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Llywodraeth Cymru
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Consultation Document

2012 consultation on changes to the Building Regulations in Wales Part L (Conservation of fuel and power)

Section two - Proposed changes to the Approved Documents

Revision 1 - Minor amendments

Date of issue: **31 July 2012**
Action required: Responses by **23 October 2012**

Overview

The Building Regulations and the associated statutory guidance set out in Approved Documents seek to ensure buildings meet certain standards for minimum health, safety, welfare, convenience and sustainability.

This document covers proposals for changes relating to Part L (Conservation of fuel and power).

This consultation is aimed primarily at firms, individuals and their representative bodies within construction and construction-related industries and the building control bodies that enable the building control system to operate. Specific elements may be of interest to members of the public.

How to respond

A response form is provided at Annex B of this document.

Consultees are invited to e-mail responses to:
enquiries.brconstruction@wales.gsi.gov.uk

Those who prefer to submit a paper copy of their response should send these to:

Building Regulations Consultation
Construction Unit
Environment and Sustainable Development Directorate
Welsh Government
Rhyd y Car Offices
Merthyr Tydfil
CF48 1UZ

Further information and related documents

Large print, Braille and alternate language versions of this document are available on request.

Contact Details

For further information:

Welsh Government
Rhyd y Car Offices
Merthyr Tydfil
CF48 1UZ
Telephone: 0300 062 8141
E-mail: enquiries.brconstruction@wales.gsi.gov.uk

Data Protection

How the views and information you give us will be used.

Any response you send us will be seen in full by Welsh Government staff dealing with the issues which this consultation is about. It may also be seen by other Welsh Government staff to help them plan future consultations.

The Welsh Government intends to publish a summary of the responses to this document. We may also publish responses in full. Normally, the name and address (or part of the address) of the person or organisation who sent the response are published with the response. This helps to show that the consultation was carried out properly. If you do not want your name or address published, please tell us this in writing when you send your response. We will then blank them out.

Names or addresses we blank out might still get published later, though we do not think this would happen very often. The Freedom of Information Act 2000 and the Environmental Information Regulations 2004 allow the public to ask to see information held by many public bodies, including the Welsh Government. This includes information which has not been published. However, the law also allows us to withhold information in some circumstances. If anyone asks to see information we have withheld, we will have to decide whether to release it or not. If someone has asked for their name and address not to be published, that is an important fact we would take into account. However, there might sometimes be important reasons why we would have to reveal someone's name and address, even though they have asked for them not to be published. We would get in touch with the person and ask their views before we finally decided to reveal the information.

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Revision 1 – Minor amendments

AD L1A

- Table 2 - 2010 values added (page 28)

AD L1B (old format)

- 3.15 – "where no heating or cooling is installed" highlighted in blue (page 57)

Introduction

Building Regulations control certain types of building work, principally the erection and extension of buildings and provision or extension of certain services or fittings, chiefly to ensure that buildings meet certain standards of health, safety, welfare, convenience and sustainability.

This document contains the proposed changes to the technical guidance which accompanies the main proposals for changes to Part L (Conservation of Fuel and Power) for Wales in 2013. The main Part L proposals and the response forms can be found at:. www.wales.gov.uk/consultations/planning/buildingregspartl/?lang=en / www.wales.gov.uk/consultations/planning/buildingregspartl/?lang=cy

In this document, we are highlighting two aspects in relation to the suite of guidance documents:

- the proposed technical changes in guidance from Part L 2010;
- the proposed new format for all of the Welsh Approved Documents for Part L, to be introduced alongside the new Part L Regulation.

The main consultation document addresses the proposed technical changes and poses a number of questions, inviting responses.

The intended format change is illustrated through the inclusion of two versions of one of the Approved Documents (wADL1B). So wADL1B *new format* sets out the guidance in the proposed new layout; it has the same intended meaning as *wADL1B old format* but the guidance has been presented in a more accessible way. The consultation document invites comments on this proposed new format.

