



Llywodraeth Cymru
Welsh Government

The Building Regulations 2010

Conservation of fuel and power

Approved
Document

L2A

New buildings other than dwellings

In effect from July 2014

For use in Wales*

2014 Edition incorporating
2016 amendments

Main changes in the 2014 edition

This approved document, Approved Document L2A: Conservation of fuel and power in new buildings other than 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 26A has been introduced that requires new non-domestic buildings to achieve or better the target primary energy consumption rate.
- The Part L 2014 specifications have been strengthened to deliver 20% carbon dioxide savings across the new non domestic build mix relative to Part L 2010.
- A wider set of notional buildings has now been defined for top-lit, side-lit (heated only) and side-lit (heated and cooled) buildings. The notional building air permeability has been further sub-divided by size.
- A summary of the Part L 2014 elemental specification of these notional buildings is published at Appendix B in the Approved Document. If the actual building is constructed entirely to the notional building specifications it will meet the carbon dioxide and primary energy consumption targets 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 primary energy consumption and 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 document is in a new style format.

Main changes made by the 2016 amendments

Changes reflect alterations to the regulations, principally withdrawal of Regulations 29 to 33 of the Building Regulations 2010 and their replacement by Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012 and changes in wording of Regulations 24, 25, 26, 26A, 26B, 27A and 27B of the Building Regulations 2010. There are no technical changes.

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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 that must be complied with as stated. For example, the requirement that the target **primary energy** consumption (**TPEC**) and the target carbon dioxide (CO₂) emission rate (**TER**) 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 **non-domestic buildings** may 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.
- 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 (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 the following works on **non-domestic buildings** (i.e. buildings that are not dwellings):

- a. Construction of new **non-domestic buildings**.
- b. **Fit-out works** where the work is either part of the construction of a new non-domestic building, or is the first fit-out of a shell and core development where the shell is sold or let before the **fit-out work** is carried out. (Approved Document L2B applies to **fit-out works of non-domestic buildings** in other circumstances.)
- c. The construction of extensions to existing **non-domestic buildings** where the **total useful floor area** of the extension is greater than 100 m² and greater than 25 per cent of the **total useful floor area** of the existing building.

For those carrying out all other building work on existing **non-domestic buildings**, Approved Document L2B should be used.

1.3.2 Approved Document L1A 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 **dwellings**, and guidance for such buildings is given in this Approved Document.

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 (and/or cooled) space; and

- c. the living accommodation forms a substantial proportion of the total area of the unit.

Note: *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 within this Approved Document.*

1.3.5 The **energy efficiency requirements** apply to buildings or parts of buildings that are walled and roofed constructions and use energy to heat or cool the indoor climate, otherwise referred to as 'conditioned' space within this document. Other building works are exempt as are some buildings with special characteristics. Buildings with exemptions are listed below but it is important to check Section 9 and discuss with your Building Control Body to ensure that you fully meet the criteria for exemption.

- a. Buildings which are used primarily or solely as places of worship
- b. Temporary buildings with a planned time of use of 2 years or less
- c. Industry sites, workshops and non-residential agricultural buildings with low energy demand
- d. Stand-alone buildings other than dwellings with a total useful floor area of less than 50m²
- e. Carports, covered yards, covered ways and some conservatories and porches

1.3.6 In addition, special considerations apply to certain classes of non-exempt buildings.

- a. Modular and portable buildings with a service life of use of more than two years (see section 3.7)
- b. Shell and core developments (see section 3.8)
- c. Non-exempt buildings with low energy demand (see Section 3.9)
- d. Industrial sites, workshops and non-residential agricultural buildings other than those with low energy demand (see Section 3.10)

1.4 Summary of the Approved Document

1.4.1 This Approved Document is subdivided into ten sections that are followed by supporting appendices. It gives guidance on how to comply with the energy efficiency requirements for common building works to new **non-domestic buildings**.

Section 1 - this introductory section sets out the general context in which the guidance in the Approved Document must be considered.

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 **primary energy** consumption and CO₂ emissions rate for buildings can be calculated to ensure that it does not exceed their targets (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 buildings 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 building 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 targets are determined: the target **primary energy** consumption and the target CO₂ emissions rate.

Section 9 - describes which **buildings are exempt** from the **energy efficiency requirements**.

Section 10 - sets out the procedures for **notifying building control**.

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

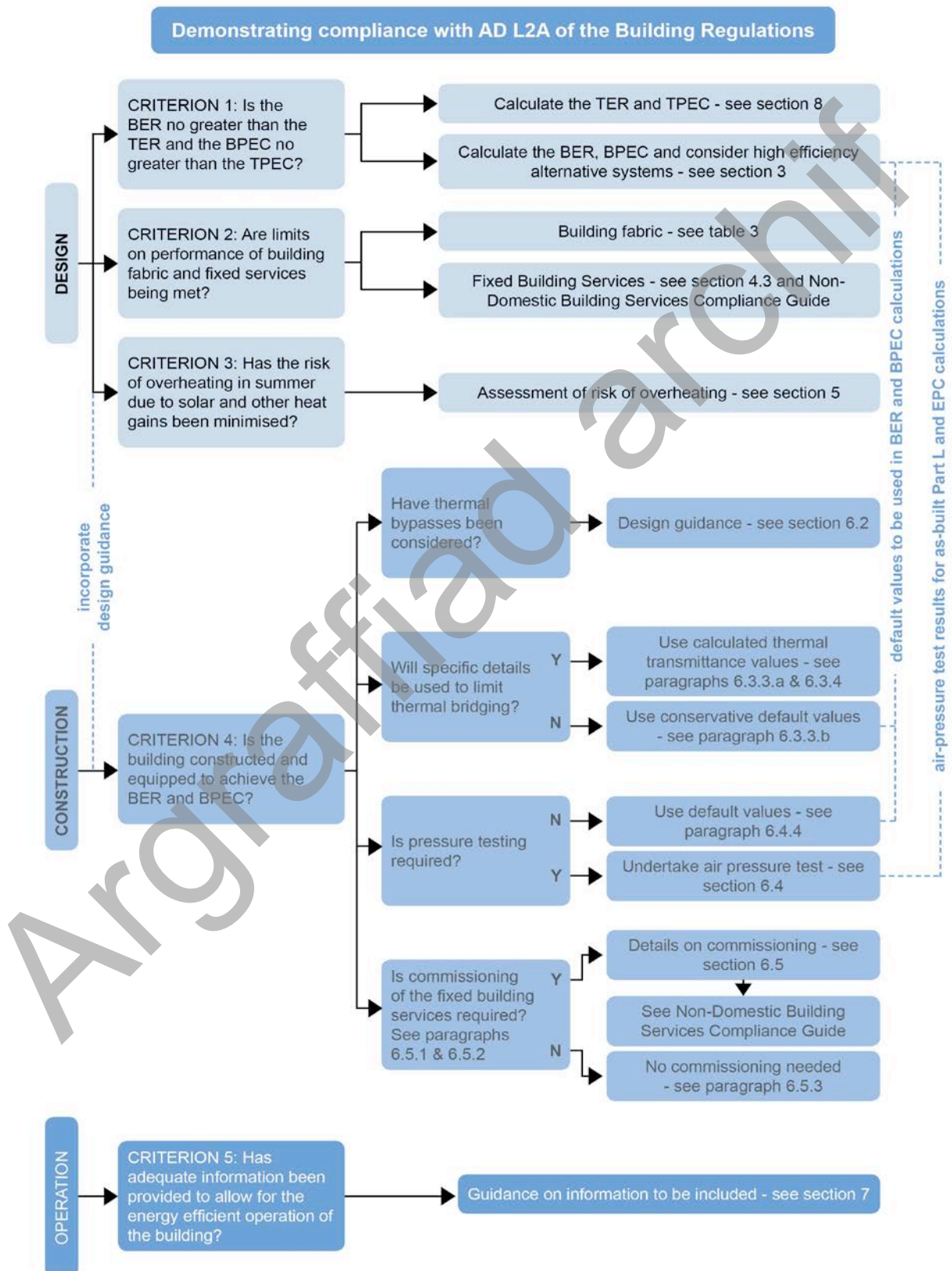
1.5 Considerations of technical risk

1.5.1 When considering the incorporation of energy efficiency measures in **non-domestic buildings**, 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 **non-domestic building** 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 **non-domestic building**; 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 builders 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;
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

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.

