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The Building Regulations 2010

Conservation of fuel and power

Approved  
Document

**L1A**

New dwellings

Coming into effect July 2014

For use in Wales\*

## Main changes in the 2014 edition

This approved document, Approved Document L1A: Conservation of fuel and power in new dwellings supports the energy efficiency requirements of the Building Regulations. Regulation 2(1) of the Building Regulations defines the energy efficiency requirements as the requirements of regulations 23, 25A, 25B, 26,26A,26B, 28, 29 and 40 and Part L of schedule 1. It takes effect on 31 July 2014 and is for use in Wales\*. The 2010 edition will continue to apply to work begun before 31 July 2014, or to work subject to a building notice, full plans application or initial notice submitted before 31 July 2014.

The main changes in the approved document are that:

- A new requirement, regulation 26B, has been introduced that requires new dwellings to achieve or better target fabric performance values.
- The Part L 2014 specifications have been strengthened to deliver 8% carbon dioxide savings across the new homes build mix relative to Part L 2010.
- A new elemental specification for new dwellings has been introduced for the purpose of target setting. A summary of the Part L 2014 elemental specification is published at Table B1 in the Approved Document. If the actual dwelling is constructed entirely to the elemental specification it will typically meet the carbon dioxide target and the limiting values for individual fabric elements and building services. Developers are however free to vary the specification, provided the same overall level of carbon dioxide emissions is achieved or bettered.
- The document consolidates the amendments made in SI 2013/747 requiring the feasibility of high efficiency alternative systems to be taken into account before construction commences.
- The guidance for insulation of circulation pipes within communal spaces is given greater prominence.
- The document is in a new style format.

**\* This Approved Document gives guidance for compliance with the Building Regulations for building work carried out in Wales. It does not apply to building work carried out on excepted energy buildings in Wales as defined in the Welsh Ministers (Transfer of Functions) (No. 2) Order 2009.**

|  | Page      |
|--|-----------|
| <b>Section 1 – Introduction</b>  | <b>3</b>  |
| 1.1 What is an Approved Document?  | 3         |
| 1.2 Conventions within this Approved Document  | 3         |
| 1.3 Types of work covered by this Approved Document  | 4         |
| 1.4 Summary of the Approved Document   | 5         |
| 1.5 Consideration of technical risk  | 5         |
| 1.6 Materials and Workmanship  | 5         |
| 1.7 Where you can get further help   | 7         |
| 1.8 Responsibility for compliance  | 7         |
| <b>Section 2 – Compliance Criteria</b>   | <b>8</b>  |
| 2.1 Introduction   | 8         |
| 2.2 Criteria for compliance  | 9         |
| <b>Section 3 – Criteria 1 – The DER must be no greater than the TER</b>                    | <b>10</b> |
| 3.1 Introduction   | 10        |
| 3.2 Calculating the DER before commencement of work  | 13        |
| 3.3 Calculating DER after completion   | 14        |
| 3.4 Secondary heating  | 15        |
| 3.5 Internal lighting  | 15        |
| 3.6 Apartments and terraces  | 15        |
| 3.7 Dwellings contained in mixed use buildings and common areas                            | 16        |
| 3.8 Conservatories and porches   | 16        |
| 3.9 Swimming pools   | 16        |
| 3.10 Demonstrating compliance  | 16        |
| <b>Section 4 – Criteria 2 – Limits on design flexibility</b>                               | <b>18</b> |
| 4.1 Introduction   | 18        |
| 4.2 Building fabric  | 18        |
| 4.3 Fixed building services  | 19        |
| 4.4 Demonstrating compliance   | 19        |
| <b>Section 5 – Criterion 3 – Limiting overheating due to solar and other Gains</b>         | <b>20</b> |
| 5.1 Introduction   | 20        |
| 5.2 Limiting the effects of solar gain in the summer                                       | 20        |
| 5.3 Evaluating the risk of overheating   | 20        |
| 5.4 Limiting the effects of other heat gains   | 21        |
| 5.5 Reasonable provision to demonstrate compliance   | 21        |
| <b>Section 6 – Criterion 4 – Dwelling construction and performance consistent with DER</b> | <b>22</b> |
| 6.1 Introduction   | 22        |

|  |  |           |
|--|--|-----------|
| 6.2  | Party wall and other thermal bypasses                            | 22        |
| 6.3  | Thermal bridging   | 23        |
| 6.4  | Air-pressure testing   | 25        |
| 6.5  | Commissioning of building services                               | 27        |
| <b>Section 7 – Criterion 5 – Providing energy efficient operation of Dwellings</b> |  | <b>29</b> |
| 7.1  | Introduction   | 29        |
| 7.2  | Reasonable provision to demonstrate compliance                   | 29        |
| <b>Section 8 – Calculating Target CO<sub>2</sub> Emissions Rate (TER)</b>          |  | <b>31</b> |
| 8.1  | Introduction   | 31        |
| 8.2  | Secondary heating  | 32        |
| 8.3  | Internal lighting  | 33        |
| 8.4  | Apartments and terraces  | 33        |
| 8.5  | Conservatories and porches                                       | 33        |
| 8.6  | Swimming pools   | 33        |
| <b>Section 9 – Notifying Building Control and demonstrating compliance</b>         |  | <b>35</b> |
| 9.1  | Introduction   | 35        |
| 9.2  | Cases when notification is not needed – Competent Persons Scheme | 35        |
| <b>Appendix A: Key Terms and Definitions</b>                                       |  | <b>36</b> |
| <b>Appendix B: Elemental specification for the TER</b>                             |  | <b>38</b> |
| <b>Appendix C: Calculating U values</b>  |  | <b>40</b> |
| <b>Appendix D: Materials and Workmanship</b>                                       |  | <b>41</b> |
| <b>Appendix E: The Workplace (Health, Safety and Welfare) Regulations 1992</b>     |  | <b>42</b> |
| <b>Appendix F: Approved Documents</b>  |  | <b>43</b> |
| <b>Appendix G: Documents and Standards referred to</b>                             |  | <b>44</b> |

## 1.1 What is an Approved Document?

**1.1.1** This Approved Document, which takes effect on 31 July 2014, has been approved and issued by the Welsh Ministers to provide practical guidance on ways of complying with the **energy efficiency requirements** of the Building Regulations 2010 for Wales, as amended, which are referred to throughout the remainder of this document as ‘the Building Regulations’.

**1.1.2** Approved Documents provide guidance about compliance with specific aspects of the Building Regulations in some of the more common building situations. They set out what, in ordinary circumstances, may be accepted as reasonable provision for compliance with the relevant requirement(s) to which they refer. The term ‘reasonable provision’ is used in the Approved Documents because the specific evidence or standards required to demonstrate compliance are not generally stipulated by the Building Regulations themselves. Approved Documents describe one way of complying with the Building Regulations.

**1.1.3** If guidance in an Approved Document is followed there will be a presumption of compliance with the requirement(s) of the Building Regulations covered by the guidance. However, this presumption can be overturned; for example, if the particular case is unusual in some way, then ‘normal’ guidance may not be applicable. It is also important to note that there may be other ways of achieving compliance with the requirements. **There is no obligation to adopt any particular solution contained in this Approved Document if you can meet the relevant requirement(s) in some other way. However, you must always check with your Building Control Body (BCB), either the local authority or an approved inspector that your proposals comply with Building Regulations.**

**1.1.4** As well as containing guidance, the Approved Documents also contain relevant extracts from the Building Regulations, which must be complied with as stated. For example, the requirement that the target carbon dioxide (CO<sub>2</sub>) emission rate for the building shall not be exceeded is a regulatory requirement.

**1.1.5** This Approved Document is concerned with energy efficiency requirements. However, building works to new homes will be subject to requirements of other sections of the Building Regulations, for instance fire safety, site preparation and ventilation. There are Approved Documents that give guidance on each of the requirements of the Building Regulations and all of these must be consulted when building works are considered. A full list of these is provided in Appendix F: Approved Documents.

## 1.2 Conventions within this Approved Document

**1.2.1** This document uses the following conventions

- a. **Text against a grey background** is an extract from the Building Regulations 2010 or the Building (Approved Inspector etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations. Where there is any doubt you should consult the full text of the regulations available at [www.legislation.gov.uk](http://www.legislation.gov.uk).
- b. Key terms which have specific meanings are used in **bold italics** in the text and defined in Appendix A.
- c. When this Approved Document refers to a named standard or other document, the relevant version is listed in Appendix G (List of Documents and Standards referred

to). However, if the issuing body has revised or updated the listed version of the standard, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.

- d. Additional *commentary in italic* text appears after some numbered paragraphs. This commentary is intended to assist understanding of the immediately preceding paragraph or sub-paragraph, or to direct readers to sources of additional information, but is not part of the technical guidance itself.

## 1.3 Types of work covered by this Approved Document

**1.3.1** This Approved Document gives guidance on how to comply with the energy efficiency requirements for those creating new **dwelling**s. For **dwelling**s that are going to be created in an existing building as a result of a material change of use, Approved Document L1B should be used.

**1.3.2** This Approved Document should be used for guidance in relation to each individual **dwelling** where one or more **dwelling** is constructed as part of a larger building. Approved Document L2A gives guidance related to the non-**dwelling** part of such buildings. This would include heated common areas in an apartment building and commercial and retail space of mixed use developments.

**1.3.3** In this Approved Document, **dwelling** refers to a self-contained unit (including a house or a flat) designed to be used separately to accommodate a **single household**. Rooms for residential purposes, for example in nursing homes, student accommodation, etc. are **not dwelling**s and in such cases guidance is given in Approved Document L2A.

**1.3.4** 'Live-work' units containing both living accommodation and space to be used for commercial purposes (e.g. workshop or office) should be assessed as a **dwelling** as long as the commercial part could revert to domestic use. This could be the case if, for example:

- a. there is direct access between the commercial space and the living accommodation; and
- b. both are contained within the same heated space; and
- c. the living accommodation forms a substantial proportion of the total area of the unit.

*Interpretation of the above is that the presence of (e.g.) a small manager's flat in a large non-domestic building would not result in the whole building being treated as a **dwelling**. Similarly, the existence of a room used as an office or utility space within a **dwelling** would not mean that the building should not be treated as a **dwelling**. However, if a small office, say a manager's office, is located within a block of apartments, i.e. for multiple households, this component will be assessed as a non-domestic building, guidance for which is given in Approved Document L2A.*

**1.3.5.** The **energy efficiency requirements** only apply to buildings or parts of building that are walled and roofed constructions and use energy to heat or cool the indoor climate. Parts of a building that are not heated or cooled, for example garages, outbuildings and some **conservatories or porches** are exempt. Guidance on which conservatories and porches are exempt is given in Section 8.

## 1.4 Summary of this Approved Document

**1.4.1** This Approved Document is subdivided into nine sections that are followed by supporting appendices. It gives guidance on how to comply with the **energy efficiency requirements** for new **dwelling**s.

Section 1- this introductory section sets out the general context for the guidance in the Approved Document.

Section 2 - explains the five criteria within this Approved Document that would need to be complied with to satisfy the **energy efficiency requirements**.

Section 3 – explains how the CO<sub>2</sub> emission rate for the **dwelling** can be calculated to ensure that it does not exceed the target CO<sub>2</sub> emissions rate (Criterion 1).