Contents

Chapter 1: Proposed changes to Welsh Approved Document L1A: New dwellings (full draft)

This chapter is a draft version of Welsh Approved Document L1A, and has been produced for consultation purposes. Final Approved Document statutory guidance will be produced to accompany the final regulatory changes. Where text from the Building Regulations 2010 is reproduced in this document, the only change which has been made is to update the numbering of the regulations in accord with Statutory Instrument 2010:2214. Further changes to the Regulations themselves are likely to be required to reflect decisions on final policy following consultation.

Text from the 2010 version is shown in black.

Deletions from the 2010 version are shown in ~~black strikethrough.~~

Text which is new to this version is shown in blue for new statutory guidance and *italic blue for new supplementary (non-statutory) advice*.

Explanatory text (which is provided to assist the consultation process and will not feature in the final Approved Document) is shown in *purple italic*.

Contents

Section 1: Introduction

What is an Approved Document?

1.1 This Approved Document, which takes effect on January 2015 ~~1 October 2010~~, has been approved and issued by the Welsh Ministers ~~Secretary of State~~ to provide practical guidance on ways of complying with the ***energy efficiency requirements*** (see Section 2) and regulation 7 of the Building Regulations 2010 (SI 2010/2214) ~~2000 (SI 2000/2531)~~ for England and Wales, as amended. Regulation 2(1) of the Building Regulations defines the ***energy efficiency requirements*** as the requirements of regulations 23, 26, 28, 29 and 40 ~~4A, 17C, 17D and 17E~~ and Part L of Schedule 1. The Building Regulations 2010 ~~2000~~ are referred to throughout the remainder of this document as 'the Building Regulations'.

1.2 The intention of issuing Approved Documents is to provide guidance about compliance with specific aspects of 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) of building regulations to which they refer.

1.3 If guidance in an Approved Document is followed there will be a presumption of compliance with the requirement(s) covered by the guidance. However, this presumption can be overturned, so simply following guidance does not guarantee compliance; 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 well be other ways of achieving compliance with the requirements. **There is therefore no obligation to adopt any particular solution contained in this Approved Document if you would prefer to meet the relevant requirement in some other way. Persons intending to carry out building work should always check with their building control body, either the local authority or an approved inspector, that their proposals comply with building regulations.**

1.4 It is important to note that this Approved Document, as well as containing guidance, also contains extracts from the Regulations. Such regulatory text must be complied with as stated. For example, the requirement that the target carbon dioxide (CO_2) emission rate for the building shall not be exceeded (regulation 26 ~~17C~~) is a regulatory requirement. There is therefore no flexibility to ignore this requirement; neither can compliance with this particular regulation be demonstrated via any route other than that set out in regulations 24 and 25 ~~17A and 17B~~.

1.5 The guidance contained in this Approved Document relates only to the particular requirements of the Building Regulations that the document addresses (set out in Section 2). However, building work may be subject to more than one requirement of building regulations. In such cases the work will also have to comply with any other applicable requirements of building regulations.

1.6 There are Approved Documents that give guidance on each of the parts of Schedule 1 and on regulation 7. A full list of these is provided at the back of this document.

Consideration of technical risk

1.7 In relation to the construction of new ***dwellings***, building work must satisfy all the technical requirements set out in regulation 26~~17C~~ of, and Schedule 1 to, the Building Regulations. When considering the incorporation of energy efficiency measures in ***dwellings***, attention should also be paid in particular to the need to comply with Part B (fire safety), Part C (site preparation and resistance to contaminants and moisture), Part E (resistance to the passage of sound), Part F (ventilation), paragraph G3 (hot water

supply and systems), Part J (combustion appliances and fuel storage systems) and Part P (electrical safety) of Schedule 1 to the Building Regulations, as well as Part L. The adoption of any particular energy efficiency measure should not involve unacceptable technical risk of, for instance, excessive condensation. Designers and builders should refer to the relevant Approved Documents and to other generally available good practice guidance to help minimise these risks.