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

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 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 approved software 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.

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

- a. Criterion 1; and
- b. Parts of Criterion 4 dealing with air-pressure testing and commissioning requirements.

2.1.4 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: both of the following conditions must apply by following the procedures set out in Sections 3 and 8:

- a. the calculated **primary energy** consumption (the Building Primary Energy Consumption, **BPEC**) must not be greater than the Target Primary Energy Consumption (**TPEC**); and
- b. the calculated the calculated CO₂ emissions rate for the building (the Building Emission Rate, **BER**) must not be greater than the Target Emission Rate (**TER**).

Note: 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 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 building 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 reduce the need for, or installed capacity of, 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 building, as built, should be consistent with the calculated **BPEC** and **BER**. 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 building 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 10.

Section 3 – Criterion 1

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The BPEC and BER must be no worse than the TPEC and TER

3.1 Introduction

Regulation 26 – CO₂ emission rates for new buildings

Where a building is erected, it shall not exceed the target CO₂ emission rate for the building that has been approved pursuant to regulation 25, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

Regulation 26A – Primary energy consumption rates for new buildings

Where a building (other than a dwelling) is erected, it must not exceed the target primary energy consumption rate for the building which has been approved pursuant to regulation 25C (a), applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

3.1.1 Criterion 1 is a mandatory requirement and must be met by all new buildings as stated.

3.1.2 To comply with **regulation 26A and regulation 26** it will need to be demonstrated that:

- a. the calculated **Building Primary Energy Consumption (BPEC)** rate does not exceed the **Target Primary Energy Consumption (TPEC)**; and
- b. the calculated **Building CO₂ Emissions Rate (BER)** rate does not exceed the **Target CO₂ Emissions Rate (TER)**

3.1.3 This section focuses on the calculation of the **BPEC** and the **BER**. Details of how the **TPEC** and **TER** are calculated are set out in Section 8. Special considerations for specific building categories are given in sections 3.7 to 3.10.

*This update to the Approved Document maintains the approach to setting the **TER** adopted in 2010 whereby the **TER** is based on an elemental set of specifications to which no additional improvement factor is applied. The specifications now include an area of roof mounted photovoltaic panels.*

3.1.4 In accordance with the methodology approved by the Welsh Ministers in the Notice of Approval, the primary energy consumption and CO₂ emission rates for individual buildings must be calculated using one of the following approved software tools and using the primary energy factors and CO₂ emission factors as published by DECC¹.

- a. The Simplified Building Energy Model (SBEM)² for those buildings whose design features are capable of being adequately modeled by SBEM; or

¹ See SAP 2012 document for CO₂ emission factors and primary energy factors for a 3-year projection 2013-2015.
<http://www.bre.co.uk/sap2012/page.jsp?id=2759>

² Simplified Building Energy Model (SBEM) User manual and software, available at www.ncm.bre.co.uk

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- b. Other approved software tools which can be found on the Department of Communities and Local Government website at www.communities.gov.uk.

3.1.5 As part of the submission to a **BCB**, the applicant must show that the software tool used is appropriate to the application.

3.1.6 Provided the building satisfies the limits on design flexibility as set out in Criterion 2, the designer flexibility to achieve the **BPEC** and the **BER** utilising fabric and services measures and the integration of **low and zero carbon technologies** in whatever mix is appropriate to the scheme. Approved software tools include appropriate algorithms that enable the designer to assess the role each of these technologies can play in achieving the **TPEC** and **TER**.

3.1.7 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 and cooling 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 building 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.

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 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;

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- (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.)

3.1.8 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, 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.

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3.1.9 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 buildings may feature 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.

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

3.1.11 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 CO₂ emission rate calculation, a facility within calculation software output reporting (the design stage Building Regulation Part L report) 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.

3.1.12 Similarly the designer should consider the potential impact of future climate change on the performance of the building. This might include giving consideration to how a cooling system might be provided at some future point.

3.2 Calculating BPEC and BER before commencement of work

Regulation 27 - CO₂ 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 CO₂ emission rate for the building, calculated and expressed in accordance with the methodology approved pursuant to regulation 24,
 - (b) the CO₂ emission rate for the building as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, 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). notice which specifies—

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- i. the target CO₂ emission rate for the building, calculated and expressed in accordance with the methodology approved pursuant to regulation 24,
 - ii. the CO₂ emission rate for the building as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, 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 energy performance certificates for that category of building.
- (5) In this regulation ‘specifications’ means specifications used for the calculation of the CO₂ emission rate.

Regulation 27A - Primary energy consumption rate calculations

- (1) This regulation applies where a building (other than a dwelling) is erected and regulation 26A 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 primary energy consumption rate for the building, calculated and expressed in accordance with the methodology approved pursuant to regulation 24;
 - (b) the primary energy consumption rate for the building as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; 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 must give the local authority—
- (a) a notice which specifies—
 - (i) the target primary energy consumption rate for the building, calculated and expressed in accordance with the methodology approved pursuant to regulation 24;
 - (ii) the primary energy consumption rate for the building as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; 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).

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

3.2.1 Regulations 26, 26A, 27 and 27A require that a calculation must be carried out before commencement of construction work to demonstrate that the **BPEC** and the **BER** of the building as-designed are no greater than the **TPEC** and the **TER**.

3.2.2 Where **fixed building services** systems are capable of being fired by more than one fuel, then:

- a. Where a biomass heating appliance is supplemented by an alternative appliance (e.g. gas), the CO₂ emission factor for the overall heating system should be based on a weighted average for the two fuels based on the anticipated usage of those fuels. The **BER** submission should be accompanied by a report, signed by a suitably qualified person, detailing how the combined CO₂ emission factor has been derived.
- b. Where the same appliance is capable of burning both biomass fuel and fossil fuel, the CO₂ emission factor for dual fuel appliances should be used, except where the building is in a smoke control area, when the anthracite figure should be used.
- c. In all other cases, the fuel with the highest CO₂ emission factor should be used.

Note: This option is to cover dual fuel systems, where the choice of fuel actually used depends on prevailing market prices.

3.2.3 If thermal energy is supplied from a district or community heating or cooling system, primary energy factors and CO₂ emission factors should be determined by considering the particular details of the scheme.

- a. Calculations should take account of the annual average performance of the whole system (i.e. the distribution circuits and all the heat generating plant, including any Combined Heat and Power (CHP), and any waste heat recovery or heat dumping). The design-stage predicted effect of all buildings proposed to be newly connected to the system in the first year of operation is to be included in the calculation of the primary energy and CO₂ emission factors so that the increased operation of any marginal plant (e.g. gas boilers) is properly accounted for.
- b. The electricity generated by any CHP or trigeneration scheme is always credited at a primary energy and CO₂ emission factor equal to the grid average. CO₂ emissions associated with the thermal energy streams of a trigeneration scheme should be attributed in proportion to the output energy streams. The **BPEC** and **BER** submission should be accompanied by a report, signed by a suitably qualified person, detailing how the emission factors have been derived.

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Note: This means that if a district heating scheme burns F kWh of input fuel to produce E kWh of electricity and H kWh of useful heat (excluding heat rejected), the emission factor for the heat output should both be taken as $1/H \cdot (F \cdot CO_{2F} - E \cdot CO_{2E})$ where CO_{2F} is the emission factor for the input fuel, and CO_{2E} the factor for grid electricity³.

3.3 Calculating BPEC and BER after completion

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

- any changes that have been made during construction from the design-stage list of specifications; and
- the assessed **air permeability**, duct work leakage and commissioned fan performance as described in Section 6.

3.4 Benefits of enhanced energy management

3.4.1 Certain management features offer improved energy efficiency in practice. Where these management features are provided in the actual building, the **BPEC** and **BER** can be reduced by an amount equal to the product of the factor given in Table 1 and the CO₂ emissions for the system(s) to which the feature is applied.