Section 4 - sets minimum energy efficiency standards for building fabric and services (Criterion 2).

Section 5 - describes how to reduce the risk of overheating in **dwelling**s and thus the need for energy for cooling (Criterion 3).

Section 6 - sets out procedures to help ensure that the actual performance of the constructed **dwelling** is as designed (Criterion 4)

Section 7 - sets out **information to be provided to the occupier** so that the building can be operated in an energy efficient manner (Criterion 5)

Section 8 - describes how the Criterion 1 target is determined: the target CO<sub>2</sub> emissions rate.

Section 9 - sets out the procedures for **notifying building control**.

**1.4.2** The following flowchart overleaf provides a summary of the information contained within the various Sections of this Approved Document.

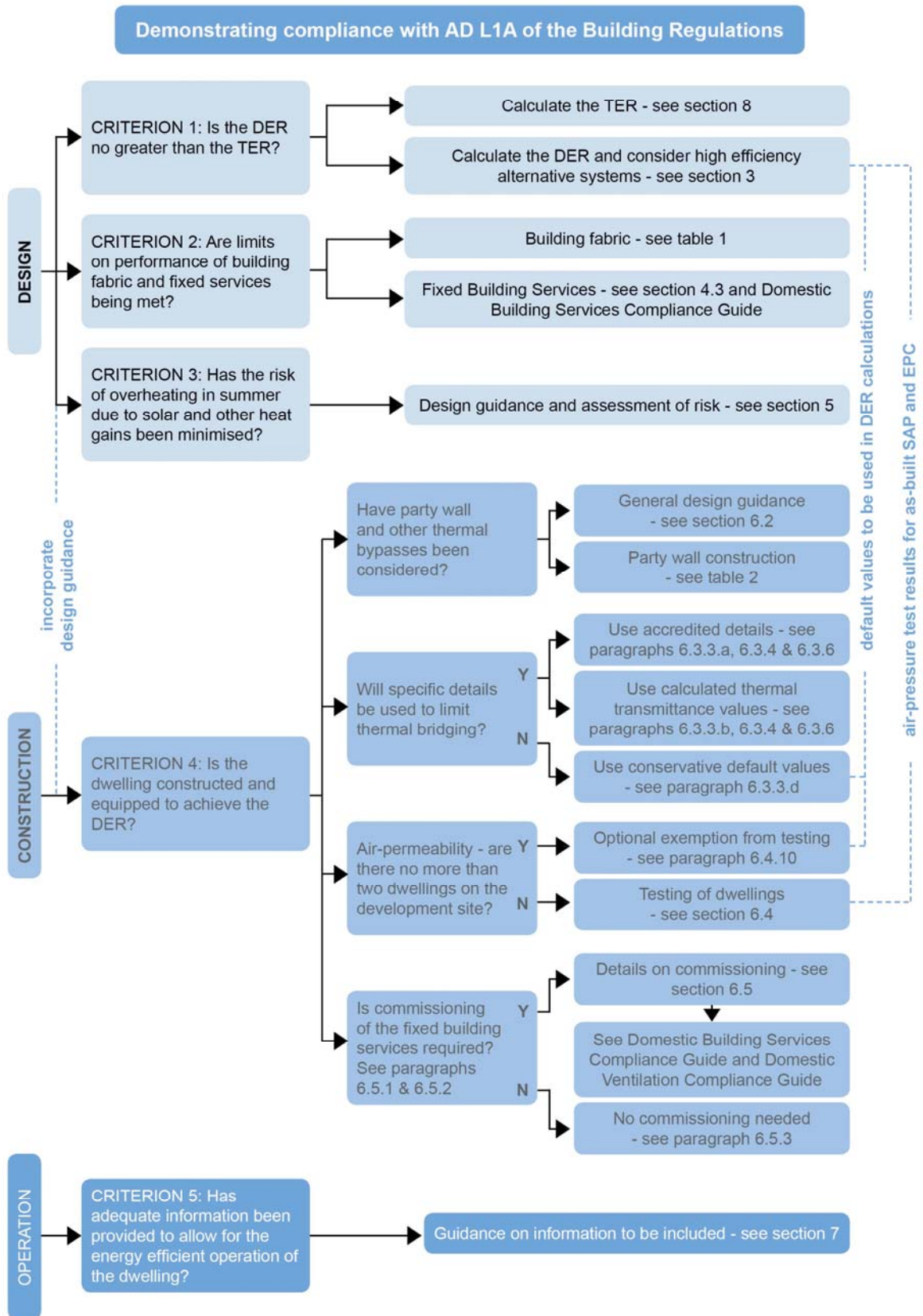
## 1.5 Considerations of technical risk

**1.5.1** When considering the incorporation of energy efficiency measures in **dwelling**s, attention should also be paid to interrelated issues such as fire safety, resistance to the passage of sound, ventilation, hot water supply and systems, combustion appliances and fuel storage systems, water ingress and possible risk of condensation and electrical safety. It is important to consider the **dwelling** as a whole and understand the interaction between all the relevant requirements of the Building Regulations. For example, where work carries a risk of condensation, such risk must be effectively mitigated by careful specification of the construction and if necessary the ventilation system for the **dwelling**; one approach would be to follow the guidance set out in BRE Report 262 Thermal Insulation: Avoiding the risks (see Approved Document C for more details). Designers and applicants should refer to the relevant Approved Documents and to other generally available good practice guidance to help minimise these risks.

## 1.6 Materials and Workmanship

**1.6.1** In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. See Appendix D for further information.

## FLOW CHART (see para 1.4.2)





## 1.7 Where you can get further help

**1.7.1** If you do not understand the technical guidance or other information set out in this Approved Document and the additional detailed technical references to which it directs you, there are a number of routes through which you can get further help:

- a. the Welsh Government website: [www.wales.gov.uk/topics/planning/buildingregs](http://www.wales.gov.uk/topics/planning/buildingregs) or
- b. your local authority building control service or your approved inspector (depending on which building control service you are using); or
- c. persons registered with a competent person self-certification scheme may be able to get technical advice from their scheme operator; or
- d. if your query is of a highly technical nature, you may wish to seek the advice of a specialist, or industry technical body, for the relevant subject.

## 1.8 Responsibility for compliance

**1.8.1** It is important to remember that if you are a person carrying out any aspect of design or building work to which any requirement of the Building Regulations applies (for example a designer, a builder or an installer) you have a responsibility to ensure that the work complies with any such requirement. The person undertaking the work also has a responsibility for ensuring compliance with the Building Regulations and could be served with an enforcement notice in cases of non-compliance.

## 2.1 Introduction

**2.1.1** This Approved Document deals with the **energy efficiency requirements** in the Building Regulations 2010 (as amended). Regulation 2(1) of the Building Regulations defines the **energy efficiency requirements** as the requirements of regulations 23, 25A, 25B, 26, 26A, 26B, 28, 29 and 40 and Part L of Schedule 1. The **energy efficiency requirements** relevant to this Approved Document, which deals with new **dwellings**, are those in regulations 25A, 26, 26B, 29 and 40 and Part L of Schedule 1 below.

**Regulation 25B** “Nearly zero-energy requirements for new buildings” will not come into force until 2019 at the earliest. Statutory guidance on compliance with Regulation 25B is not included within this Approved Document and will be provided nearer to the time it comes into force.”

**2.1.2** No new **dwellings** are exempt from the **energy efficiency requirements** of the Building Regulations

### *Requirement*

#### **Schedule 1 – Part L Conservation of fuel and power**

L1. Reasonable provision shall be made for the conservation of fuel and power in buildings 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 fixed building services which—
  - (i) are energy efficient;
  - (ii) have effective controls; and
  - (iii) are commissioned by testing and adjusting as necessary to ensure they use no more fuel and power than is reasonable in the circumstances

**2.1.3** In the Welsh Minister’s view, compliance with the **energy efficiency requirements** could be demonstrated by meeting all five criteria set out in this Approved Document. It is expected that software implementations of SAP 2012 will produce an output report that will assist the Building Control Body (**BCB**) to check that compliance has been achieved.

*This output report can also benefit both developers and Building Control Bodies during the design and construction stages as well as at and after completion.*

**2.1.4** Of the five criteria explained in this Approved Document, the approaches described to meet the following criteria are within regulations and must be complied with as stated:

- a. Criterion 1; and
- b. Part of Criterion 2 dealing with the worst acceptable fabric performance standards; and
- c. Parts of Criterion 4 dealing with air-pressure testing and commissioning requirements.

**2.1.5** The approaches to meet the other criteria are ‘reasonable provision’ and alternative proposals are permissible, which should be checked with the **BCB** to confirm that they meet the **energy efficiency requirements**.

## 2.2 Criteria for compliance

**2.2.1 Criterion 1:** the calculated rate of CO<sub>2</sub> emissions from the **dwelling** (the Dwelling Emission Rate, **DER**) must not be greater than the Target Emission Rate (**TER**). The procedures for calculating these are set out in Sections 3 and 8.

*The calculations required to show compliance with Criterion 1 can also provide the information needed to prepare the Energy Performance Certificate (or EPC) for buildings.*

**2.2.2 Criterion 2:** the performance of the building fabric must meet minimum mandatory energy efficiency standards and the **fixed building services** should achieve reasonable minimum energy efficiency standards following the procedure set out in Section 4.

*This is intended to place limits on design flexibility to encourage the reduction of demand for space heating (and cooling) and efficient use of fuel and discourage excessive use of renewable energy solutions.*

**2.2.3 Criterion 3:** the **dwelling** should have appropriate passive control measures to limit the effect of solar and other heat gains on indoor temperatures in summer. This is to help avoid the need for mechanical cooling and the associated energy consumption. Section 5 provides guidance on reasonable provision to meet this criterion.

**2.2.4 Criterion 4:** the performance of the **dwelling**, as built, should be consistent with the calculated **DER**. Section 6 provides information on site management and testing procedures that would need to be adopted to demonstrate that the performance of the building fabric and **fixed building services** will be consistent with the specification used for energy performance evaluation.

**2.2.5 Criterion 5:** information necessary to enable the energy efficient operation of the **dwelling** should be provided to the occupier in an easy to understand format. Section 7 includes guidance on the information that could be included by way of reasonable provision to demonstrate compliance with this criterion.

**2.2.6** Sections 3 to 7 include details of how to demonstrate that each of the criteria has been met. Further details on communicating this to **BCBs** are included in Section 9.

## The DER must be no greater than the TER

### 3.1 Introduction

**3.1.1** Criterion 1 is a mandatory requirement and must be met by all new **dwelling**s as stated here.

#### **Regulation 26 – CO<sub>2</sub> emission rates for new buildings**

Where a building is erected, it shall not exceed the target CO<sub>2</sub> emission rate for the building that has been approved pursuant to regulation 25.

**3.1.2** To comply with **regulation 26** it will need to be demonstrated that the calculated Dwelling CO<sub>2</sub> Emissions Rate (**DER**) does not exceed the Target CO<sub>2</sub> Emissions Rate (**TER**).

**3.1.3** This section focuses on the calculation of the **DER**. Details of how the **TER** is calculated are set out in Section 8.