How to use this Approved Document

1.8 This Approved Document is subdivided into seven sections as detailed below. These main sections are followed by supporting appendices.

This **introductory** section sets out the general context in which the guidance in the Approved Document must be considered.

Section 2 sets out the relevant legal requirements contained in the Building Regulations.

Section 3 contains general guidance, including the definition of key terms, the types of building work covered by this Approved Document, the types of building work that are exempt, procedures for notifying work, materials and workmanship and health and safety issues, an overview of the routes to compliance and how to deal with 'special' areas of buildings that contain ***dwellings***.

Section 4 details the considerations that apply to demonstrating that the design of the ***dwelling*** will meet the ***energy efficiency requirements***. This section begins the detailed technical guidance relating to showing compliance with the ***energy efficiency requirements***.

Section 5 details the considerations that apply when demonstrating that the design has been appropriately translated into actual construction performance.

Section 6 describes the information that should be provided to occupiers to help them achieve reasonable standards of energy efficiency in practice.

Section 7 provides a pointer to some useful information on different design approaches to meeting the ***energy efficiency requirements***.

1.9 In this document the following conventions have been adopted to assist understanding and interpretation:

a. Texts shown against a red~~green~~ background are extracts from the Building Regulations or Building (Approved Inspectors etc.) Regulations 2010 (SI 2010/2215) ~~2000 (SI 2000/2532)~~ ('the Approved Inspectors Regulations'), both as amended, and set out the legal requirements that relate to compliance with the ***energy efficiency requirements*** of building regulations. As stated previously, there is no flexibility in respect of such text; it defines a legal requirement, not guidance for typical situations. It should also be remembered that, as noted above, building works must comply with all the other applicable provisions of building regulations.
b. Key terms are defined in paragraph 3.1 and are printed in ***bold italic text***.
c. Details of technical publications referred to in the text of this Approved Document will be given in footnotes and repeated as references at the end of the document. A reference to a publication is likely to be made for one of two main reasons. The publication may contain additional or more comprehensive technical detail, which it would be impractical to include in full in the Approved Document but which is needed to fully explain ways of meeting the requirements; or it is a source of more general information. The reason for the reference will be indicated in each case. The reference will be to a specified edition of the document. The Approved Document may be amended from time to time to include new references or to refer to revised editions where this aids compliance.

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.

Where you can get further help

1.10 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 seek further assistance:

- the Welsh Government website: www.wales.gov.uk/topics/planning/buildingregs/
- the Planning Portal website: www.planningportal.gov.uk;
- if you are the person undertaking the building work you can seek assistance either from your local authority building control service or from your approved inspector (depending on which building control service you are using);
- persons registered with a competent person self-certification scheme may be able to get technical advice from their scheme operator;
- 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.

Responsibility for compliance

1.11 It is important to remember that if you are the person (e.g. designer, builder, installer) carrying out building work to which any requirement of building regulations applies you have a responsibility to ensure that the work complies with any such requirement. The building owner may also have a responsibility for ensuring compliance with building regulation requirements and could be served with an enforcement notice in cases of non-compliance.

Section 2: The Requirements

2.1 This Approved Document, ~~which takes effect on 1 October 2010~~, deals with the ***energy efficiency requirements*** in the Building Regulations 2010 ~~2000~~ (as amended). Regulation 2(1) of the Building Regulations defines the ***energy efficiency requirements*** as the requirements of regulations 23, 26, 28, 29 and 40 ~~4A, 17C, 17D and 17E~~ and Part L of Schedule 1. The ***energy efficiency requirements*** relevant to this Approved Document, which deals with new ***dwellings***, are those in regulations 26, 29 and 40 ~~17C and 17E~~ and Part L of Schedule 1, and are set out below.

Text numbering to be confirmed for final stage

New buildings – Regulation 26 ~~17C~~

Where a building is erected, it shall not exceed the target CO_2 emission rate for the building that has been approved pursuant to regulation 25 ~~17B~~.