3.4.2 For example, if the CO₂ emissions due to electrical energy consumption were 70 kgCO₂/(m².year) without power factor correction, the provision of correction equipment to achieve a power factor of 0.95 would enable the **BER** to be reduced by $70 \times 0.025 = 1.75$ kgCO₂/(m².year).

Table 1: Enhanced management and control features

Feature	Adjustment factor
Automatic monitoring and targeting with alarms for out of range values	0.050
Power factor correction to achieve a whole building power factor > 0.90	0.010
Power factor correction to achieve a whole building power factor > 0.95	0.025

Notes:

- (1) Automatic monitoring and targeting with alarms for out of range values means a complete installation that measures, records, transmits, analyses, reports and communicates meaningful energy management information to enable the operator to manage the energy it uses.
- (2) The power factor adjustment can be taken only if the whole building power factor is corrected to the level stated. The two levels of power factor correction are alternative values, not additive.

³ See NCM Modelling Guide at: <http://wales.gov.uk/topics/planning/?lang=en>

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3.5 Conservatories and porches

3.5.1 Conservatories and porches should be included in the **BPEC/TPEC** and **BER/TER** calculations only if they are constructed at the same time as a new building; and

- a. There is no thermal element between the building and the conservatory and/or porch; or
- b. the conservatory or porch contains no fixed heating appliance or the buildings heating system is not extended into the conservatory or porch.

3.6 Swimming pools

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

3.7 Modular and portable buildings with a planned service life of more than two years

3.7.1 Special considerations apply to modular and portable buildings with a planned service life greater than 2 years (exemptions for temporary buildings with a total service life of two years or less are given in section 9). The placing of an existing module to a new site is considered to be the construction of a new building as far as the Building Regulations are concerned. In that context, it is not always appropriate to expect such a relocated unit to meet the new-build standards set out in this Approved Document, especially as the embodied energy in an existing module is retained, a benefit that compensates for small differences in operating energy demand. Furthermore, portable buildings are often 'distress purchases', and the constraints imposed by the time in which a working building must be delivered mean that additional considerations apply.

3.7.2 Compliance with the **energy efficiency requirements** should be demonstrated by showing that satisfactory performance has been achieved against each of the five compliance criteria set out in this Approved Document. However, if more than 70 per cent of the external envelope of the building is to be created from sub-assemblies/modules manufactured prior to the date this Approved Document comes into force, the **TER** should be adjusted by the relevant factor from Table 2 and it is not necessary to meet the requirement for **TPEC**. One way of demonstrating the date of manufacture of each sub-assembly/module is by relating the serial number to the manufacturer's records. If the modules are to be refurbished as part of the process, then the guidance in Approved Document L2B should be followed in terms of the standards to be achieved, e.g. for replacement windows and new lighting.

3.7.3 Portable buildings with an intended planned service life in a given location of less than 2 years are often 'distress purchases' (e.g. following a fire), and the buildings must be up and operational in a matter of days. In such cases, different arrangements for demonstrating compliance apply. An example of the evidence that the

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planned service life in the given location is less than 2 years would be the hire agreement for the unit.

- a. A **TPEC/BPEC** and a **TER/BER** calculation should be carried out when the module is first constructed and can be based on a standard generic configuration. This calculation can then be provided as evidence of satisfying the requirements of Criterion 1, whenever the building is moved to a new location, provided its intended service life in that new location is less than 2 years. In addition to the details of the calculation, the supplier should provide written confirmation that:
 - i. the modules as actually provided meet or exceed the elemental energy standards of the generic module on which the calculation was based; and
 - ii. the activities assumed in the generic module are reasonably representative of the planned use of the actual module.
- b. Where the planned service life in a given location is less than 2 years, the only practical heating technology is electric resistance heating. In such cases, energy efficiency measures should be provided that are 15 per cent better than if using conventional fossil fuel heating. This can be demonstrated by assuming that the heating in the generic configuration used for the **TPEC/BPEC** and a **TER/BER** calculation is provided by a gas boiler with an efficiency of 77 per cent.
- c. If **TER/BER** calculations are not available for a module constructed prior to July 2014, reasonable provision would be to demonstrate that the **BER** is not greater than the 2014 **TER** adjusted by the relevant factor from Table 2. It is not necessary to meet the **TPEC** for a module constructed prior to July 2014.
- d. Post initial construction, any work on the module should meet the standards set out in Approved Document L2B.

Table 2: TER multiplying factor for modular and portable buildings

Date of manufacture of 70% of modules making up the external envelope	TER multiplying factor
After 31 July 2014	1.00
1 Oct 2010 – 31 July 2014	1.25
6 April 2006 – 1 Oct 2010	1.67
1 April 2002 – 5 April 2006	2.20
Pre 1 April 2002	2.20 [2.95 ⁽¹⁾]

Notes:
⁽¹⁾ For buildings with a planned service life in a given location of less than 2 years, the figure in brackets is applicable.

3.8 Shell and core developments

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3.8.1 If a building is offered to the market for sale or let as a shell for specific **fit-out work** by the incoming occupier, the developer should demonstrate via the design-stage **TPEC/BPEC** and **TER/BER** submission how the building shell as offered could meet the **energy efficiency requirements**. For those parts of the building where certain systems are not installed at the point the building is to be offered to the market, the model that is used to derive the **BPEC** and **BER** should assume efficiencies for those services that will be installed as part of the first **fit-out work**. The specification provided to the **BCB** should identify which services have not been provided in the base build, and the efficiency values assumed for each such system. This will enable the **BCB** to ensure that the necessary infrastructure needed to deliver the assumed fit-out specification is provided as part of the base build. At practical completion of the base building, the as-built **TPEC/BPEC** and **TER/BER** calculation should be based only on the building and systems as actually constructed; the fit-out areas should be assumed to be conditioned to temperatures appropriate to their designated use, but no associated energy demand included.

Note: *As part of the design-stage calculation, a predicted Energy Performance Certificate (EPC) rating for the fit-out areas should be available to inform prospective occupiers of the energy performance that is achievable. However, a formal EPC lodged on the EPC register is not required at this stage.*

3.8.2 When an incoming occupier does first **fit-out work** on all or part of the building through the provision or extension of any of the fixed services for heating, hot water, air-conditioning or mechanical ventilation, then **TPEC/BPEC** and **TER/BER** submission should be made to the **BCB** after completion to demonstrate compliance for the part of the building covered by the **fit-out work**. This submission should be based on the building shell as constructed and the **fixed building services** as actually installed. If the **fit-out work** does not include the provision or extension of any of the fixed services for heating, hot water, air-conditioning or mechanical ventilation, then reasonable provision would be to demonstrate that any lighting systems that are installed are at least as efficient as those assumed in the shell developer's initial submission.

Note: *Since the fit-out is specific to the needs of the particular tenant and is, by definition, uniquely controlled by him for his benefit, this is creating a new 'part designed or altered for separate use', and a new EPC is required for that part of the physical building covered by the fit-out.*

3.9 Buildings with a low energy demand

3.9.1 Exemptions from the **energy efficiency requirements** for industrial sites, workshops and non-residential agricultural buildings **with** low energy demand are described in Section 9.

3.9.2 Where other categories of building with low energy demand is constructed, it would not be reasonable for the building envelope to be insulated to the same standard as for typical new buildings.

3.9.3 This applies to buildings or parts thereof where:

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- a. **fixed building services** are used to heat or cool only a localised area rather than the entire enclosed volume of the space concerned (e.g. localised radiant heaters at a workstation in a generally unheated space); or
- b. **fixed building services** are used to heat spaces in the building to temperatures substantially lower than those normally provided for human comfort (e.g. to provide condensation or frost protection in a warehouse).

3.9.4 In such situations, no **TPEC/BPEC** and **TER/BER** calculations are required. Furthermore, every **fixed building service** that is installed should meet the energy efficiency standards set out in the Non-Domestic Building Services Compliance Guide⁴.

3.9.5 In addition, if some general heating is provided (case b above), the opaque fabric within the new or renovated building envelope should achieve a U-value no worse than 0.7 W/m².K.