*A significant change in 2014 is that the **TER** for homes where the main heating system uses gas is based on an elemental set of specifications to which no additional improvement factor is applied.*

**3.1.4** In accordance with the methodology approved by the Welsh Ministers in the Notice of Approval<sup>1</sup>, the CO<sub>2</sub> emission rates (**DER and TER**) for individual **dwelling**s must be calculated using SAP 2012. Provided the **dwelling** satisfies the limits on design flexibility as set out in Criterion 2, the designer has flexibility to achieve the **TER** utilising fabric and services measures and the integration of **low and zero carbon technologies** in whatever mix is appropriate to the scheme. SAP software tools include appropriate algorithms that enable the designer to assess the role each of these technologies can play in achieving the **TER**.

**3.1.5** To encourage incorporation of improvements in building services system efficiencies and the integration with **low and zero carbon technologies**, the designer should:

- a. consider incorporating heating system designs that use low distribution temperatures; and
- b. where multiple systems serve the same end use, organise the control strategies such that priority is given to the least carbon-intensive option, for example where a solar hot water system is present, the controls should be arranged so that the best use is made of the available solar energy; and,
- c. consider making the **dwelling** easily adaptable for the integration of additional low and zero carbon technologies at a later date by providing appropriate facilities at the construction stage that would make subsequent enhancements much easier and cheaper, e.g. providing capped off connections that can link into a planned community heating scheme.

**3.1.6** **Regulation 25A** requires that before the work starts, the person undertaking the work must carry out an analysis that considers and takes into account the technical,

<sup>1</sup> Notice of Approval of the methodology of calculation of the energy performance of buildings in England and Wales.

## The DER must be no greater than the TER

environmental and economic feasibility of using high-efficiency alternative systems in the construction.

The following high efficiency alternative systems may be considered if available, but other low and zero carbon systems may also be considered if available:

- decentralised energy supply systems based on energy from renewable sources;
- cogeneration;
- district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources;
- heat pumps.

**3.1.7** The analysis should state whether high-efficiency alternative systems have or have not been included in the building design. The requirement relates to considering, taking into account, documenting and making available for verification purposes the analysis of high-efficiency alternative systems.

*The Building Regulations are technology neutral and do not mandate the installation of high efficiency alternative systems or other low and zero carbon systems. However, the design and construction of new dwellings often features such systems to meet local interpretations of Planning Policy Wales conditions that require specific energy performance standards exceeding the Building Regulations and/or require a proportion of energy used in development to be from renewable and/or low carbon sources.*

**3.1.8** The analysis of using high-efficiency alternative systems may be carried out for individual **dwellings**, groups of similar **dwellings** or for common typologies of **dwellings** in the same area. Where a number of **dwellings** are connected to a community energy system, a single analysis may be carried out for all of the **dwellings** connected to the system in the same area as the building to be constructed.

**3.1.9** Before work starts, the person undertaking the work shall give the **BCB** a notice which states that the analysis of using high-efficiency alternative systems has been undertaken, is documented and is available for verification purposes. The results of the analysis must be documented and retained for inspection by the **BCB** upon request.

*Although the analysis of high efficiency alternative systems is not an explicit requirement of the CO<sub>2</sub> emission rate calculation, a facility within calculation software output reporting may be available to the builder to declare that the analysis has been carried out, is documented and where it is available for verification purposes.*

### **Regulation 25A - Consideration of high-efficiency alternative systems for new buildings**

(1) Before construction of a new building starts, the person who is to carry out the work must analyse and take into account the technical, environmental and economic feasibility of using high-efficiency alternative systems (such as the following systems) in the construction, if available—

- (a) decentralised energy supply systems based on energy from renewable sources;
- (b) cogeneration;
- (c) district or block heating or cooling, particularly where it is based entirely or

## The DER must be no greater than the TER

- partially on energy from renewable sources; and  
(d) heat pumps.
- (2) The person carrying out the work must—
- (a) not later than the beginning of the day before the day on which the work starts, give the local authority a notice which states that the analysis referred to in paragraph (1)—
- (i) has been undertaken;
- (ii) is documented; and
- (iii) the documentation is available to the authority for verification purposes; and
- (b) ensure that a copy of the analysis is available for inspection at all reasonable times upon request by an officer of the local authority
- (3) An authorised officer of the local authority may require production of the documentation in order to verify that this regulation has been complied with.
- (4) The analysis referred to in paragraph (1)—
- (a) may be carried out for individual buildings or for groups of similar buildings or for common typologies of buildings in the same area; and
- (b) in so far as it relates to collective heating and cooling systems, may be carried out for all buildings connected to the system in the same area.
- (5) In this regulation—
- (a) “cogeneration” means simultaneous generation in one process of thermal energy and one or both of the following—
- (i) electrical energy;
- (ii) mechanical energy;
- (b) “district or block heating or cooling” means the distribution of thermal energy in the form of steam, hot water or chilled liquids, from a central source of production through a network of multiple buildings or sites, for the use of space or process heating or cooling;
- (c) “energy from renewable sources” means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases; and
- (d) “heat pump” means a machine, a device or installation that transfers heat from natural surroundings such as air, water or ground to buildings or industrial applications by reversing the natural flow of heat such that it flows from a lower to a higher temperature. (For reversible heat pumps, it may also move heat from the building to the natural surroundings.)

## The DER must be no greater than the TER

### 3.2 Calculating *DER* before commencement of work

#### **Regulation 27 - CO<sub>2</sub> emission rate calculations**

- (1) This regulation applies where a building is erected and regulation 26 applies.
- (2) Not later than the day before the work starts, the person carrying out the work shall give the local authority a notice which specifies—
  - a. the target CO<sub>2</sub> emission rate for the building,
  - b. the calculated CO<sub>2</sub> emission rate for the building as designed, and
  - c. a list of specifications to which the building is to be constructed.
- (3) Not later than five days after the work has been completed, the person carrying out the work shall give the local authority—
  - a. a notice which specifies—
    - i. the target CO<sub>2</sub> emission rate for the building,
    - ii. the calculated CO<sub>2</sub> emission rate for the building as constructed, and
    - iii. whether the building has been constructed in accordance with the list of specifications referred to in paragraph (2) (c), and if not a list of any changes to those specifications; or
  - b. a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).
- (4) A local authority is authorised to accept, as evidence that the requirements of regulation 26 have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce such certificates for that category of building.
- (5) In this regulation 'specifications' means specifications used for the calculation of the CO<sub>2</sub> emission rate.

#### **Regulation 27B - Fabric performance values calculations**

- (1) This regulation applies where a dwelling is erected and regulation 26B applies.
- (2) Not later than the day before the work starts, the person carrying out the work must give the local authority a notice which specifies—
  - (a) the target fabric performance values for the dwelling;
  - (b) the calculated fabric performance values for the dwelling as designed; and
  - (c) a list of specifications to which the dwelling is to be constructed.
- (3) Not later than five days after the work has been completed, the person carrying out the work must give the local authority—
  - (a) a notice which specifies—
    - (i) the target fabric performance values for the dwelling;
    - (ii) the calculated fabric performance values for the dwelling as constructed; and
    - (iii) whether the dwelling has been constructed in accordance with the list of specifications referred to in paragraph 2(c), and if not a list of any changes to those specifications; or
  - (b) a certificate of the sort referred to in paragraph (4) accompanied by the information

## The DER must be no greater than the TER

referred to in sub-paragraph (a).

- (4) A local authority is authorised to accept, as evidence that the requirements of regulation 26B have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce such certificates for that category of building.
- (5) In this Regulation, “specifications” means specifications used for the calculation of the fabric performance values.”

**3.2.1 Regulations 26, 27 and 27B** require that a calculation must be carried out before commencement of construction work to demonstrate that the **DER** of the **dwelling** as-designed is no greater than the **TER**.

**3.2.2** Where a **dwelling** is connected to a community energy system, the annual percentage heat supplied from each heat source should be the same for each newly connected **dwelling**. Sufficient evidence should be provided to demonstrate that:

- a. the capacity of the community scheme would be able to provide the percentage that is assumed; and
- b. the calculated CO<sub>2</sub> emission factor has taken into account the predicted effect of all buildings proposed to be newly connected to the system in the first 12 months of operation of the building. This is to ensure that the increased operation of any marginal plant (e.g. gas boilers) is properly accounted for.

### 3.3 Calculating DER after completion

**3.3.1** The final **DER** calculation produced in accordance with the guidance in this document must be based on the building, as constructed, incorporating:

- a. any changes that have been made during construction from the design-stage list of specifications; and
- b. the **assessed air permeability**.

**3.3.2** The **assessed air permeability** shall be determined as follows:

- a. Where testing of **air permeability** has been carried out, in accordance with procedures set out in Section 6.4 of this Approved Document:
  - i. in the particular **dwelling**, the **assessed air permeability** is the measured **air permeability**; or
  - ii. where the **dwelling** has not been tested, the **assessed air permeability** is the average test result obtained from other **dwellings** of the same **dwelling type** on the development, increased by a value of 2.0 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa.
- b. In development sites where no more than two **dwellings** are to be erected, the following alternatives to air-pressure testing are available:
  - i. the **assessed air permeability** can be taken to be the value of 15 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa; or
  - ii. it may be demonstrated that during the preceding 12 month period, a **dwelling** of the same **dwelling type** constructed by the same builder had been pressure tested according to the procedures given in Section 6.4 and had achieved the claimed **design air permeability**. It should be noted that in this instance as well, the **air permeability rate** to be used in the calculation of the **DER** will need to be increased by a value of 2.0 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa as the **dwellings** will be untested.



## The DER must be no greater than the TER

### 3.4 Secondary heating

**3.4.1** A secondary heating appliance may meet part of the space heat demand. However, a secondary heating appliance is not considered while calculating the **TER**. Hence, where secondary heating is specified in the actual **dwelling**, compensating measures may be required to ensure that the final **DER** does not exceed the **TER**.

**3.4.2** When calculating the **DER**, the fraction of the heating demand provided by the secondary heating system must be based on the procedures set out in SAP 2012 for the particular combination of main heating system and secondary heating appliance.

**3.4.3** Secondary heating appliances must be incorporated in the calculation of the **DER** using the following guidance:

- a. Where a secondary heating appliance is fitted, the efficiency of the actual appliance with its appropriate fuel must be used;
- b. Where a chimney or flue is provided but no appliance is actually installed, and:
  - i. a gas point is located adjacent to the hearth, a decorative fuel effect gas fire open to the chimney or flue with an efficiency of 20 per cent must be used;
  - ii. if there is no gas point, an open fire in grate for burning multi-fuel with an efficiency of 37 per cent must be used, unless the **dwelling** is in a smoke control area when the fuel should be taken as smokeless solid mineral fuel;
- c. Otherwise the **DER** shall be calculated with no secondary heating.

### 3.5 Internal lighting

**3.5.1** The **DER** must be calculated taking into account the proportion of low-energy lamps that will actually be installed in the fixed lighting locations in each **dwelling**. A greater proportion of low energy lamps will benefit the **DER** calculation. The **TER** calculation assumes all fixed internal lighting uses low energy lamps.

### 3.6 Apartments and terraces

**3.6.1** In a terrace of houses or in a block of flats, where the main building envelope includes more than one **dwelling**, compliance with this criterion may be demonstrated if:

- a. either every individual **dwelling** has a **DER** that is no greater than its corresponding **TER**;
- b. OR the average **DER** is no greater than the average **TER**. The average **DER** is the floor-area-weighted average of all the individual **DERs**, and the average **TER** is calculated in the same way.