Energy performance certificates – Regulation 29 ~~17E~~

(1) This regulation applies where—

(a) a building is erected; or

(b) a building is modified so that it has a greater or lesser ~~fewer~~ number of parts designed or altered for separate use than it previously had, where the modification includes the provision or extension of any of the fixed services for heating, hot water, air conditioning or mechanical ventilation.

(2) The person carrying out the work shall—

(a) give an energy performance certificate for the building to the owner of the building; and

(b) give to the local authority notice to that effect, including the reference number under which the energy performance certificate has been registered in accordance with regulation **30(4)**~~17F(4).~~

(3) The energy performance certificate and notice shall be given not later than five days after the work has been completed.

~~(4) The energy performance certificate must be accompanied by a recommendation report containing recommendations for the improvement of the energy performance of the building, issued by the energy assessor who issued the energy performance certificate.~~

(4~~5~~) An energy performance certificate must—

(a) express the asset rating of the building in a way approved by the Secretary of State under regulation 24 ~~17A;~~

(b) include a reference value such as a current legal standard or benchmark;

(c) be issued by an energy assessor who is accredited to produce energy performance certificates for that category of building; and

(d) include the following information—

(i) the reference number under which the certificate has been registered in accordance with regulation 30(4) ~~17F(4);~~

(ii) the address of the building, or in the case of a portable building the address of the owner;

(iii) an estimate of the total useful floor area of the building;

(iv) the name of the energy assessor who issued it;

(v) the name and address of the energy assessor's employer, or, if ~~he is~~ self-employed, the name under which the assessor trades and the assessor's ~~his~~ address;

(vi) the date on which it was issued; and

(vii) the name of the approved accreditation scheme of which the energy assessor is a member.

(5) The energy performance certificate must be accompanied by a recommendation report containing recommendations for the improvement of the energy performance of the building, issued by the energy assessor who issued the energy performance certificate.

(6) Certification for apartments or units designed or altered for separate use in blocks may be based—
(a) except in the case of a dwelling, on a common certification of the whole building for blocks with a common heating system; or
(b) on the assessment of another representative apartment or unit in the same block.

(7) Where —
(a) a block with a common heating system is divided into parts designed or altered for separate use; and
(b) one or more, but not all, of the parts are dwellings,

certification for those parts which are not dwellings may be based on a common certification of all the parts which are not dwellings.

Information about use of fuel and power – Regulation 40

(1) This regulation applies where paragraph L1 of Schedule 1 imposes a requirement in relation to

	building work. (2) The person carrying out the work shall not later than five days after the work has been completed provide to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.	

	Requirement	*Limits on application*
	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 ~~; and~~ ensure they use no more fuel and power than is reasonable in the circumstances ~~(c) providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.~~	

LIMITATION ON REQUIREMENTS

2.2 In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D, F to K and N and P (except for paragraphs G2, H2 and J6) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

2.3 Paragraph G2 is excluded as it deals with water efficiency and paragraphs H2 and J7~~6~~ are excluded from regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound and access to and use of buildings) are excluded from regulation 8 because they address the welfare and convenience of building users. Part L is excluded from regulation 8 because it addresses the conservation of fuel and power.

Section 3: General guidance

Key terms

3.1 The following are key terms used in this document:

Air permeability is the physical property used to measure 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 establishing the ***DER***, and is based on a specific measurement of the ***dwelling*** concerned, or on measurements of other ***dwellings*** of the same ***dwelling type***.

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

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

Commissioning means the advancement of a ***fixed building service*** following installation, replacement 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.

Controlled service or fitting means a service or fitting in relation to which Part G (sanitation, hot water safety and water efficiency), H (drainage and waste disposal), J (combustion appliances and fuel storage systems), L (conservation of fuel and power) or P (electrical safety) of Schedule 1 to the Building Regulations imposes a requirement.