3.9.6 If a part of a building with low energy demand is partitioned off and heated normally (e.g. an office area in an unheated warehouse), the separately heated area should be treated as a separate 'building' and the normal procedures for demonstrating compliance (including **TPEC/BPEC** and **TER/BER** calculation) should be followed in respect of the enclosure.

3.9.7 If a building with low energy demand subsequently changes such that the space is generally conditioned, then this is likely to involve the initial provision or an increase in the installed capacity of a **fixed building service**. The guidance in Approved Document L2B would require the building envelope to be upgraded and a consequential improvement to be made, a process that is likely to be much more expensive than incorporating suitable levels of insulation at the new-build stage. Alternatively, if the building shell was designed as a building with low energy demand and the first occupier of the building wanted to install (e.g.) heating, this would be first **fit-out works**, and a full **TPEC/BPEC** and **TER/BER** submission would then be required (see paragraph 1.3.1).

3.10 Industrial sites, workshops and non-residential agricultural buildings other than those with a low energy demand

3.10.1 Special considerations may apply in such cases, e.g. where a CO₂ target is established through other regulatory frameworks such as the Carbon Reduction Commitment, or where it is impractical for the generic **National Calculation Methodology** to adequately account for the particular industrial processes or agricultural use without leading to the possibility of negative impacts on cost-effectiveness and/or increased technical risk. In such cases, reasonable provision would be to provide **fixed building services** that satisfy the standards set out in Approved Document L2B.

3.10.2 Exemptions from the **energy efficiency requirements** for industrial sites, workshops and non-residential agricultural buildings **with** low energy demand are described in Section 9.

⁴ Non-Domestic Building Services Compliance Guide, 2013

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3.11 Extensions

3.11.1 This Approved Document gives guidance on how to comply with the **energy efficiency requirements** for the construction of larger extensions to existing **non-domestic buildings**. These building works are where the **total useful floor area** of the extension is greater than 100 m² and greater than 25 per cent of the **total useful floor area** of the existing building.

3.11.2 The approach for assessing compliance is similar to that of new non-domestic buildings with the exception that the elemental specifications used to set the **TPEC** and **TER** exclude the renewable energy component. This takes into account less design flexibility when constructing an extension to an existing building compared to constructing a new building.

3.12 Demonstrating compliance

3.12.1 Before commencement of construction work, the **BCB** must be notified of the as-designed values of the **BPEC/TPEC** and **BER/TER**, thereby confirming that the as-designed building 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 **BPEC** and **BER**.

3.12.2 It is expected that the approved software will be used to produce, in addition to the design stage **BPEC/TPEC** and **BER/TER**, the list of specifications and highlight those 'key features' of the design that are critical to achieving compliance (see Section 10 for more details of the 'key features' to be identified.). These 'key features' may be used to prioritise the risk-based inspection of the building as part of confirming compliance with the Building Regulations.

3.12.3 On completion of the building works for a building, the **BCB** must be notified of the final values of the **BPEC/TPEC** and **BER/TER**, thereby confirming that the completed building 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.

3.12.4 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 **BPEC** and **BER** calculations. 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.

3.12.5 More information on notifying the **BCB** is given in Section 10.

4.1 Introduction

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.

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:

- a. Heat gains and losses through the fabric of the building are limited; and
- b. Energy efficient **fixed building services** with effective controls are provided to all buildings.

4.1.2 This requirement can be satisfied by adopting the guidance on the minimum energy efficiency standards for the building fabric and building services and associated controls which are set out in this Section.

*Note that, introducing the **TPEC** limits fabric heat gains and losses and energy consumption from **fixed building services**. However, achieving the **TPEC** could be dependent on very good performance of one specific feature of the design with poorer performance elsewhere. If this key element of the design was to fail, or perform less well than expected, this would have a significant impact on performance. Hence minimum energy efficiency standards for building fabric and service elements have been retained.*

4.1.3 Meeting the standards set in this section of the Approved Documents, for building fabric and fixed services, should be considered a starting point towards achieving the **TPEC** and **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 **TPEC** and the **TER**.

Section 4 - Criterion 2 – Limits on design flexibility

4.2 Building fabric

4.2.1 In order to demonstrate compliance with this criterion, the fabric parameters should be as good as or better than the worst acceptable values set out in Table 3.

Table 3: Worst acceptable fabric parameters

Table 3: Worst acceptable fabric parameters	
Roof	0.25 W/m ² .K
Wall	0.35 W/m ² .K
Floor	0.25 W/m ² .K
Windows, roof windows, rooflights curtain walling and pedestrian doors ^(1,2)	2.2 W/m ² .K
Vehicle access and similar large doors	1.5 W/m ² .K
High-usage entrance doors	3.5 W/m ² .K
Roof ventilators (inc. smoke vents)	3.5 W/m ² .K
Air permeability	10.0m ³ /h.m ² at 50 Pa
Swimming pool basin	0.25 W/m ² .K
Notes: (1) Excluding display windows and similar glazing. There is no limit on design flexibility for these exclusions but their impact on primary energy consumption and CO ₂ emissions must be taken into account in the Criterion 1 calculations. (2) In buildings with high internal heat gains, a less demanding area weighted average U-value for the glazing may be an appropriate way of reducing overall primary energy consumption CO ₂ emissions and hence the BPEC and BER. If this case can be made, then the average U-value for windows can be relaxed from the values given above. However, values should be no worse than 2.7 W/m ² .K.	

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 building.

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

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 *Non-Domestic Building Services Compliance Guide*⁵.

4.3.2 The energy efficiency of each **fixed building service** should be as good as or better than that of the worst acceptable value for the particular type of appliance of system as set out in the *Non-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 *Non-Domestic Building Services Compliance Guide* as agreed with the **BCB**.

⁵ Non-Domestic Building Services Compliance Guide, CLG, 2013 Edition.

Section 4 - Criterion 2 – Limits on design flexibility

4.3.3 The efficiency claimed for the **fixed building service** should be based on the appropriate test standard as set out in the *Non-Domestic Building Services Compliance Guide*, and the test data should be certified by a notified body. It would be reasonable for a **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.

4.3.4 Controls should be installed with new HVAC (heating, ventilation and air conditioning) systems to enable the achievement of reasonable standards of energy efficiency. Typically, the following control features would be appropriate and should be included:

- a. the **fixed building services** systems should be sub-divided into separate control zones to correspond to each area of the building that has a significantly different solar exposure, occupancy period or type of use; and
- b. each separate control zone should be capable of independent timing and temperature control and, where appropriate, ventilation and air recirculation rate; and
- c. the provision of the **fixed building service** should respond to the requirements of the space that it serves. If both heating and cooling are provided, they should be controlled so they do not operate simultaneously; and
- d. central plant serving the zone-based systems should operate only as and when required. The default condition should be off; and
- e. in addition to these general control requirements, the systems should meet the specific control requirements and general energy efficiency criteria as set out in the *Non-Domestic Building Services Compliance Guide*.

4.3.5 Energy meters should be installed to allow effective monitoring of the performance of the newly installed **fixed building services** as follows:

- a. the building occupier should be able to assign at least 90% of the estimated annual energy consumption of each fuel to the various end-use categories (heating, lighting etc). Detailed guidance on how this can be achieved is given in CIBSE TM 39⁶; and
- b. energy meters should be provided to enable the performance of any renewable energy system provided as part of the building works to be separated monitored; and
- c. In buildings with a **total useful floor area** greater than 1000m², the energy metering system should enable automatic meter reading and data collection; and
- d. the energy metering provisions should be designed such as to facilitate the benchmarking of energy performance as set out in CIBSE TM 46⁷.

4.3.6 Consideration should be given to the provision of centralised switches to allow the facilities manager to switch off appliances when they are not needed (e.g. overnight and at weekends). Where appropriate, these should be automated (with manual override) so that energy savings are maximised.

Note: A centralised switch would be more reliable than depending on each individual occupant to switch off their (e.g.) computer.

⁶ TM 39 *Building Energy Metering*, CIBSE, 2010.

⁷ TM 46 *Energy benchmarks*, CIBSE, 2008

4.4 Demonstrating compliance

4.4.1 It is expected that the approved software tools will be used to produce, in addition to the **BPEC/TPEC** and **BER/TER** comparisons, 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 building.