**3.6.2** In case (b) above, the average **DER** (or **TER**) is the floor-area-weighted average of all the individual **DERs** (or **TERs**), and is calculated according to the following formula:

$$\frac{\{(DER1 \times \text{Floor area1}) + (DER2 \times \text{Floor area2}) + (DER3 \times \text{Floor area3}) + \dots\}}{\{(\text{Floor area1} + \text{Floor area2} + \text{Floor area3}) + \dots\}}$$

**3.6.3** Averaging of the **DER** (and **TER**) is permitted only across multiple **dwelling**s in a single building, and not across multiple buildings on a development site.

## The DER must be no greater than the TER

**3.6.4** It should be noted that when adopting the average **DER** approach, it would still be necessary to provide calculations and supporting information for each individual **dwelling**.

### 3.7 Dwellings contained in mixed use buildings and common areas

**3.7.1** For buildings containing **dwellings** and accommodation to be used for non-**dwelling** purposes (so called 'mixed-use developments'), the **DER** calculations based on the guidance contained in this Approved Document are carried out for the **dwelling** component of the development only.

**3.7.2** For common areas within apartment buildings:

- a. if heated, guidance provided in Approved Document L2A should be followed
- b. if unheated, the fabric standards should meet those set out in Section 4.2.

### 3.8 Conservatories and porches

**3.8.1** Conservatories and porches should be included in the **DER** calculations only if they are constructed at the same time as a new **dwelling**; and

- a. there is no thermal element between the **dwelling** and the conservatory and/or porch;  
or
- b. the conservatory and/or porch will be heated via fixed heating.

### 3.9 Swimming pools

**3.9.1** Where a swimming pool is constructed as part of a new **dwelling**, the **dwelling** should be assessed as if the pool basin was not present, while the pool hall should be included in the calculation of the **DER**. The area covered by the pool basin should be taken into account in the calculation, as an equivalent area of floor, and a U-value equal to the pool surround should be assigned to this.

### 3.10 Demonstrating compliance

**3.10.1** Before commencement of construction work, the **BCB** must be notified of the as-designed values of the **DER** and **TER**, thereby confirming that the as-designed **dwelling** complies with Criterion 1. In addition, the **BCB** should be given a list of specifications for building fabric, **fixed building services** and renewable systems (if any) used in calculating the **DER**.

**3.10.2** It is expected that software implementations of SAP2012 will be used to produce, in addition to the design stage **DER** and **TER**, the list of specifications and highlight those 'key features' of the design that are critical to achieving compliance (see Section 9 for more details of the 'key features' to be identified). These 'key features' may be used to prioritise the risk-based inspection of the **dwelling** as part of confirming compliance with the Building Regulations. If a provisional energy rating is calculated at this stage and an interim recommendations report is therefore available, the recommendations should be reviewed to see if further carbon mitigation measures could be incorporated in a cost effective manner.

**3.10.3** On completion of the building works for a **dwelling**, the **BCB** must be notified of the final values of the **DER** and **TER**, thereby confirming that the completed **dwelling**

## The DER must be no greater than the TER

complies with Criterion 1. Supporting information must also be provided confirming if the construction was in accordance with the specification submitted to the **BCB** prior to commencement of work and, if not, all changes must be clearly listed. The **BCBs** are authorised to accept, as evidence of compliance of Criterion 1, a certificate to this effect signed off by a suitably accredited energy assessor.

**3.10.4** For all specifications, prior to commencement of work and after completion, it would be useful to provide the **BCB** with additional information to support the values used in the **DER** calculation. For example, U-values might be determined from a specific calculation, in which case the details should be provided, or from an accredited source, in which case a reference to that source would be sufficient. For a boiler, the model reference and fuel type is sufficient evidence to allow the claimed performance to be checked against the SEDBUK (Seasonal Efficiencies of Domestic Boilers in the UK) database.

**3.10.5** More information on notifying the **BCB** is given in Section 9.

# Section 4 - Criterion 2

## Limits on design flexibility

### 4.1 Introduction

**4.1.1** Considerable flexibility is allowed in devising a design and specification strategy to demonstrate compliance with Criterion 1, however the Building Regulations require that provision is made to ensure that:

- heat gains and losses through the fabric of the **dwelling** are limited; and
- energy efficient **fixed building services** with effective controls are provided to all **dwellings**.

**4.1.2** This requirement can be satisfied by

- adopting the mandatory minimum energy efficiency standards for the building fabric, which are set out in Section 4.2; and
- adopting the guidance for minimum energy efficiency standards for building services and associated controls which are set out in Section 4.3.

**4.1.3** Meeting the standards set in this section of the Approved Document, for building fabric and fixed services, should be considered a starting point towards achieving the **TER**. It is likely that the design standards will need to be considerably better than the stated values in more than one aspect. The specification in Appendix B provides a better indication of the standards that will be required to meet the **TER**.

### 4.2 Building fabric

#### Regulation 26B – Fabric performance values for new dwellings

Where a dwelling is erected, it must not exceed the target fabric performance values for the dwelling which have been approved pursuant to regulation 25C(b).

#### Regulation 25C – New Buildings: Minimum energy performance requirements

Minimum energy performance requirements may be approved by the Welsh Ministers, in accordance with the methodology approved pursuant to regulation 24, for-  
(b) new dwellings in the form of target fabric performance values.

**4.2.1** In order to demonstrate compliance with **regulation 25C (b)**, the fabric performance values must be as good as or better than the worst acceptable values set out in Table 1.

|  |   |
|--|---|
| External walls   | 0.21 W/m <sup>2</sup> .K                        |
| Party walls  | 0.20 W/m <sup>2</sup> .K                        |
| Floor  | 0.18 W/m <sup>2</sup> .K                        |
| Roof   | 0.15 W/m <sup>2</sup> .K                        |
| Windows, roof windows, glazed roof lights, curtain walling <sup>2</sup> and pedestrian doors | 1.60 W/m <sup>2</sup> .K                        |
| Air permeability <sup>3</sup>  | 10.00 m <sup>3</sup> /h.m <sup>2</sup> at 50 Pa |

<sup>2</sup> The limiting value for curtain walling is an area-weighted average for the whole facade.

<sup>3</sup> Unless opting for alternative to air permeability testing on small sites which must be carried out in accordance with 3.3.2b(i) and 6.4.10b.

# Section 4 - Criterion 2

## Limits on design flexibility

# L1A

**4.2.2** The stated U-values for the main building elements are expressed as area-weighted average value for all types of that element in each **dwelling**.

**4.2.3** Approved Document C provides worst acceptable U-values for individual sections comprising each element to minimise the risk of condensation in **dwelling**s.

**4.2.4** U-values should be calculated as given in Appendix C of this Approved Document.

### 4.3 Fixed building services

**4.3.1** Guidance on the minimum energy efficiency standards of **fixed building services** is set out in the Domestic Building Services Compliance Guide<sup>4</sup>.

**4.3.2** The energy efficiency of each **fixed building service** should be as good as or better than the worst acceptable value for the particular type of appliance or system as set out in the Domestic Building Services Compliance Guide. If the type of appliance is not covered, then it would be reasonable to demonstrate that the proposed system is no less efficient than a comparable system that is covered by the Domestic Building Services Compliance Guide.

**4.3.3** The efficiency claimed for the **fixed building service** should be based on the appropriate test standard as set out in the Domestic Building Services Compliance Guide, and the test data should be certified by a notified body. It would be reasonable for a Building Control Body (**BCB**) to accept such data at face value. In the absence of such quality assured data, the **BCB** would need to satisfy itself that the claimed performance is justified.

### 4.4 Demonstrating compliance

**4.4.1** It is expected that software implementations of SAP2012 will be used to produce, in addition to the **DER/TER** comparison, the list of specifications and highlight those features of the design that are critical to achieving compliance. This would include a list of the minimum building fabric and services standards that must be met in order to comply with Criterion 2, alongside the comparable fabric and services specifications for the actual **dwelling**.

**4.4.2** The **BCBs** are authorised to accept, as evidence of compliance with Criterion 2, a certificate to this effect signed off by a suitably accredited energy assessor, both at the stage prior to commencement of work and post-completion.

**4.4.3** In addition to the list of specifications produced by the software implementations of SAP 2012, supporting information including product specification and data from product manufacturers should be provided. More detail on notifying the **BCB** is given in Section 9.

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<sup>4</sup> Domestic Building Services Compliance Guide, CLG, 2013 Edition.

## Limiting overheating due to solar and other gains

### 5.1 Introduction

**5.1.1** In order to comply with the Building Regulations, reasonable provision should be made to limit overheating in new **dwelling**s from solar and other heat gains during the summer months.

**5.1.2** Solar gains are beneficial in winter as a means of offsetting space-heating demand and may be maximised by passive design measures like provision of windows with optimum orientation. Windows are also incorporated to ensure adequate daylight into the living spaces, to limit the use of artificial lighting. These measures may however contribute to overheating in the summer months, unless appropriate design considerations are made.

**5.1.3** The risk of overheating should be limited within **dwelling**s by non-mechanical means, regardless of whether a mechanical cooling system is to be installed.

**5.1.4** It is recommended that the risk of overheating is evaluated early in the design process to ensure that solar and other gains can be minimised appropriately.

### 5.2 Limiting the effects of solar gain in the summer

**5.2.1** Limiting the effects of solar gain in summer can be achieved by an appropriate combination of window size and orientation, solar protection through shading and other solar control measures, ventilation (day and night) and thermal capacity.

**5.2.2** If ventilation is provided using a balanced mechanical system, consideration should be given to providing a summer bypass function during warm weather (or allow the **dwelling** to be naturally ventilated) so that the ventilation is more effective in reducing overheating.

**5.2.3** When seeking to limit solar gains, consideration should be given to the provision of adequate levels of daylight. BS 8206 – 2 Code of practice for daylighting<sup>5</sup> gives guidance on maintaining adequate levels of daylight.

**5.2.4** Reducing window area will have conflicting impacts on the energy efficiency of a building: reduced solar gains will help minimise the risk of overheating but may cause an increase in the use of electric lighting due to inadequate levels of daylight. Although the Building Regulations do not specify minimum daylight requirements, as a general guide, if the area of glazing is much less than 20 per cent of the total floor area, some parts of the **dwelling** may experience poor levels of daylight. Designers should also consider the impact of site layout on internal daylighting. BR 209 'Site layout planning for daylight and sunlight' PJ Littlefair 2nd edition gives guidance on this issue.

### 5.3 Evaluating the risk of overheating from solar gains

**5.3.1** Appendix P of SAP 2012 provides a procedure to check whether there is a risk of overheating in **dwelling**s from solar gains.

**5.3.2** The risk of overheating should be assessed regardless of whether or not the **dwelling** has mechanical cooling. If the **dwelling** is to be installed with a mechanical cooling system, the assessment should be based on the design without the cooling system operating, but with an appropriate assumption about effective air change rate through openable windows.

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<sup>5</sup> BS 8206–2:2008 Lighting for buildings. Code of practice for daylighting.

## Limiting overheating due to solar and other gains

**5.3.3** Designers may wish to go beyond the requirements in the current Building Regulations to consider the impacts of future global warming on the risks of higher internal temperatures occurring more often. CIBSE TM 36 Climate change and the indoor environment<sup>6</sup> gives guidance on this issue.