DER is the ***Dwelling*** CO_2 Emission Rate expressed as $kgCO_2/(m^2.year)$.

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

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

i. be of the same generic form (i.e. detached, semi-detached, end terrace, mid-terrace, ground-floor flat (inc. ground-floor maisonette), mid-floor flat, top-floor flat (inc. top-floor maisonette);
ii. be of the same number of storeys;
iii. be of the same ***design air permeability***;

iv. have similar adjacency to unheated spaces such as stairwells, integral garages, etc.
v. have the same principal construction details (as identified by the Accredited Construction Details (ACD) or bespoke detail reference codes);
vi. have a similar (i.e. ±1) number of significant penetrations, i.e. for windows, doors, flues/ chimneys, supply/exhaust terminals, waste water pipes;
vii. have envelope areas that do not differ by more than 10 per cent (see ***air permeability*** for a definition of envelope area).

Elemental recipe (or 'Elemental recipe specification') refers to the schedule of fabric services and renewable energy generation that is used to calculate the carbon target for a ***dwelling.*** If a builder chooses to follow this specification they could expect to comply with criterion 1 and 2 of Part L1A. Whilst following the elemental recipe is expected to avoid iteration of the building specification to meet the carbon target, compliance with criteria 3 in particular should be demonstrated in SAP2012.

Energy efficiency requirements means the requirements of regulations 23, 26, 28, 29 and 40 ~~4A, 17C, 17D and 17E~~ of, and Part L of Schedule 1 to, the Building Regulations.

Fixed building services means any part of, or any controls associated with:
a. fixed internal or external lighting systems, but does not include emergency escape lighting or specialist process lighting; or
b. fixed systems for heating, hot water, air-conditioning or mechanical ventilation.

Room for residential purposes means a room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep ~~in~~ and includes a room in a hostel, a hotel, a boarding house, a hall of residence or a residential home, ~~whether or not the room is separated from or arranged in a cluster group with other rooms~~, but does not include a room in a hospital, or other similar establishment, used for patient accommodation. ~~and, for the purposes of this definition, a 'cluster' is a group of rooms for residential purposes which is:~~
~~a. separated from the rest of the building in which it is situated by a door which is designed to be locked; and~~
~~b. not designed to be occupied by a single household.~~

TER is the Target CO_2 Emission Rate expressed as $kgCO_2/(m^2.year)$ (see paragraphs 4.2 to 4.6).

Worst acceptable fabric parameter refers to the poorest fabric performance acceptable for an element of the building envelope such as a wall, floor or the building envelope air tightness.

Types of work covered by this Approved Document

3.2 This Approved Document is intended to give guidance on what, in ordinary circumstances, may be considered reasonable provision for compliance with the requirements of regulation 26~~17C~~ of, and Part L of Schedule 1 to, the Building Regulations for those creating new ***dwellings***. In addition it gives guidance on compliance with regulations 27, 43 and 44 ~~20B, 20C and 20D~~ of the Building Regulations and regulation 20(1), 20(2) and 20(6) ~~12B, 12C and 12D~~ of the Approved Inspectors Regulations.

Live-work units

3.3 If a unit contains both living accommodation and space to be used for commercial purposes (e.g. workshop or office), the whole unit should be treated 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 thermal envelope; and
c. the living accommodation occupies a substantial proportion of the total area of the unit.

*Sub-paragraph c means 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**.*

Mixed-use developments

3.4 When constructing a ***dwelling*** as part of a larger building that contains other types of accommodation, sometimes called a mixed-use development, this Approved Document L1A should be used for guidance in relation to each individual ***dwelling***. Approved Document L2A gives guidance relating to the non-dwelling parts of such buildings such as heated common areas, and in the case of mixed-use developments, the commercial or retail space.

Material changes of use

3.5 The erection of a new ***dwelling*** is not a material change of use. Approved Document L1B applies where a ***dwelling*** is being created in an existing building as the result of a material change of use of all or part of the building.