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 approved software tools, supporting information including product specification and data from product manufacturer's data should be provided. More detail on notifying the **BCB** is given in Section 10.

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Section 5 - Criterion 3 – Limiting the effect of heat gains

5.1 Limiting the effect of solar gains during the summer

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

5.1.2 This section applies to all buildings, irrespective of whether they are air conditioned or not. The intention is to limit solar gains during the summer period to either:

- a. reduce the need for air-conditioning; or
- b. reduce the installed capacity of any air-conditioning system that is installed.

5.1.3 If the criterion set out in this section is satisfied in the context of a naturally ventilated building, this is **NOT** evidence that the internal environment will be satisfactory, since many factors that are not covered by this compliance assessment procedure will have a bearing on the incidence of overheating (incidental gains, thermal capacity, ventilation provisions, etc.)

Note: *Therefore, the developer should work with the design teams to specify what constitutes an acceptable indoor environment in each case, and carry out the necessary design assessments to develop solutions that meet the agreed brief. Some ways of assessing the overheating risk are given in CIBSE TM37⁸ and, for education buildings, in BB101⁹.*

5.1.4 For the purposes of Part L compliance, reasonable provision for limiting solar gain through the building fabric would be demonstrated by showing that, for each space in the building that is either occupied or mechanically cooled, the solar gains through the glazing aggregated over the period April to September inclusive are no greater than would occur through one of the following reference glazing systems with a defined total solar energy transmittance (g-value) calculated according to BS EN 420¹⁰:

- a. For every space that is defined in the **NCM** database as being side lit, the reference case is an east-facing façade with full-width glazing to a height of 1.0m having a framing factor of 10 per cent and a normal solar energy transmittance (g-value) of 0.68.
- b. For every space that is defined in the **NCM** database as being top lit, and whose average zone height is not greater than 6m, the reference case is a horizontal roof of the same total area that is 10 per cent glazed as viewed from the inside out and having rooflights that have a framing factor of 25 per cent and a normal solar energy transmittance (g-value) of 0.68.
- c. For every space that is defined in the **NCM** database as being top lit, and whose average zone height is greater than 6m, the reference case is a horizontal roof of the same total area that is 20 per cent glazed as viewed from the inside out and

⁸ TM37 Design for improved solar shading control, CIBSE, 2006

⁹ Ventilation of school buildings, Building bulletin 101, School Building and Design Unit, Department for Education and Skills, Version 1.4 – 5th July 2006 ISBN 011-2711642

¹⁰ BS EN 410:2011 Glass in Building: Determination of luminous and solar characteristics of glazing

Section 5 - Criterion 3 – Limiting the effect of heat gains

having rooflights that have a framing factor of 15 per cent and a normal solar energy transmittance (g-value) of 0.46.

Note: In double-height industrial-type spaces, dirt on the rooflights and internal absorption within the rooflight reduce solar gains. These effects, combined with temperature stratification, will reduce the impact of solar gains in the occupied space and so increased rooflight area may be justified. In such situations, the developer should pay particular attention to the design assessments referred to in paragraph 5.1.4b.

- d. For the purpose of this specific guidance, an occupied space means a space that is intended to be occupied by the same person for a substantial part of the day. This excludes circulation spaces, and other areas of transient occupancy, such as toilets, as well as spaces that are not intended for occupation (e.g. **display windows**).

Section 6 - Criterion 4 – L2A

Building construction and performance consistent with BER

6.1 Introduction

6.1.1 In order that the intended performance in use of fuel and power is achieved, buildings must be constructed and equipped so that the performance is consistent with the **BPEC** and **BER** as calculated at the completion of the building work. In normal circumstances, this would be to demonstrate by evidence that:

- a. thermal bypasses are limited (see 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 Limiting 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**.

6.2.2 A common instance of this would be an uninsulated and unsealed cavity party wall in which heat flowing from adjacent buildings 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.

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

6.2.4 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 such as in a masonry wall.

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:

- 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.

Section 6 - Criterion 4 – L2A

Building construction and performance consistent with BER

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

- a. 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 BR 497¹¹ and following a process flow sequence that has been provided to the **BCB** indicating the way in which the detail should be constructed. These values can then be used in the **BPEC** and **BER** calculations. 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*¹².

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 that model to the example calculations set out in BR 497 and has achieved results that are within the stated tolerances.

- b. To use construction joint unaccredited details, with no specific quantification of the thermal bridge values. In such cases, the generic linear thermal bridge values as given in IP 1/06 increased by 0.04 W/MK or 50 per cent whichever is greater must be used in the **BPEC** and **BER** calculations.

6.3.4 When using details as determined from paragraph 6.2.3a, the builder should demonstrate to the **BCB** that an appropriate system of site inspection is in place to give confidence that the construction procedures achieve the required standards of consistency. 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

¹¹ BR 497 Conventions for calculating linear thermal transmittance and temperature factors, BRE, 2007

¹² IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, BRE, 2006

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- 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 Independent Airtightness Testing Scheme Limited 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 the building, and recording the results and the underpinning data, is given in the ATTMA publication *Measuring air permeability of building envelopes*¹³. 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 All **non-domestic buildings** (including extensions which are being treated as new buildings for the purposes of complying with Part L) should be pressure tested, with the following exceptions;

- a. Buildings less than 500 m² **total useful floor area**; in this case the developer may choose to avoid the need for a pressure test provided that the **air permeability** used in the calculation of the **BPEC** and **BER** is taken as 15 m³/(h.m²) at 50 Pa.

*Compensating improvements in other elements of the building fabric and building services will be needed to keep the **BPEC** and **BER** no worse than the **TPEC** and **TER**.*

- b. A factory-made modular building of less than 500 m² floor area, with a planned service life of more than 2 years at more than one location, and where no site

¹³ Measuring air permeability of building envelopes (non-dwellings), Technical Standard L2, ATTMA, 2010

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assembly work is needed other than making linkages between standard modules using standard link details. Compliance can be demonstrated by giving a notice to the **BCB** confirming that the building as installed conforms to one of the standard configurations of modules and link details for which the installer has pressure test data from a minimum of five in-situ measurements incorporating the same module types and link details as utilised in the actual building. The results must indicate that the average test result is better than the design **air permeability** as specified in the **BPEC** and **BER** calculation by not less than $1.0 \text{ m}^3/(\text{h.m}^2)$ at 50 Pa.

- c. Large extensions (whose compliance with Part L is being assessed as if they were new buildings – see *Approved Document L2B*) where sealing off the extension from the existing building is impractical. The ATTMA publication gives guidance both on how extensions can be tested and on situations where pressure tests are inappropriate. Where it is agreed with the **BCB** that testing is impractical, the extension should be treated as a large, complex building, with the guidance in (d) below being applicable.
- d. Large complex buildings, where due to building size or complexity it may be impractical to carry out pressure testing of the whole building. The ATTMA publication indicates those situations where such considerations might apply. Before adopting this approach developers must produce (in advance of construction work in accordance with the approved procedure) a detailed justification of why pressure testing is impractical. This should be endorsed by a suitably qualified person such as a competent person approved for pressure testing. In such cases, a way of showing compliance would be to appoint a suitably qualified person to undertake a detailed programme of design development, component testing and site supervision to give confidence that a continuous air barrier will be achieved. It would not be reasonable to claim an **air permeability** better than $5.0 \text{ m}^3/(\text{h.m}^2)$ at 50 Pa has been achieved

One example of a suitably qualified person would be an ATTMA member. The $5.0 \text{ m}^3/(\text{h.m}^2)$ at 50 Pa limit has been set because at better standards, the actual level of performance becomes too vulnerable to single point defects in the air barrier.

- e. Compartmentalised buildings, where buildings are compartmentalised into self-contained units with no internal connections it may be impractical to carry out whole building pressure tests. In such cases reasonable provision would be to carry out a pressure test on a representative area of the building as detailed in the ATTMA guidance. In the event of a test failure, the provisions of 6.3.5 to 6.3.7 would apply, but it would be reasonable to carry out a further test on another representative area to confirm that the expected standard is achieved in all parts of the building.