### 5.4 Limiting the effects of other heat gains

**5.4.1** In addition to solar gain and high external temperatures contributing to the risk of **dwelling**s overheating, there may be sources of internal heat gains from the **fixed building services** providing space and water heating to the **dwelling**.

**5.4.2** Guidance on the insulation of primary pipework within **dwelling**s, and hot water distribution pipes in common areas where blocks of flats are serviced via a communal heating system, can be found in the *Domestic Building Services Compliance Guide*.

### 5.5 Reasonable provision to demonstrate compliance

**5.5.1** Reasonable provision towards demonstrating compliance with this Criterion would be achieved if the evaluation using Appendix P of the SAP assessment indicates that the **dwelling** will not have a high risk of internal temperatures being high.

**5.5.2** Reasonable provision to demonstrate that heat losses from circulation pipes used for hot water services have been limited will be made by following the guidance set out in the *Domestic Building Services Compliance Guide* with regards to insulation of hot water distribution systems.

**5.5.3** More detail on notifying the **BCB** is given in Section 9.

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<sup>6</sup> TM36 Climate change and the indoor environment: impacts and adaptation, CIBSE, 2005.

## Dwelling construction and performance consistent with DER

### 6.1 Introduction

**6.1.1** In order that the intended performance in use of fuel and power is achieved, **dwelling**s must be constructed and equipped so that the performance is consistent with the Dwelling Emissions Rate (**DER**) as calculated at the completion of the building work. In normal circumstances, reasonable provision would be to demonstrate by evidence that:

- a. party wall and other thermal bypasses are reasonably limited (Section 6.2); and
- b. the insulation is reasonably continuous over the whole building envelope to limit thermal bridging (Section 6.3); and
- c. the air-permeability is within reasonable limits (Section 6.4); and
- d. the **fixed building services** and their controls are installed and **commissioned** so that they use no more fuel and power than is reasonable under the circumstances (Section 6.5).

### 6.2 Party wall and other thermal bypasses

**6.2.1** Where the layer of insulation is not contiguous with the line defining the air-barrier of a building, there is a possibility that a gap may occur which would be subject to movement of cold air from outside, thereby setting up heat loss through **a thermal bypass**. Common instances of this would include:

- a. An uninsulated and unsealed cavity party wall in which heat flowing from adjacent **dwelling**s into the cavity may set up air circulation due to stack effect. This would cause the warmed air to rise through the cavity and pull in cool air from the underfloor void.
- b. In a room-in-roof situation, where the insulation layer may be installed between the roof rafters and continue to the eaves but the **air-permeability** barrier is installed along the stud walls that define the habitable space. In this case, cold air from outside can enter the space that is bound by insulation and therefore heated, due to the absence of any specific air-tightness barrier.

*In a room-in-roof design, the insulation layer may follow the sloping roof sections to a horizontal ceiling then continue at ceiling level. In such a case it is important that the party wall cavity seal follows the line of the insulation in the slope and horizontal ceiling sections (though for the purposes of Part B (Fire) it may be necessary to ensure that the fire cavity barrier follows the slope to the ridge). In the case of flats, the sealing system should follow the line of party floors and other party structures as well as the main thermal envelope.*

**6.2.2** The extent of air flow and heat loss will depend on a number of external conditions such as degree of exposure, wind and temperatures and the air movement and resulting heat losses can be significant.

**6.2.3** As a general rule, the line of insulation must be contiguous with the air-barrier in buildings, and where this is not possible, the gap in between must be filled with solid material.



## Dwelling construction and performance consistent with DER

**6.2.4** While previously it was believed that there may be no net heat loss across party walls between **dwelling**s, it has been observed that in the case of uninsulated and unsealed cavity party walls, heat loss due to thermal bypass can be equivalent to these surfaces having a U-value of 0.5W/m<sup>2</sup>K or greater.

**6.2.5** This heat loss can be reduced by measures that restrict air movement through the cavity, either by fully filling the cavity and/or by providing effective sealing around the perimeter. The extent to which heat loss can be reduced will be dependent on the detailed design and the quality of construction.

**6.2.6** For the purpose of carrying out the **DER** calculations, the party wall U-values to be used for different types of construction adopted are listed in Table 2.

| Table 2 - U-values for party walls  |                              |
|---|------------------------------|
| Party wall construction   | U-value (W/m <sup>2</sup> K) |
| Solid   | 0.0                          |
| Unfilled cavity with effective sealing around all exposed edges and in line with insulation layers in abutting elements   | 0.2                          |
| A fully filled cavity with effective sealing at all exposed edges and in line with insulation layers in abutting elements | 0.0                          |

**6.2.7** In applying the U-values in Table 2, the following must be considered:

- a. where edge sealing is adopted, either on its own or in conjunction with a fully filled cavity, the sealing must be effective in restricting air flow and be aligned with the thermal envelope. Although effective sealing may be part of a cavity barrier which is provided in order to comply with Part B (Fire Safety), a cavity barrier on its own may not be effective in restricting air flow. In order to claim either of the listed U-values, it will be necessary to demonstrate that the design adopted is likely to be robust under normal site conditions.
- b. the sealing system must be applied in such a way so as to be in line with the thermal envelope.
- c. any solution to reducing party wall heat loss must take into the requirements of Part E (Resistance to the passage of sound) of the Building Regulations. It should be noted that fully filling the cavity may have implications for sound transmission through party walls and if following this route, evidence must be submitted to the Building Control Body (**BCB**) confirming that the requirements of Part E will be satisfied, either by adopting details accredited under the Robust Details scheme, or through specific site testing.

### 6.3 Thermal bridging

**6.3.1** The building fabric should be constructed so that there are no reasonably avoidable **thermal bridges**. **Thermal bridges** are instances where heat loss is worse than through the main building fabric. They allow heat to flow between the outer and inner surfaces of a wall, floor and roof by bridging the insulation.

**6.3.2** **Thermal bridges** occur in the building fabric

## Dwelling construction and performance consistent with DER

- a. where there are gaps in the continuity of the insulation layer,
- b. at the joints between two elements, such as where the external wall meets the ground floor, and
- c. at the edges of an element, such as around a window opening.

**6.3.3** Ways of demonstrating that reasonable provision has been made in the **DER** calculations are as follows.

- a. adopt approved design details such as those set out in the DCLG Accredited Construction Details<sup>7</sup> (ACD) or those that are formally recognised by the Welsh Government. The calculated linear thermal transmittance values can be used directly in the DER calculation; or
- b. use linear thermal transmittance values for construction joint details that have been calculated by a person with suitable expertise and experience following the guidance set out in *BRE Report 497 Conventions for calculating linear thermal transmittance and temperature factors*. These values can be used directly in the **DER** calculation. Reasonable provision for temperature factors is that they should achieve a performance no worse than that set out in *BRE Information Paper IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of a building*, or;

*Evidence of suitable expertise and experience for calculating linear thermal transmittance would be to demonstrate that the person has been trained in the software used to carry out the calculation, has applied the model to the example calculations set out in BR 497 and has achieved results that are within the stated tolerances.*

- c. use the linear thermal transmittance values in the 'default' column of Table K1 in SAP 2012 directly in the **DER** calculation; or
- d. use a conservative default  $\gamma$ -value of 0.15 W/m<sup>2</sup>K, rather than linear thermal transmittance values for each construction joint, in the **DER** calculation.

**6.3.4** The alternative approaches for using linear thermal transmittance values in paragraphs 6.3.3 (a), (b) and (c) are not mutually exclusive. For example, a builder could use approved design details for the majority of the junctions, but use a calculated bespoke detail for the window head. Furthermore, where design details via paragraphs 6.3.3 (a) or (b) are adopted for some junctions but not all junctions, the linear thermal transmittance values in the 'default' column of Table K1 in SAP 2012 should be used for the other junctions.

**6.3.5** It should be noted that wherever a party wall penetrates an insulation layer, such as when the blockwork of a masonry party wall penetrates insulation at ceiling level, a **thermal bridge** is likely to exist. This will be the case even where the party wall U-value is zero. The **thermal bridging** at this location will need to be taken into account as well in the **DER** calculations.

**6.3.6** When using details as determined from paragraphs 6.3.3 (a) and (b), the builder should demonstrate to the **BCB** that an appropriate system of site inspection is in place

<sup>7</sup> [www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/acd/](http://www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/acd/)

## Dwelling construction and performance consistent with DER

to give confidence that the construction procedures achieve the required standard of consistency. The following are examples of how this can be achieved:

- a. if adopting approved design details, one way of achieving this would be to produce a report demonstrating that the compliance checklists outlined with the details have been completed and show satisfactory results.
- b. if adopting details where linear thermal transmittance has been calculated following procedures described in this Approved Document, one way of achieving this would be to produce a report including evidence of site quality control during the construction period of the thermal insulation and air barrier (e.g. photographs, site reports etc).

### 6.4 Air-pressure testing

#### Regulation 43 - Pressure testing

- (1) This regulation applies to the erection of a building in relation to which paragraph L1(a)(i) of Schedule 1 imposes a requirement.
- (2) Where this regulation applies, the person carrying out the work shall, for the purpose of ensuring compliance with regulation 26 and paragraph L1(a)(i) of Schedule 1:
  - (a) ensure that:
    - i. pressure testing is carried out in such circumstances as are approved by the Secretary of State; and
    - ii. the testing is carried out in accordance with a procedure approved by the Secretary of State; and
  - (b) subject to paragraph (5), give notice of the results of the testing to the local authority.
- (3) The notice referred to in paragraph (2)(b) shall:
  - (a) record the results and the data upon which they are based in a manner approved by the Secretary of State; and
  - (b) be given to the local authority not later than seven days after the final test is carried out.
- (4) A local authority is authorised to accept, as evidence that the requirements of paragraph (2)(a)(ii) have been satisfied, a certificate to that effect by a person who is registered by the British Institute of Non-destructive or the Air Tightness and Testing and Measuring Association in respect of pressure testing for the air tightness of buildings.
- (5) Where such a certificate contains the information required by paragraph (3)(a), paragraph (2)(b) does not apply.

**6.4.1** This section sets out the approved circumstances under which air-pressure testing is to be carried out in order to demonstrate compliance with **regulation 43**– Pressure testing.

**6.4.2** The approved procedure for pressure testing of the building envelope of **dwelling**, and recording the results and underpinning data is given in the ATTMA publication

## Dwelling construction and performance consistent with DER

*Measuring air permeability of building envelopes*<sup>8</sup>. The preferred test method is that trickle ventilators should be temporarily sealed rather than just closed.

**6.4.3** **BCBs** should be provided with evidence that test equipment has been calibrated within the previous 12 months using a UKAS-accredited facility and that the person has received appropriate training and is registered to test the specific class of building concerned.

**6.4.4** On each development, the number of **dwelling(s)** to be air-pressure tested should be selected based on the following, whichever is less:

- a. three units of each **dwelling type**; or,
- b. 50 per cent of all instances of that **dwelling type**.

**6.4.5** The **dwelling(s)** to be tested should be taken from the first completed batch of units of each **dwelling type**. Most larger developments will include many **dwelling types** and multiple units of each type should be tested to confirm the robustness of the designs and the construction procedures.

**6.4.6** For the purposes of this Approved Document, a block of flats should be treated as a separate development irrespective of the number of blocks on the site. This means that the **dwelling types** from which the sample of **dwelling(s)** to be tested is selected must be identified separately each time a block of flats is repeated across a development.