Buildings that are exempt from the energy efficiency requirements

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

Notification of work covered by the energy efficiency requirements

3.7 In all cases where it is proposed to erect a new ***dwelling*** building regulations require the person proposing to carry out the work to notify a ***BCB*** 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 paragraphs 3.8 to 3.11 below.

Competent person self-certification schemes

3.8 It is not necessary to notify a ***BCB*** in advance of work which is to be carried out by a person registered with a relevant competent person self-certification scheme listed in Schedule 3 ~~2A~~ to the Building Regulations. 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.

3.9 Where work is carried out by a person registered with a competent person scheme, regulation 20 ~~16A~~ of the Building Regulations 2010 ~~2000~~ and regulation 20(1)~~11A~~ of the Building (Approved Inspectors etc) Regulations 2010~~2000~~ require that the occupier of the building 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. There is also a requirement to give the ***BCB*** a notice of the work carried out, again within 30 days of the completion of the work. These certificates and notices are usually made available through the scheme operator.

3.10 ***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.

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

3.12 A list of competent person self-certification schemes and the types of work for which they are authorised can be found at www.communities.gov.uk

Materials and workmanship

3.12a Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations should be carried out in accordance with Regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in the Approved Document to Regulation 7.

3.12b Building regulations are made for specific purposes, primarily 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.

3.12c When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

This text is amended to reflect the proposed changes to the Regulation 7 Approved Document. See Chapter 7 of the Consultation Document for more details.

~~Materials and workmanship~~

~~**3.13** Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations should, in accordance with regulation 7, be carried out with proper materials and in a workmanlike manner.~~

~~**3.14** You may show that you have complied with regulation 7 in a number of ways. These include demonstrating the appropriate use of:~~

- ~~a product bearing CE marking in accordance with the Construction Products Directive (89/106/EEC)[1], as amended by the CE Marking Directive (93/68/EC)[2], the Low Voltage Directive (2006/95/EC)[3] and the EMC Directive (2004/108/EC)[4];~~
- ~~a product complying with an appropriate technical specification (as defined in those Directives mentioned above), a British Standard, or an alternative national technical specification of a Member State of the European Union or Turkey[5], or of another State signatory to the Agreement on the European Economic Area (EEA) that provides an equivalent level of safety and protection;~~
- ~~a product covered by a national or European certificate issued by a European Technical Approval Issuing body, provided the conditions of use are in accordance with the terms of the certificate.~~

~~[1] As implemented by the Construction Products Regulations 1991 (SI 1991/1620).~~
~~[2] As implemented by the Construction Products (Amendment) Regulations 1994 (SI 1994/3051).~~

[3] As implemented by the Electrical Equipment (Safety) Regulations 1994 (SI 1994/3260).
[4] As implemented by the Electromagnetic Compatibility Regulations 2006 (SI 2006/3418).
[5] Decision No 1/95 of the EC-Turkey Association Council of 22 December 1995.

3.15 You will find further guidance in the Approved Document which specifically supports regulation 7 on materials and workmanship.

Independent certification schemes

3.16 There are many UK product certification schemes. Such schemes certify compliance with the requirements of a recognised standard that is appropriate to the purpose for which the material is to be used. Materials which are not so certified may still conform to a relevant standard.

3.17 Many certification bodies that approve products under such schemes are accredited by the United Kingdom Accreditation Service (UKAS). Such bodies can issue certificates only for the categories of product covered under the terms of their accreditation.

3.18 ***BCBs*** may take into account the certification of products, components, materials or structures under such schemes as evidence of compliance with the relevant standard. Similarly, ***BCBs*** may accept the certification of the installation or maintenance of products, components, materials or structures under such schemes as evidence of compliance with the relevant standard. Nonetheless, before accepting that certification constitutes compliance with building regulations, a ***BCB*** should establish in advance that the relevant scheme is adequate for that purpose.