6.4.5 Compliance would be demonstrated if:

- a. the measured **air permeability** is not worse than the limiting value of $10 \text{ m}^3/(\text{h.m}^2)$ at 50 Pa; and

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- b. the **BPEC** and **BER** calculated using the measured **air permeability** is not worse than the **TPEC** and **TER**.

6.4.6 If satisfactory performance is not achieved, then the remedial measures should be carried out on the building and new test carried out until the building achieves the criteria set out in paragraph 6.3.5.

6.4.7 If the measured **air permeability** on retest is greater than the design **air permeability** but less than the limiting value of $10 \text{ m}^3/(\text{h.m}^2)$ at 50 Pa then other compensating improvements may be undertaken to the building fabric and services to achieve the **TPEC** and **TER**.

Note: *Builders may therefore wish to schedule air pressure tests early enough to facilitate compensating improvements on the building fabric if necessary e.g. before false ceilings are up.*

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.

Where the BCB is an Approved Inspector see regulation 20 of the Building (Approved Inspector etc.) Regulations 2010

6.5.1. The Building Regulations require 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.

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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 provided with the design stage **BPEC/TPEC** and **BER/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**.

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

- a. CIBSE Commissioning Code M: Commissioning management¹⁴. This provides details on the overall process as well as a schedule of the relevant documents relating to the **commissioning** of specific building services systems
- b. for leakage testing of ductwork, paragraphs 6.4.8 to 6.4.10.

6.5.5 **Commissioning** should be carried out in such a way as not to prejudice compliance with any applicable health and safety requirements.

Energy efficiency in practice can often be enhanced by a sustained period of fine tuning to ensure the systems are operating as intended and controls are configured to the needs of the occupier. The Soft Landings initiative is an example of an appropriate fine tuning process (see <http://www.bsria.co.uk/services/design/soft-landings/>).

6.5.6 Membership of the Commissioning Specialists Association or the Commissioning group of the B&ES are possible ways of demonstrating suitability to sign the **commissioning** report in respect of the HVAC systems. For lighting control systems, suitability may be demonstrated by accreditation under the Lighting Industry Commissioning Scheme. A way of documenting the process would be the use of the templates in the Model Commissioning Plan (BSRIA BG 8/2009).

6.5.7 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**

¹⁴ CIBSE Code M: Commissioning management, CIBSE, 2003

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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.

6.5.8 Ductwork leakage testing should be carried out where required by and in accordance with the procedures set out in B&ES DW/143 and B&ES DW/144 on systems served by fans with a design flow rate greater than 1 m³/s.

NOTE: DW/143 does not call for any testing of low-pressure (class A) ductwork. However, where at least 10% of low-pressure ductwork is tested at random and achieves the low-pressure standard as defined by DW/143 the NCM recognises an improvement in the **BPEC** and **BER**. A decision to test low-pressure ductwork should be made at the initial design phase prior to commencement on site. The ductwork pressure classes are set out in Table 4.

Table 4: Ductwork pressure classes				
Pressure class	Design static pressure (Pa)		Maximum air velocity (m/s)	Air leakage limit (l/(s.m ²) of duct surface area) ¹
	Maximum positive	Maximum negative		
Low pressure (class A)	500	500	10	0.027 $\Delta P^{0.65}$
Medium pressure (class B)	1000	750	20	0.009 $\Delta P^{0.65}$
High pressure (class C)	2000	750	40	0.003 $\Delta P^{0.65}$
High pressure (class D)	2000	750	40	0.001 $\Delta P^{0.65}$

¹ Where ΔP is the differential pressure in Pascals

6.5.9 If a ductwork system fails to meet the leakage standard, remedial work should be carried out as necessary to achieve satisfactory performance in retests and further ductwork sections should be tested as set out in DW/143.

6.5.10 Membership of the B&ES specialist ductwork group or the Association of Ductwork Contractors and Allied Services (ADCAS) could be a way of demonstrating suitable qualifications for testing work

Providing energy efficient operation of buildings

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 building 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 Building Log Book

7.2.1 The necessary information should be provided by following the guidance in CIBSE TM 31 *Building log book toolkit*. An alternative guidance document can be followed in preparing the log book, if the information conveyed and the format of presentation is equivalent to TM 31¹⁵.

7.2.2 The information should be presented in templates as or similar to those in TM 31. The information should be provided in summary form, suitable for day-to-day use. It could draw on or refer to information available as part of other documentation, such as the Operation and Maintenance Manuals and the Health and Safety file required by the CDM Regulations. Further advice is provided in BSRIA BG26/2011 Building Manuals and Building User Guides¹⁶.

7.2.3 The data used to calculate the **BPEC, TPEC, BER** and **TER** should be included with the log book. The occupier should also be provided with the recommendations report, generated in parallel with the “on-construction” Energy Performance Certificate, which will inform the occupier as to how the energy performance of the building might be further improved.

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

¹⁵ TM 31 *Building log book toolkit*, CIBSE, 2006

¹⁶ Building Manual and User Guides, BG 26/2011, BSRIA 2011

Section 8 – L2A

Calculating Target Primary Energy Consumption (TPEC) and the Target CO₂ Emission Rate (TER)

8.1 Introduction

Regulation 24 - Methodology of calculation of the energy performance of buildings

(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 an energy performance indicator determined from of the amount of energy estimated to meet the different needs associated with a standardised use of the building; and

‘operational rating’ means an energy performance indicator determined from the amount of energy consumed during the occupation of a building over a period of time and the energy demand associated with a typical use of the building over that period.

Regulation 25 - Minimum energy performance requirements for buildings

The Secretary of State shall approve minimum energy performance requirements for new buildings, in the form of target CO₂ emission rates, which shall be calculated and expressed in accordance with the methodology approved pursuant to regulation 24.

Regulation 25C(a) – New Buildings – minimum energy performance requirements

Minimum energy performance requirements must be approved by the Welsh Ministers, calculated and expressed in accordance with the methodology approved pursuant to regulation 24 for- new buildings (other than new dwellings), in the form of target primary energy consumption rates.

8.1.1 The **Target Primary Energy Consumption (TPEC)** and the **Target CO₂ Emission Rate (TER)** are the minimum energy performance requirements for a new building approved by the Welsh Ministers in accordance with the **regulation 25C(a) and regulation 25**.

8.1.2 In accordance with the methodology approved by the Welsh Ministers in the Notice of Approval¹⁷, the **TPEC** and **TER** for individual builders must be calculated using one of the following approved software tools:

- a. The Simplified Building Energy Model (SBEM)¹⁸ for those buildings whose design features are capable of being adequately modeled by SBEM; or

¹⁷ Notice of Approval of the methodology of calculation of the energy performance of buildings in England and Wales.

¹⁸ Simplified Building Energy Model (SBEM) User manual and software, available at www.ncm.bre.co.uk

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Calculating Target Primary Energy Consumption (TPEC) and the Target CO₂ Emission Rate (TER)

- b. Other approved software tools which can be found on the Departments website at www.communities.gov.uk.

8.1.3 As part of the submission to a **BCB**, the applicant must show that the software tool used is appropriate to the application.

8.1.4 The **TPEC** is calculated by determining the **primary energy** consumption from a building of the same size and shape as the actual building and which is constructed according to the elemental specification set out in the 2013 Wales NCM Modelling Guide¹⁹ using one of the approved software tools. Key components of this specification can also be seen in Appendix B of this Approved Document with the exception that all electrical demand is assumed to be supplied from the grid (i.e. energy generated by the PV system is disregarded) so that the **TPEC** is based only on the fabric and building services performance.

8.1.5 The **TER** is calculated by determining the CO₂ emissions from a building of the same size and shape as the actual building and which is constructed according to the elemental specification set out in the 2013 Wales NCM Modelling Guide using one of the approved software tools. Key components of this specification can also be seen in Appendix B of this Approved Document.