**6.4.7** The specific **dwelling(s)** making up the test sample should be selected by the **BCB** in consultation with the pressure tester. These should be selected for testing so that about half of the scheduled tests for each **dwelling type** are carried out during construction of the first 25 per cent of each **dwelling type**. All tests on **dwelling(s)** in the sample must be reported to the **BCB**, including any test failure. This is to enable lessons to be learned and adjustments to design and/or site procedures to be made before the majority of the **dwelling(s)** are built.

**6.4.8** Compliance would be demonstrated if:

- a. the measured **air permeability** is not worse than the limit value of 10 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa; and
- b. the **DER** calculated using the measured **air permeability** is not worse than the **TER**.

**6.4.9** If satisfactory performance is not achieved, then remedial measures should be carried out on the **dwelling**, and,

- a. a new test should be carried out until the **dwelling** achieves the above criteria, and
- b. a further **dwelling** of the same **dwelling type** should be tested, thereby increasing the overall sample size, and
- c. other **dwelling(s)** of the same **dwelling type** that have not been tested should be examined and, where appropriate, similar remedial measures applied.

**6.4.10** In developments where no more than two **dwelling(s)** are to be erected, an alternative approach to specific pressure testing may be taken, through which alternative provision would be as follows:

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<sup>8</sup> *Measuring air permeability of building envelopes (dwellings)*, Technical Standard L1, ATTMA, 2010

## Dwelling construction and performance consistent with DER

- a. If it can be demonstrated that during the preceding 12 month period, a **dwelling** of the same **dwelling type** constructed by the same builder had been pressure tested according to the procedures set out in this Approved Document, the **DER** can be calculated using this air permeability (increased by a value of 2.0 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa as described in section 3.3); or
- b. avoid the need for any pressure testing by using a value of 15 m<sup>3</sup>/(h.m<sup>2</sup>) at 50 Pa for the **air permeability** when calculating the **DER**.

### 6.5 Commissioning of building services

#### Regulation 44 - Commissioning

- (1) This regulation applies to building work in relation to which paragraph F1(2) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed system for mechanical ventilation or any associated controls where testing and adjustment is not possible.
- (2) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed building service where testing and adjustment is not possible or would not affect the energy efficiency of that fixed building service.
- (3) Where this regulation applies the person carrying out the work shall, for the purpose of ensuring compliance with paragraph F1(2) or L1(b) of Schedule 1, give to the local authority a notice confirming that the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State.
- (4) The notice shall be given to the local authority—
  - (a) not later than the date on which the notice required by regulation 16(4) is required to be given; or
  - (b) where that regulation does not apply, not more than 30 days after completion of the work.

**6.5.1** Regulation 44 requires the **commissioning of fixed building services** by testing and adjustment as necessary to ensure that they are handed over in efficient working order. This includes both the systems and associated controls.

**6.5.2** This regulation does not apply to **fixed building services** where testing and adjustment is not possible, for instance where the only controls are 'on' and 'off' switches. Examples of this would be some mechanical extraction systems or single fixed electrical heaters. The regulation also does not apply to **commissioning of fixed building services** which would have no effect on energy use.

**6.5.3** A commissioning plan should be prepared in advance, identifying the systems that need to be tested and the tests that will be carried out, and provide this with the design stage **DER/TER** calculation so that the **BCB** can check the **commissioning** is being done as the work proceeds. This plan should also identify the **fixed building services** which do not require **commissioning**, along with the reason for not requiring **commissioning**.

## Dwelling construction and performance consistent with DER

*An appropriate way of documenting the process would be the use of the templates in the Model Commissioning Plan (BSRIA BG 8/2009).*

**6.5.4** Where **commissioning** is carried out, it must be done in accordance with the following procedure approved by the Welsh Ministers:

- a. For heating and hot water systems the approved procedures are set out in the *Domestic Building Services Compliance Guide*.
- b. For ventilation systems, the approved procedure is set out in the *Domestic Ventilation: Installation and Commissioning Compliance Guide*<sup>9</sup>.

**6.5.5** **Commissioning** is often carried out by the person who installs the system. In other cases it may be carried out by a subcontractor or by a specialist firm. It is important that whoever carries it out follows the relevant approved procedure in doing so.

**6.5.6** Notice of **commissioning** of any **fixed building services** should be given to the **BCB** within five working days of the completion of the **commissioning** work (or within thirty days if the work is carried out by a person registered with a competent person scheme). The notice should include confirmation that the **commissioning** plan has been followed and that the test results show performance in accordance with the design requirements (including written commentary where any differences are proposed to be accepted by the **BCB**). Until the **Building Control Body** receives the **commissioning** notice it cannot be reasonably satisfied that Part L has been complied with and consequently is unlikely to be able to provide a certificate of compliance.

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<sup>9</sup> Domestic Ventilation: Installation and Commissioning Compliance Guide, CLG, 2010.

## Providing energy efficient operation of dwellings

### 7.1 Introduction

#### Regulation 40 – Information about use of fuel and power

- (1) This regulation applies where paragraph L1 of Schedule 1 imposes a requirement relating to building work
- (2) The person carrying out the building work shall not later than 5 days after the work has been completed provide the owner with sufficient information about the building, 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.

**7.1.1** In accordance with **regulation 40** the owner of the **dwelling** should be provided with 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.

### 7.2 Reasonable provision to demonstrate compliance

**7.2.1** A way of complying with the requirement would be to provide a suitable set of operating and maintenance instructions aimed at assisting the occupiers of the home achieve the expected level of energy efficiency. The documentation should:

- a. be specific to the **dwelling**; and,
- b. be in a durable format that can be kept and referred to over the service life of the various systems and components; and,
- c. include relevant information in an easily understood format.

**7.2.2** Without prejudice to the need to comply with health and safety requirements, this should:

- a. Explain the essential design principles (insulation, materials, etc.) and the key features, with floor plans showing the location of the main heating and ventilation components in the **dwelling**.
- b. Explain how to operate, control and maintain the following systems:
  - i. Space heating system
  - ii. Hot water heating system
  - iii. Ventilation system
  - iv. Any other technology which has been included in the **dwelling** e.g. solar panels or other low and zero carbon technology, or a technology for which SAP Appendix Q has been utilised.
- c. Signpost other important documentation which should include:
  - i. appliance manuals
  - ii. the data used to calculate the **DER** and the **TER**
  - iii. the Recommendations Report generated with the “on- construction” Energy Performance Certificate, which will inform the occupier as to how the energy performance of the **dwelling** might be further improved.

# Section 7 - Criterion 5

L1A

## Providing energy efficient operation of dwellings

*It would be sensible to retain an electronic copy of the input file for the DER/TER calculation to facilitate any future analysis that may be required by the owner when altering or improving the **dwelling**.*



# Section 8 - Calculating target CO<sub>2</sub> Emission Rate (TER)

## 8.1 Introduction

### Regulation 24 - Methodology of calculation and expression of energy performance

(1) The Secretary of State shall approve—

- (a) a methodology of calculation of the energy performance of buildings, including methods for calculating asset ratings and operational ratings of buildings; and
- (b) ways in which the energy performance of buildings, as calculated in accordance with the methodology, shall be expressed.

(2) In this regulation—

‘asset rating’ means a numerical indicator of the amount of energy estimated to meet the different needs associated with a standardised use of the building; and

‘operational rating’ means a numerical indicator of the amount of energy consumed during the occupation of the building over a period of time.

### Regulation 25 - Minimum energy performance requirements for new buildings

The Secretary of State shall approve minimum energy performance requirements for new buildings, in the form of target CO<sub>2</sub> emission rates, which shall be based upon the methodology approved pursuant to regulation 24.

**8.1.1** The Target CO<sub>2</sub> Emission Rate (**TER**) is the minimum energy performance requirement for a new **dwelling** approved by the Welsh Ministers in accordance with **regulation 25**, expressed in terms of the mass of CO<sub>2</sub>, in units of kg per m<sup>2</sup> of floor area per year, emitted when the **dwelling** is built to the elemental specification as summarised in Appendix B of this Approved Document. In accordance with the methodology approved by the Welsh Ministers in the Notice of Approval<sup>10</sup>, the **TER** for individual **dwelling**s must be calculated using SAP 2012.

**8.1.2** The **TER** must be calculated in two stages:

a. In the first instance, CO<sub>2</sub> emissions must be calculated for a dwelling of the same size and shape as the actual dwelling and which is constructed according to the elemental values set out in SAP Appendix R (and summarised in Appendix B of this Approved Document), using SAP 2012. No values may be varied from these reference values while making these calculations, which will report the CO<sub>2</sub> emissions arising from:

- i. The provision of space heating and hot water, C<sub>H</sub>
- ii. The use of pumps and fans, C<sub>PF</sub>
- iii. The use of internal lighting, C<sub>L</sub>

b. The **TER** will then be calculated using the following formula:

$$TER = C_H \times FF + C_{PF} + C_L$$

where FF is the fuel factor taken from Table 3 in accordance with the approach described in 8.1.3.

<sup>10</sup> Notice of Approval of the methodology of calculation of the energy performance of buildings in Wales.

Calculating target CO<sub>2</sub> Emission Rate (TER)

| Table 3: Fuel Factors  |             |
|--|-------------|
| Heating fuel   | Fuel factor |
| Mains gas  | 1.00        |
| LPG  | 1.06        |
| Oil  | 1.17        |
| B30K   | 1.00        |
| Grid electricity for direct acting and storage systems   | 1.55        |
| Grid electricity for heat pumps  | 1.55        |
| Solid mineral fuel <sup>1</sup>  | 1.35        |
| Any fuel with a CO <sub>2</sub> emission factor less than that of mains gas  | 1.00        |
| Solid multi-fuel <sup>1</sup>  | 1.00        |
| <b>Notes:</b>  |             |
| 1. The specific fuel factor should be used for those appliances that can only burn the particular fuel. Where an appliance is classed as multi-fuel, the multi-fuel factor should be used except where the dwelling is in a Smoke Control Area. In such cases the solid mineral fuel figure should be used, unless the specific appliance type has been approved for use within Smoke Control Areas. |             |

**8.1.3** The fuel factor to be applied for the calculation of the **TER** must be selected from Table 3 based on the fuel that will be used to provide space and water heating to the actual **dwelling**, using the following guidelines:

- a. Where the same fuel serves all space heating and domestic hot water appliances, the fuels used in those appliances.
- b. Where the space and domestic hot water in the **dwelling** are served by more than one appliance and these are served by different fuels:
  - i. mains gas if any of the appliances are fired by mains gas; otherwise
  - ii. the fuel used for the appliance providing the largest proportion of the space heating.
- c. For **dwelling**s connected to a community heating system:
  - i. mains gas, if the community heating system is supplied by mains gas, for any proportion of the heat; otherwise
  - ii. the fuel that provides the most heat for the community heating system.

## 8.2 Secondary heating

**8.2.1** As shown in Appendix B, the elemental specifications assume that there is no secondary heating in the calculation of the **TER**.

# Section 8 - Calculating target CO<sub>2</sub> Emission Rate (TER)

## 8.3 Internal lighting

**8.3.1** All fixed internal lighting, with the exception of emergency escape lighting and specialist process lighting, are assumed to be installed with low-energy lamps while calculating the **TER** of a **dwelling**.