Standards and technical specifications

3.19 Building regulations are made for specific purposes, including securing the health, safety, welfare and convenience of people in or about buildings; furthering the conservation of fuel and power; furthering the protection or enhancement of the environment; and facilitating sustainable development. Guidance contained in standards and technical approvals referred to in Approved Documents may be relevant to compliance with building regulations to the extent that it relates to those purposes. However, it should be noted that guidance in standards and technical approvals may also address other aspects of performance such as serviceability, or aspects which, although they relate to health and safety, are not covered by building regulations.

3.20 When an Approved Document makes reference to a named standard or document, the relevant version of the standard or document is the one listed at the end of the Approved Document. Until the reference in the Approved Document is revised, the standard or document listed remains the approved source, but if the issuing body has published a revised or updated version, any content that addresses the relevant requirements of the Building Regulations may be used as a source of guidance.

3.21 The appropriate use of a product in compliance with a European Technical Approval as defined in the Construction Products Directive will meet the relevant requirements.

3.22 Communities and Local Government intends to issue periodic amendments to its Approved Documents to reflect emerging harmonised European standards. Where a national standard is to be replaced by a European harmonised standard, there will be a coexistence period during which either standard may be referred to. At the end of the coexistence period the national standard will be withdrawn.

The Workplace (Health, Safety and Welfare) Regulations 1992

3.23 The Workplace (Health, Safety and Welfare) Regulations 1992, as amended, apply to the common parts of flats and similar buildings if people such as cleaners, wardens and caretakers are employed to work in these common parts. These Regulations contain

some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see *Workplace health, safety and welfare, Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and guidance*, HSE publication L24, HMSO, 1996.

Demonstrating compliance

3.24 In the Welsh Ministers' ~~Secretary of State's~~ view, compliance with the ***energy efficiency requirements*** could be demonstrated by meeting all **five criteria** set out in the following paragraphs. It is expected that software implementations of SAP 20~~09~~12 will produce an output report that will assist ***BCBs*** to check that compliance has been achieved.

*The output report can benefit both developers and **BCBs** during the design and construction stages as well as at completion.*

3.25 Criterion 1: in accordance with regulation 26~~17C~~, the calculated rate of CO_2 emissions from the ***dwelling*** (the Dwelling Emission Rate, ***DER***) must not be greater than the Target Emission Rate (***TER***), which is determined by following the procedure set out in paragraphs 4.7 to 4.17.

*In 2013 an elemental recipe specification is introduced to calculate the **TER. The use of a recipe specification offers a builder a simplified route to compliance** with criteria 1 and 2. As the elemental recipe specification is used to calculate a carbon target, flexibility is retained for a designer to iterate to a cost optimal specification that has carbon emissions no greater than the same building built to the recipe specification.*

~~*Criterion 1 is a regulation and is therefore mandatory. Criteria 2 to 5 are only guidance. The calculations required as part of the procedure used to show compliance with this criterion can also provide information needed to prepare the Energy Performance Certificate required by regulation 17E of the Building Regulations and by the Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007 (SI 2007/991) as amended.*~~

3.26 Criterion 2: the performance of the building fabric and the ***fixed building services*** should achieve reasonable overall standards of energy efficiency following the procedure set out in paragraphs 4.18 to 4.24.

This is intended to place limits on design flexibility to discourage excessive and inappropriate trade-offs – e.g. buildings with poor insulation standards offset by renewable energy systems with uncertain service lives. This emphasises the purpose of Criterion 2.

Criterion 1 is a regulation and is therefore mandatory, as is the new regulation for worse acceptable fabric standards in Criterion 2. Criteria ~~2~~3 to 5 are only guidance. The calculations required as part of the procedure used to show compliance with ~~this criterion~~ Criterion 1 can also provide information needed to prepare the Energy Performance Certificate required by regulation 29~~17E~~ of the Building Regulations and by the Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007 (SI 2007/991) as amended.