*This update to the Approved Document maintains the approach to setting the **TER** adopted in 2010 whereby the **TER** is based on an elemental set of specifications to which no additional improvement factor is applied. The specifications now include an area of roof mounted photovoltaic panels.*

8.2 Conservatories and porches

8.2.1 Conservatories and porches should be included in the **TPEC** and **TER** calculations only if they are constructed at the same time as a new building; and

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

8.3 Swimming pools

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

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

¹⁹ National Calculation Methodology (NCM) modelling guide for buildings other than dwelling in England and Wales) 2013 Edition (see section headed 'Detailed definition of Notional Building for buildings other than dwellings')

Buildings Exempt from the Energy Efficiency Requirements

9.1 Introduction

9.1.1 The **energy efficiency requirements** apply to buildings or parts of buildings that are walled and roofed constructions and use energy to heat or cool the indoor climate. Parts of a building which are not heated or cooled, for example carports, covered ways and some conservatories or entrance halls, are exempt. Guidance on which conservatories and porches are exempt is given in this section. Some buildings with special characteristics are also exempt with guidance provided in this section.

9.2 Places of worship**9.2.1** **Places of worship** are exempt from the **energy efficiency requirements**.

9.2.2 **Places of worship**, for the purposes of the **energy efficiency requirements**, are taken to mean those buildings or parts thereof that are used for formal public worship, including adjoining spaces whose function is directly linked to that use (for example, a vestry in a church). Such buildings often have traditional, religious or cultural constraints that mean compliance with the **energy efficiency requirements** is not possible.

9.2.3 Other parts of the building that are designed to be used separately, such as offices, catering facilities, day centres, meeting halls and accommodation are not exempt.

9.3 Temporary buildings

9.3.1 Temporary buildings with a planned time of use of two years or less are exempt from the **energy efficiency requirements**.

9.3.2 This does not include modular and portable buildings which have a planned service life greater than 2 years, whether located on one or more sites.

9.4 Industrial sites, workshops and non residential agricultural buildings with a low energy demand

9.4.1 Industrial sites, workshops and non residential agricultural buildings with low energy demand are exempt from the **energy efficiency requirements**. The low energy demand relates only to the energy used by fixed heating or cooling systems and **not** to energy required for or created by process needs.

9.4.2 Examples of such buildings that are low energy demand are as follows:

- a. buildings or parts of buildings where the space is not generally heated, other than by process heat, or cooled;
- b. buildings or parts of buildings that require heating or cooling only for short periods each year, such as during critical periods in the production cycle (e.g. plant germination, egg hatching) or in very severe weather conditions.

9.4.3 Other buildings (e.g. some types of warehouse) may have low energy demand but are not exempt because they do not fall into one of the above categories of buildings (i.e.

Buildings Exempt from the Energy Efficiency Requirements

industrial sites, workshops or non-residential agricultural buildings). See section 3.9 for more detail.

9.5 Conservatories and porches

9.5.1 Conservatory and porches installed at the same time as the new building are exempt from the **energy efficiency requirements** if they meet the following conditions:

- a. they are located at ground level;
- b. the floor area is less than 30m²
- c. the existing walls, doors and windows which separate the conservatory from the building are retained or, if removed, are replaced by walls, windows and doors which meet the energy efficiency requirements; and
- d. contains no fixed heating appliance or extension of the buildings heating system.

9.5.2 Guidance for non-exempt conservatory and porches is given in section 8.2.

9.6 Stand-alone buildings

9.6.1 Building work is also exempt from the **energy efficiency requirements** on stand-alone buildings other than dwellings with a **total useful floor area** of less than 50m².

Section 10 –

Notifying Building Control and demonstrating compliance

10.1 Introduction

10.1.1 In all cases where it is proposed to erect a new **building**, 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 10.2.

10.1.2 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**.

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

10.1.4 It is anticipated that two versions of the standardised report would be produced by the approved compliance software: 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.

10.1.5 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 443²⁰ 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.

²⁰ BR 443 Conventions for U-value calculations, BRE, 2006

Notifying Building Control and demonstrating compliance

10.1.6 The report should indicate the percentage by which the average performance of elements in the actual building deviates from the elemental specifications in the notional buildings (see Appendix B). The **BCB** is advised to give particular attention to elements that are more than 10% better than the elemental specification as their appropriate installation will be critical in achieving the **TPEC** and the **TER**.

10.1.7 It is expected that low and zero carbon technologies will be increasingly employed for compliance with the **TER**, particularly where the average performance of elements in the actual building is worse than the elemental specification. The report should highlight where these low and zero carbon technologies have been used and the **BCB** is advised to give particular attention to their installation.

10.2 Cases when notification is not needed – Competent person scheme

10.2.1 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

10.2.2 There are no competent person schemes that cover all aspects of the construction of a new building. 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).

10.2.3 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.

10.2.4 **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/m²). 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 **BER**, and is based on a specific measurement of the building concerned.

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

BER is the Building Carbon Dioxide (CO₂) Emission Rate. It is expressed in terms of the mass of CO₂, in units of kg per m² of the **total useful floor area** of the building per year, kgCO₂/(m².year), emitted as a result of the provision of the specified **fixed building services**, which include space and water heating, ventilation system and fixed lighting systems, for a standardised occupancy when assessed using approved calculation tools.

BPEC is the Building Primary Energy Consumption. It is expressed in terms of the amount of **primary energy** consumed in the building, in units of kWh per m² of the **total useful floor area** of the building per year, kWh/(m².year), as a result of the provision of the specified **fixed building services**, which include space and water heating, ventilation system and fixed lighting systems, for a standardised occupancy when assessed using approved calculation tools.

Building means the whole of a building or parts of it designed or altered to be used separately.

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.

Delivered energy means energy supplied to the building and its systems to satisfy the relevant energy demands e.g. space heating, water heating, cooling, ventilation, lighting. Delivered energy includes renewable energy produced on site and used within the building but does not include any exported energy.

Display Window means an area of glazing, including glazed doors, intended for the display of products or services on offer within the building, positioned:

- a. at the external perimeter of the building; and
- b. at an access level and immediately adjacent to a pedestrian thoroughfare.

There should be no permanent workspace within one glazing height of the perimeter. Glazing more than 3m above such an access level should not be considered part of a **display window** except:

- a. where the products on display require a greater height of glazing;
- b. in existing buildings, where replacing display windows that already extend to a greater height;
- c. in cases of building work involving changes to the façade and glazing requiring planning consent, where planners should have discretion to require a greater height of glazing, e.g. to fit in with surrounding buildings or to match the character of the existing façade.

It is expected that **display windows** will be found in Planning Use Classes A2, A2, A3 and D2 as detailed in Table 5.

Table 5: Planning use classes	
Class	Use
A1	<ul style="list-style-type: none"> • Shops: including retail-warehouse, undertakers, showrooms, post offices, hairdressers, shops for sale of cold food for consumption off premises
A2	<ul style="list-style-type: none"> • Financial and professional services: banks, building societies, estate and employment agencies, betting offices
A3	<ul style="list-style-type: none"> • Food and drink: restaurants, pubs, wine bars, shops for sale of hot food for consumption off premises
D2	<ul style="list-style-type: none"> • Assembly and leisure: cinemas, concert halls, bingo halls, casinos, sports and leisure uses

Dwelling refers to a self-contained unit (including a house or a flat) designed to be used separately to accommodate a single household. New **Dwellings** are covered by Approved Document L1A.

Emergency escape lighting means that part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before leaving an area.

Energy efficiency requirements are the requirements of the Building Regulations covered by this Approved Document. See Appendix B for further details of these requirements.

Energy performance certificate means a certificate which complies with Regulation 7A of the Energy Performance of Buildings (England and Wales) Regulations 2012 (SI 2012/3119).

Fit-out work means that work needed to complete the internal layout and servicing of the building shell to meet the specific needs of an incoming occupier. The building shell is the structural and non-structural envelope of a building provided as a primary stage (usually for a speculative developer) for a subsequent project to fit out with internal accommodation works.

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.

National Calculation Methodology (NCM) is the procedure for calculating the energy performance of **non-domestic buildings** for Part L. Only software tools approved by the Notice of Approval²¹ (SBEM, approved software interfaces to SBEM or approved Dynamic Simulation Models) should be used.

Non-domestic buildings are those buildings that are **not dwellings**.