## 8.4 Apartments and terraces

**8.4.1** Where a building contains more than one **dwelling** (such as in a terrace of houses or in a block of flats), an average **DER** and **TER** can be calculated for all the **dwelling**s in the building. In such cases, the average **TER** is the floor-area-weighted average of all the individual **TER**s, and is calculated according to the following formula:

$$\{(TER1 \times \text{Floor area1}) + (TER2 \times \text{Floor area2}) + (TER3 \times \text{Floor area3}) + \dots\} \div \{(\text{Floor area1} + \text{Floor area2} + \text{Floor area3}) + \dots\}$$

Block averaging is only permitted for multiple **dwelling**s in the same building. It is not permitted across multiple buildings on the same development site.

## 8.5 Conservatories and porches

**8.5.1** Conservatories and porches must be included in the **TER** calculations only if they are constructed at the same time as a new **dwelling**; and

- a. there is no thermal element between the dwelling and the conservatory and/or porch;
- or
- b. the conservatory and/or porch will be heated via fixed heating.

## 8.6 Swimming pools

**8.6.1** Where a swimming pool is constructed as part of a new **dwelling**, the **dwelling** should be assessed as if the pool basin was not present, while the pool hall should be included in the calculation of the **TER**.

**8.6.2** The area covered by the pool basin should be taken into account in the calculation, as an equivalent area of floor.

## Notifying Building Control and demonstrating compliance

### 9.1 Introduction

**9.1.1** In all cases where it is proposed to erect a new *dwelling*, Building Regulations require the person proposing to carry out the work to notify a **BCB**, either the local authority or an approved inspector, in advance of any work starting. This notification would usually be by way of full plans (or possibly a building notice) given to a local authority, or an initial notice given jointly with the approved inspector. However, some elements of the work may not need to be notified to a **BCB** in advance as set out in Section 9.2.

**9.1.2** Sections 3 to 7 detail the evidence to demonstrate compliance with the *energy efficiency requirements* both at the design and completed stages of construction. To facilitate effective communication between the person undertaking the work and **BCB**, it would be beneficial to adopt a standardised report format for presenting the evidence that demonstrates compliance with the *energy efficiency requirements*.

**9.1.3** Since the data in SAP 2012 and the results calculated can provide a substantial proportion of the evidence in support of the compliance demonstration, it is anticipated that software implementations of SAP 2012 will produce this report as a standard output option.

**9.1.4** It is anticipated that two versions of the standardised report would be produced by software implementations of SAP 2012: the first before commencement of works to include the as-designed calculations plus supporting list of specifications and the second after completion to include the as built calculations plus any changes to the list of specifications. The first design-stage report and accompanying list of specifications can then be used by the **BCB** to assist checking that what has been designed is actually built. A standardised report should enable the source of the evidence to be indicated, and allow the credentials of those submitting the evidence to be declared.

**9.1.5** An important part of demonstrating compliance is to make a clear the information, product specifications and the data inputs referred to for input into the compliance software (e.g. the wall construction that would deliver the claimed U-value). Examples as to how compliance software might provide this link are:

- a. By giving each data input a reference code that can be mapped against a separate submission by the applicant/developer that details the specification corresponding to each unique reference code in the data input.
- b. By providing a free-text entry facility along with each input parameter that has a unique reference code, thereby allowing the software to capture the specification of each item and so include the full details in an integrated output report.
- c. By including one or more utility programs that derive the data input from the specification, e.g. a U-value calculator that conforms to BR 443 and that calculates the U-value based on the layer thicknesses and conductivities, repeating thermal bridge effects etc. Outputs from such a utility program could then automatically generate the type of integrated report described at b. above.

**9.1.6** The report should highlight any items whose specification is better than typically expected values. The **BCB** can then give particular attention to such 'key features', as

## Notifying Building Control and demonstrating compliance

their appropriate installation will be critical in achieving the **TER**. The **BCB** should give particular attention to those aspects where the claimed specification delivers an energy efficiency standard in advance of that defined in the following schedule.

| Parameter  |  |
|--|--|
| Wall U-value   | 0.18 W/m <sup>2</sup> K                          |
| Roof U-value   | 0.13 W/m <sup>2</sup> K                          |
| Floor U-value  | 0.13 W/m <sup>2</sup> K                          |
| Window/door U-value  | 1.4 W/m <sup>2</sup> K                           |
| Thermal bridging value   | 0.04 W/m <sup>2</sup> K                          |
| Design air permeability  | 5.0 m <sup>3</sup> /(h.m <sup>2</sup> ) at 50 Pa |
| Any secondary heating appliance  |  |
| Any item involving SAP Appendix Q  |  |
| Use of any low or zero carbon technology   |  |
| <b>Note:</b> Solutions using electric resistance heating may have to better several of these fabric parameters |  |

### 9.2 Cases when notification is not needed – Competent Person Scheme

**9.2.1** Some elements of the work may not need to be notified to a **BCB**, in advance, if carried out by someone registered with a relevant Competent Person Self-certification scheme. In order to join such a scheme a person must demonstrate competence to carry out the type of work the scheme covers, and also the ability to comply with all relevant requirements in the Building Regulations. A list of these and the types of work for which they are authorised can be found at

[www.wales.gov.uk/topics/planning/buildingregs/competent-persons-scheme](http://www.wales.gov.uk/topics/planning/buildingregs/competent-persons-scheme)

**9.2.2** There are no competent person schemes that cover all aspects of the construction of a new **dwelling**. There are, however, schemes that cover the electrical and plumbing installation work and the installation of certain **fixed building services** (heating, hot water, air-conditioning, mechanical ventilation).

**9.2.3** Where work is carried out by a person registered with a competent person scheme, the occupier of the building and the **BCB** are required to be given, within 30 days of the completion of the work, a certificate confirming that the work complies fully with all applicable building regulation requirements. These certificates and notices are usually made available through the scheme operator.

**9.2.4** **BCBs** are authorised to accept these certificates and notices as evidence of compliance with the requirements of the Building Regulations. Local authority inspection and enforcement powers remain unaffected, although they are normally used only in response to a complaint that work does not comply.

## 1. Introduction

Words within this Approved Document which are in ***bold italics*** have a definition listed in this section. The following are key terms used in this document:

***Air permeability*** is the physical property used to express airtightness of the building fabric. It is defined as air leakage rate per hour per square metre of envelope area at a test reference pressure differential across the building envelope of 50 Pascal (50 N/m<sup>2</sup>). The envelope area of the building, or measured part of the building, is the total area of all floors, walls and ceilings bordering the internal volume subject to the test. This includes walls and floors below external ground level. Overall internal dimensions are used to calculate this area and no subtractions are made for the area of the junctions of internal walls, floors and ceilings with exterior walls, floors and ceilings. The ***limiting air permeability*** is the worst allowable ***air permeability***. The ***design air permeability*** is the target value set at the design stage, and must always be no worse than the limiting value. The ***assessed air permeability*** is the value used in established the ***DER***, and is based on a specific measurement of the building concerned; or on measurements of other ***dwelling***s of the same ***dwelling type***.

*The envelope area of a terraced house includes the party wall(s). The envelope area of a flat in a multiple storey building includes the floors, walls and ceilings which are shared with adjacent flats.*

***BCB*** means Building Control Body: a local authority or an approved inspector.

***Commissioning*** means the advancement of a ***fixed building service*** following the installation, replacement, extension or alteration of the whole or part of the system, from the state of static completion to working order by testing and adjusting as necessary to ensure that the system as a whole uses no more fuel and power than is reasonable in the circumstances, without prejudice to the need to comply with health and safety requirements. For each system ***commissioning*** includes setting-to-work, regulation (that is testing and adjusting repetitively) to achieve the specified performance, the calibration, setting up and testing of the associated automatic control systems, and recording of the system settings and the performance test results that have been accepted as satisfactory.

***DER*** is the ***Dwelling*** Carbon Dioxide (CO<sub>2</sub>) Emission Rate. The Dwelling CO<sub>2</sub> Emission Rate (***DER***) is expressed in terms of the mass of CO<sub>2</sub>, in units of kg per m<sup>2</sup> of floor area per year, kgCO<sub>2</sub>/(m<sup>2</sup>.year), emitted as a result of the provision of the specified ***fixed building services*** for a standardised household when assessed using approved calculation tools.

***Dwelling*** means a self-contained unit design to accommodate a single household. Buildings exclusively containing rooms for residential purposes such as nursing homes, student accommodation and similar are not ***dwelling***s, and in such cases, Approved Document L2A applies.

**Dwelling type** is a means of allocating each **dwelling** on a development to a particular group to provide the basis for the pressure-testing regime. The allocation of each **dwelling** to a **dwelling type** should be the responsibility of the person carrying out the pressure testing. To be classed as of the same **dwelling type**, **dwellings** must:

- a. be of the same generic form (i.e. detached, semi-detached, end terrace, mid-terrace, ground-floor flat, mid-floor flat, top-floor flat - including maisonettes);
- b. be of the same number of storeys;
- c. have the same **design air permeability**;
- d. have similar adjacency to unheated spaces such as stairwells, integral garages, etc.
- e. have the same principal construction details (as identified by the approved design details or bespoke detail reference codes);
- f. have a similar (i.e.  $\pm 1$ ) number of significant penetrations, i.e. for windows, doors, flues/ chimneys, supply/exhaust terminals, waste water pipes;
- g. have areas of thermal elements that do not differ by more than 10 per cent (see **air permeability** for a definition of envelope area).

**Energy efficiency requirements** are the requirements of the Building Regulations covered by this Approved Document. See Section 2.1 for more details.

**Energy performance certificate** means a certificate which complies with the requirements of regulation 29 in these regulations

**Fixed building services** means any part of, or any controls associated with—

- (a) fixed internal or external lighting systems (but not including emergency escape lighting or specialist process lighting);
- (b) fixed systems for heating, hot water, air conditioning or mechanical ventilation;  
or
- (c) any combination of systems of the kinds referred to in paragraph (a) or (b).

**Low and Zero Carbon Technologies (LZCs)** means technologies that produce renewable non-fossil fuel energy and fossil-fuel technologies that are capable of supplying low carbon energy such as combined heat and power and heat pumps.

**TER** is the Target Carbon Dioxide (CO<sub>2</sub>) Emission Rate. It is expressed in terms of the mass of CO<sub>2</sub>, in units of kg per m<sup>2</sup> of floor area per year, kgCO<sub>2</sub>/(m<sup>2</sup>.year) emitted when the **dwelling** is built to the elemental specification summarised in Appendix B of this Approved Document.

**Thermal element** is used in the Building Regulations to describe a wall, floor or roof, which separates a heated or cooled space from the external environment, the ground, and any parts of the building which are not heated or cooled or, where another part of the building which is not a dwelling, is heated or cooled to a different temperature.

# Appendix B – Elemental specification for the TER

## L1A

1. The elemental specification which must be used to calculate the **TER** of a new **dwelling** is given in SAP Appendix R. A summary is given in the table below.

