for achieving compliance with Part L of the Building Regulations, TIMSA (2006)

HVCA DW/144 Specifications for

sheet metal ductwork (1998)

Limiting Thermal Bridging and Air Leakage: Robust Construction Details for Dwellings and Similar Buildings, Amendment 1, TSO (2002)

Low or Zero Carbon Energy Sources: strategic guide, ODPM (2006)

Measuring Air Permeability of Building Envelopes, ATTMA (March 2006)

National Calculation Methodology, DCLG NBS (2007)
Due to be published

Non-domestic heating, cooling and ventilation compliance guide, ODPM/NBS (2006)

SBEM user manual and calculation tool, BRE (2006).

Statutory Instrument SI 2005/1726 The Energy Information (Household Air Conditioners) (No. 2) Regulations 2005.

The Government's Standard Assessment Procedure for energy rating of dwellings, BRE/Defra (2005).

Thermal Insulation of H & V Ductwork, TIMSA (1998)

TM 36 Climate change and the internal environment: Impacts and adaptation, CIBSE

TM31 Building logbook toolkit, CIBSE (2006)

TM33 Standard tests for the

assessment of building services
design software, CIBSE

TM37 Design for improved solar
shading control, CIBSE (2006)

TM39 Building Energy Metering
(a guide to energy sub-metering
in non-domestic buildings), CIBSE

TP17 Guidance on design of
metal roofing and cladding to
comply with Approved Document
L2, MCRMA (2006)

Use of rooflights to satisfy the
2002 Building Regulations for the
conservation of fuel and power,
NARM (2002)