Occupied space is that intended to be occupied by the same person for a substantial part of the day. This excludes circulation spaces, and other areas of transient occupancy, such as toilets, as well as spaces that are not intended for occupation (e.g. **display windows**).

Primary energy means energy that has not been subjected to any conversion or transformation process. For a building, it is the **delivered energy** plus the energy used to produce the energy delivered to the building. It is calculated from the **delivered energy** using **primary energy** (conversion) factors.

Renewable energy means energy from renewable non-fossil energy sources e.g. solar energy (thermal and photovoltaic), wind, hydropower, biomass, geothermal, wave, tidal, landfill gas, sewage treatment plant gas and biogases. For the purposes of calculating

²¹ Notice of Approval of the methodology of calculation of the energy performance of buildings in England and Wales.

the actual building's primary energy consumption all electricity demand will be valued at the grid primary energy factor, regardless of whether some or all of the delivered electricity is derived from renewable sources on site. This is because the **TPEC/BPEC** calculation is primarily a measure of the energy efficiency of fabric and building services.

TER is the Target Carbon Dioxide (CO₂) Emission Rate. It is expressed in terms of the mass of CO₂, in units of kg per m² of the **total useful floor area** of the building per year, kgCO₂/(m².year), emitted as a result of the provision of standardised **fixed building services**, which include space and water heating, ventilation system and fixed lighting systems, for a standardised occupancy when assessed using approved calculation tools.

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.

Total useful floor area is the total area of all enclosed spaces measured to the internal face of the external walls, that is to say it is the gross floor area as measured in accordance with the guidance issued to surveyors by the RICS. In this convention:

- a. the area of sloping surfaces such as staircases, galleries, raked auditoria and tiered terraces should be taken as their area on plan; and
- b. areas that are not enclosed such as open floors, covered ways and balconies are excluded.

TPEC is the Target Primary Energy Consumption. It is expressed in terms of the amount of **primary energy** consumed in the building, in units of kWh per m² of the **total useful floor area** of the building per year, kWh/(m².year), as a result of the provision of the standardised **fixed building services**, which include space and water heating, ventilation system and fixed lighting systems, for a standardised occupancy when assessed using approved calculation tools

Appendix B – The Building Regulations

L2A

1. The elemental specifications which must be used to calculate the **TPEC** and **TER** of a new building are given in the NCM Modelling Guide²². A summary is given in the table below for different categories of building.

Element	Side lit or unlit (When HVAC specification is heating only)	Side lit or unlit (Where HVAC specification includes cooling)	Toplit
Roof U-value (W/m ² .K)	0.18	0.18	0.18
Wall U-value (W/m ² .K)	0.26	0.26	0.26
Floor U-value (W/m ² .K)	0.22	0.22	0.22
Window U-value (W/m ² .K)	1.6 (10% FF)	1.8 (10% FF)	N/A
G-Value (%)	40%	40%	N/A
Light Transmittance (%)	71%	71%	N/A
Roof light U-value (W/m ² .K)	N/A	N/A	1.8 (15% FF)
G-Value (%)	N/A	N/A	52%
Light Transmittance (%)	N/A	N/A	57%
<i>Air-permeability (m³/m²/hour), note: GIA = Gross Internal Area</i>			
GIA ≤ 250m ²	5	5	7
250m ² < GIA ≤ 3,500m ²	3	5	7
3,500m ² < GIA ≤ 10,000m ²	3	5	5
10,000m ² < GIA	3	5	3
Lighting Efficacy (lm / circuit watt)	65	65	65
Occupancy control (Yes/No)	Yes	Yes	Yes
Daylight control (Yes/No)	Yes	Yes	Yes
Maintenance Factor	0.8	0.8	0.8
Constant illuminance control	No	No	No
Heating efficiency	91%	91%	91%
Central SFP (W//s)	1.8	1.8	1.8

²² <http://www.ncm.bre.co.uk/>

Elemental Specification for the TER calculation

Element	Side lit or unlit (When HVAC specification is heating only)	Side lit or unlit (Where HVAC specification includes cooling)	Toplit
Terminal Unit SFP (W/l/s)	0.3	0.3	0.3
Cooling (SEER / SSEER)	N/A	4.5 / 3.6	4.5 / 3.6
Cooling (mixed mode) ¹ (SSEER)	N/A	2.7	2.7
Heat recovery efficiency (%)	70%	70%	70%
Variable speed control	Yes	Yes	Yes
Demand control ventilation	Yes	Yes	Yes
Renewable Energy Contribution:			
Monocrystalline PV with an efficiency of 15%.		5.3% of gross internal area	
Active area of south facing panels (120kWh/m ² /year output) equivalent to stated % of gross floor area but limited to 50% of roof area.			

Note 1: Mixed mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor unit and fans, pumps and losses

- 1** U-values for thermal elements (walls, floors and roofs) shall be calculated using methods and conventions set out in BRE Report *BR 443 Conventions for U-value Calculations*, 2006 Edition.
- 2** U-values for windows and doors 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 BRE Report *BR 443 Conventions for U-value Calculations*, 2006 Edition.
- 3** In the case of a window, 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 set out 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 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 door.
- 5** The U-values for roof windows and rooflights set out in Table 3 are calculated for windows positioned in a vertical plane. If a particular unit is not positioned vertically, the U-values to be achieved or bettered set out in this table should be adjusted for the specific angle following the guidance set out in BRE Report *BR 443 Conventions for U-value Calculations*, 2006 Edition.
- 6** The U-values 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).
- 7** U-values for indoor swimming pool basins shall be calculated using the methods and conventions set out in *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 – L2A 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, 2nd Edition, 2013.
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 – The Approved Documents

L2A

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

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

Air Tightness Testing and Measurement Association (ATTMA)

www.attma.org

Measuring air permeability of building envelopes (non-dwellings), Technical Standard L2, 2010.

BRE

www.bre.co.uk

BR 443 Conventions for U-value calculations, 2006. (Downloadable from 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

National Calculation Methodology (NCM) modelling guide (for buildings other than dwellings in Wales) [2014]. www.wales.gov.uk/topics/planning/buildingregs (to be updated)

Simplified Building Energy Model (SBEM) User manual and software: www.2013ncm.bre.co.uk (to be updated)

BSRIA

www.bsria.co.uk

BSRIA BG 8/2009 Model Commissioning Plan

Building and Engineering Services Association (B&ES)

www.b-es.org

DW/143 A Practical Guide to Ductwork Leakage Testing [2013].

DW/144 Specification for Sheet Metal Ductwork [2013]

CIBSE

www.cibse.org

Commissioning Code M: Commissioning management, 2003. ISBN 978 1 10328 733 0

TM 31 Building Log Book Toolkit, 2006. ISBN 978 1 90328 771 2

TM 37 Design for improved solar shading control, 2006. ISBN 978 1 90328 757 6

Appendix G – Documents and Standards referred to

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TM 39 Building energy metering, 2009. ISBN 978 1 90684 611 4

TM 46 Energy benchmarks, 2008.

Department for Education (DfE) England

www.education.gov.uk

Ventilation of school buildings, Building bulletin 101, School Building and Design Unit, Version 1.4 – 5th July 2006 ISBN 011-2711642

Department for Energy and Climate Change (DECC)

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)

Department for Communities and Local Government

www.gov.uk/government/organisations/department-for-communities-and-local-government

Non-Domestic Building Services Compliance Guide, 2013.

Health and Safety Executive (HSE)

www.hse.gov.uk

L24 Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and Guidance, The Health and Safety Commission, 2nd edition 2013. ISBN 978 0 71760 413 5

National Association of Rooflight Manufacturers

www.narm.org.uk

NARM Technical Document NTD 2 (2010),

Welsh Government

www.wales.gov.uk/topics/planning/buildingregs

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

www.planningportal.gov.uk/buildingregulations/approveddocuments/part1/bcassociateddocuments9/ncm

Legislation

Building Regulations 2010 (SI 2010/2214)

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

Building Regulations &c. (Amendment) (Wales) Regulations (SI 2013/747)

The Energy Performance of Buildings (England and Wales) Regulations 2012 (SI 2012/3119).

Standards

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

BS EN 410:2011 Glass in building. Determination of luminous and solar characteristics of glazing.

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)].