2. Note that the elemental specification states an airtightness of 5.0 m<sup>3</sup>/h.m<sup>2</sup> at 50Pa. Approved Document F provides two sets of guidance for new dwellings: the default case is ventilation provisions appropriate for all dwellings and an alternative approach of lesser ventilation provisions for dwellings with an airtightness leakier than 5.0 m<sup>3</sup>/h.m<sup>2</sup>. It is recommended that the default ventilation provisions are installed if constructing to the elemental specification. The elemental specification is not prescriptive and alternative specifications (including air tightness and associated ventilation provisions) can be adopted as long as they meet the requirements set out in this document.

| Table B1 Elemental Specification                          |  |
|---|--|
| Element or System   | Specification  |
| Opening areas (windows and doors)                         | Same as actual dwelling up to a maximum proportion of 25% of total floor area[1]   |
| External Walls  | 0.18 W/m <sup>2</sup> K  |
| Party Walls   | 0.0 W/m <sup>2</sup> K   |
| Floor   | 0.13 W/m <sup>2</sup> K  |
| Roof  | 0.13 W/m <sup>2</sup> K  |
| Windows, roof windows, glazed rooflights and glazed doors | 1.4 W/m <sup>2</sup> K [2]<br>(whole window u-value)   |
|   | g-value = 0.63 [3]   |
| Opaque doors  | 1.0 W/m <sup>2</sup> K   |
| Semi glazed doors   | 1.2 W/m <sup>2</sup> K   |
| Air tightness   | 5.0 m <sup>3</sup> /h.m <sup>2</sup> at 50Pa   |
| Linear thermal transmittance                              | Standardised psi values – See SAP Appendix R, except use of y=0.05 W/m <sup>2</sup> K if the default value of y=0.15 W/m <sup>2</sup> K is used in the actual building |
| Ventilation type  | Natural (with extract fans)[4]   |
| Air conditioning  | None   |
| Heating System  | Mains Gas  |
|   | If combi in actual dwelling, combi boiler;<br>otherwise regulation boiler  |
|   | Radiators  |
|   | Room sealed  |
|   | Fan flue   |
| Controls  | SEDBUK 2009 89.5% efficient  |
|   | Time and temperature zone control[5]<br>Weather compensation   |
|   | Modulating boiler with interlock   |
| Hot water storage system                                  | Heated by boiler (regular or combi as above)   |
|   | If cylinder specified in actual dwelling, volume of cylinder in actual dwelling.<br>If combi boiler, no cylinder.<br>Otherwise 150 litres.                             |
|   | Located in heated space  |
|   | Thermostat controlled  |
|   | Separate time control for space and water heating  |
| Primary Pipework  | Fully Insulated  |
| Hot water cylinder loss factor (if specified)             | Declared loss factor equal or better than 0.85 x (0.2 + 0.051 V <sup>2/3</sup> ) kWh/day   |
| Secondary Space Heating                                   | None   |
| Low Energy Lighting                                       | 100% Low Energy Lighting   |
| Thermal Mass Parameter                                    | Medium (TMP=250)   |



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## Notes relating to the Elemental Specification:

- (1) The Building Regulations do not specify minimum daylight requirements. However, reducing window area produces conflicting impacts on the predicted CO<sub>2</sub> emissions: reduced solar gain but increased use of electric lighting. As a general guide, if the area of glazing is much less than **20** per cent of the total floor area, some parts of the dwelling may experience poor levels of daylight, resulting in increased use of electric lighting.
  - (2) The orientation of the elemental building is the same as the actual building. The u-value is set to 1.5 W/m<sup>2</sup>K for curtain walling glazed areas, as an allowance for thermal bridging.
  - (3) Higher g-values would also comply with the recipe as increasing solar gains reduces the space heat load. However designers should be aware of the impact of g-value on the risk of overheating and optimise their choice accordingly.
  - (4) See SAP 2012 section 11: 2 fans for TFA up to 70m<sup>2</sup>; 3 fans for 70 < TFA < 100m<sup>2</sup> ; 4 fans for TFA > 100m<sup>2</sup> . A recipe approach can be followed if extract fans are replaced with the same number of passive vents.
  - (5) In order for a system to be specified with time and temperature zone control, it must be possible to program the heating times of at least two heating zones independently, as well as having independent temperature controls. These two heating zones must be space heating zones. For single storey open plan dwellings in which the living area is greater than 70% of total floor area, sub zone of temperature control is not appropriate and the recipe will default to programmer and room stat.
-

1. U-values for thermal elements (walls, roofs and floors) shall be calculated using the methods and conventions set out in BRE report *BR 443 Conventions for U-value calculations*, 2006 Edition.
2. U-values for doors and windows shall be calculated for the whole unit, i.e. for the combined performance of the glazing or door leaf and the frame, using methods and conventions set out in the BRE report *BR 443 Conventions for U-value calculations*, 2006 Edition.
3. In the case of windows, the U-value can be calculated for:
  - a. the standard window set out in BRE report *BR 443 Conventions for U-value calculations*, 2006 Edition;
  - b. the smaller of the two standard windows defined in BS EN 14351-1 [2006 (+AMD 1:2010)] *Windows and doors – Product standard, performance characteristics*; or
  - c. the specific size and configuration of the actual window.
4. In the case of a door, the U-value can be calculated for
  - a. the standard door set out in BS EN 14351-1 [2006 (+AMD 1:2010)] *Windows and doors – Product standard, performance characteristics*; or
  - b. the specific size and configuration of the actual door
5. The U-values for roof windows and roof lights set out in Table 1 have been calculated for windows positioned in the vertical plane. If a particular unit is not positioned vertically, the U-values set out in this table that are to be achieved or improved upon should be adjusted for the specific angle of the unit following the guidance set out in the BRE report *BR 443 Conventions for U-value calculations*, 2006 Edition
6. For domestic-type construction, SAP 2012 Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.
7. The U-values in Criterion 2 for out-of-plane rooflights (i.e. rooflights that sit proud of the plane of the roof, mounted on upstands or kerbs) should be based on the developed area of the glazing, rather than the aperture area. Details of how the developed area is defined and calculated are given in *Assessment of thermal performance of out-of-plane rooflights*, NARM Technical Document NTD 2 (2010).
8. U-values for indoor swimming pool basins shall be calculated using the methods and conventions set out in the *BS EN ISO 13370* [2007 incorporating corrigendum March 2009]. *Thermal Performance of Buildings. Heat transfer via the ground. Calculation Methods*.

1. Building work should be carried out in accordance with Regulation 7 of the Building Regulations. Guidance on meeting these requirements on materials and workmanship is contained in the Approved Document to Regulation 7.
2. Building regulations are made for specific purposes, including the health and safety, welfare and convenience of people and for energy conservation. Standards and other technical specifications may provide relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance such as serviceability, or aspects which, although they relate to health and safety, are not covered by the Regulations.

# Appendix E – L1A The Workplace (Health, Safety and Welfare) Regulations 1992

1. The Workplace (Health, Safety and Welfare) Regulations 1992, as amended, apply to the common parts of flats and similar buildings if people such as cleaners, wardens and caretakers are employed to work in these common parts. These Regulations contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see *Workplace health, safety and welfare, Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and guidance*, HSE publication L24, HMSO, 1996.
2. Where the requirements of the Building Regulations that are covered by this Approved Document do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

# Appendix F – Approved Documents

# L1A

1. The following documents have been approved and issued by Welsh Ministers for the purpose of providing practical guidance with respect to the requirements of the Building Regulations 2010 (2010/2214) for Wales.

Approved Document A  
Structure

Approved Document B: Fire Safety  
Volume 1: Dwellinghouses

Approved Document B: Fire Safety  
Volume 2: Buildings other than  
dwellinghouses

Approved Document C  
Site preparation and resistance to  
contaminants and moisture

Approved Document D  
Toxic substances  
Drainage and waste disposal

Approved Document E  
Resistance to the passage of sound

Approved Document F  
Ventilation

Approved Document G  
Sanitation, hot water safety and water  
efficiency

Approved Document H  
Drainage and waste disposal

Approved Document J  
Combustion appliances and fuel  
storage systems

Approved Document K  
Protection from falling, collision and  
impact

Approved Document L1A  
Conservation of fuel and power (New  
dwellings)

Approved Document L1B  
Conservation of fuel and power  
(Existing dwellings)

Approved Document L2A  
Conservation of fuel and power (New  
buildings other than dwellings)

Approved Document L2B  
Conservation of fuel and power  
(Existing buildings other than  
dwellings)

Approved Document M  
Access to and use of buildings

Approved Document N  
Glazing Safety

Approved Document P  
Electrical safety – Dwellings

Approved Document 7  
Materials and workmanship  
Approved Document L1A

# Appendix G – Documents and Standards referred to

## **Air Tightness Testing and Measurement Association (ATTMA)**

[www.attma.org](http://www.attma.org)

Measuring air permeability of building envelopes (dwellings), Technical Standard L1, 2010.

## **BRE**

[www.bre.co.uk](http://www.bre.co.uk)

BR 443 Conventions for U-value calculations, 2006. (Available at

[www.bre.co.uk/uvalues](http://www.bre.co.uk/uvalues) )

Information Paper IP1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, 2006. ISBN 978 1 86081 904 9

BRE Report BR 497 Conventions for Calculating Linear Thermal Transmittance and Temperature Factors, [2007 and 2010 amendments and conventions]. ISBN 978 1 86081 986 5

## **BSRIA**

[www.bsria.co.uk](http://www.bsria.co.uk)

BSRIA BG 8/2009 Model Commissioning Plan

## **CIBSE**

[www.cibse.org](http://www.cibse.org)

TM 36 Climate change and the indoor environment: impacts and adaptation, 2005. ISBN 978 1 90328 750 7

## **Department of Energy and Climate Change (DECC)**

[www.gov.uk/government/organisations/department-of-energy-climate-change](http://www.gov.uk/government/organisations/department-of-energy-climate-change)

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2012 (available at [www.bre.co.uk/sap2012](http://www.bre.co.uk/sap2012))

SEDBUK Boiler Efficiency Database (Available at [www.sedbuk.com](http://www.sedbuk.com) )

## **Department for Communities and Local Government**

[www.gov.uk/government/organisations/department-for-communities-and-local-government](http://www.gov.uk/government/organisations/department-for-communities-and-local-government)

Domestic Building Services Compliance Guide, 2013.

Domestic Ventilation Compliance Guide, 2013.

## **Health and Safety Executive (HSE)**

[www.hse.gov.uk](http://www.hse.gov.uk)

L24 Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations 1992 Approved Code of Practice and Guidance.

## **National Association of Rooflight Manufacturers (NARM)**

[www.narm.org.uk](http://www.narm.org.uk)

NARM Technical Document NTD 2, 2010.

## **Welsh Government**

[www.wales.gov.uk/topics/planning/buildingregs](http://www.wales.gov.uk/topics/planning/buildingregs)

Notice of approval of the methodology of calculation of the energy performance of buildings in Wales

[www.wales.gov.uk/topics/planning/buildingregs/publications/part-l-energy](http://www.wales.gov.uk/topics/planning/buildingregs/publications/part-l-energy)

## **Legislation**

Building Regulations 2010 (SI 2010/2214)

Building (Approved Inspectors etc.) Regulations 2010 (SI 2010/2215)

SI 2007/991 Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007 (as amended)

## **Standards Referred To**

**BS EN ISO 13370** Thermal performance of buildings. Heat transfer via the ground. Calculation methods [2007 incorporating corrigendum March 2009].

**BS EN 14351-1** Windows and doors. Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics [2006 (+AMD 1:2010)].

**BS 8206-2:2008** Lighting for buildings. Code of practice for daylighting.