3.27 Criterion 3: the ***dwelling*** should have appropriate passive control measures to limit the effect of solar and other heat gains on indoor temperatures in summer, irrespective of whether or not the ***dwelling*** has mechanical cooling. The guidance given in paragraphs 4.25 to 4.27a of this Approved Document provides a way of demonstrating that reasonable provision has been made.

The aim is to counter excessive internal temperature rise in summer to reduce or eliminate the need for air conditioners. Criterion 3 should be satisfied even if the

dwelling *is air conditioned. Compliance with criterion 1 and 2 by following the elemental recipe specification will not necessarily demonstrate compliance with Criterion 3.*

3.28 Criterion 4: the performance of the ***dwelling***, as built, should be consistent with the ***DER***. The guidance in Section 5 should be used to demonstrate that this criterion has been met. ~~Extra credits will be given in the ***TER/DER*** calculation where builders provide robust evidence of quality assured procedures in the design and construction phases.~~

3.29 Criterion 5: the necessary provisions for energy efficient operation of the ***dwelling*** should be put in place. One way to achieve this would be by following the guidance in Section 6. **'Special areas' related to dwellings**

3.30 The following paragraphs describe some 'special areas' that fall outside the normal five criteria, and give guidance on how reasonable provision for the conservation of fuel and power can be demonstrated.

Common areas in buildings with multiple dwellings

3.31 The common areas of buildings containing more than one ***dwelling*** are not classified as ***dwellings***, and therefore fall outside the scope of the five criteria outlined above.
For such areas, reasonable provision would be:
a. if they are heated, to follow the guidance in Approved Document L2A; or
b. if they are unheated, to provide fabric elements that meet the fabric standards set out in paragraphs 4.20 to 4.22.

Conservatories and porches

3.32 Where conservatories and porches are installed at the same time as the construction of a new ***dwelling***, the guidance in this document applies. For conservatories and porches added as extensions to a ***dwelling***, see guidance in Approved Document L1B.

Swimming pool basins

3.33 Where a swimming pool is constructed as part of a new ***dwelling***, reasonable provision should be made to limit heat loss from the pool basin by achieving a U-value no worse than 0.25 W/m².K as calculated according to BS EN ISO 13370[1].

3.34 In terms of Criterion 1, the ***dwelling*** should be assessed as if the pool basin were not there, although the pool hall should be included. The area covered by the pool should be replaced with the equivalent area of floor with the same U-value as the pool surround.

[1] BS EN ISO 13370 Thermal performance of buildings. Heat transfer via the ground. Calculation methods.

Section 4: Design standards

REGULATIONS 24 AND 25 ~~17A AND 17B~~

4.1 Regulations 24, 25 and 26 ~~17A, 17B and 17C~~ of the Building Regulations implement Articles 3, 4 and 6~~5~~ of the Energy Performance of Buildings Directive. Regulations 24 and 25 ~~17A and 17B~~ state that:

Methodology of calculation and expression of ~~the~~ energy performance ~~of buildings~~

24~~17A.~~– (1) The Secretary of State shall approve–

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

(2) In this regulation–
'asset rating' means a numerical indicator of the amount of energy estimated to meet the different needs associated with a standardised use of the building; and
'operational rating' means a numerical indicator of the amount of energy consumed during the occupation of the building over a period of time.

Minimum energy performance requirements for new buildings

25~~17B.~~–The Secretary of State shall approve minimum energy performance requirements for new buildings, in the form of target CO_2 emission rates, which shall be based upon the methodology approved pursuant to regulation 24~~17A~~.

CRITERION 1

We intend for the final version to include a flow diagram of process.

Setting the Target CO_2 Emission Rate (*TER*)

4.2 The Target CO_2 Emission Rate (***TER***) is the minimum energy performance requirement for a new ***dwelling*** approved by the Welsh Ministers ~~Secretary of State~~ in accordance with regulation 25~~17B~~. It is expressed in terms of the mass of CO_2, in units of kg per m^2 of floor area per year, emitted as a result of the provision of the specified ***fixed building services*** for a standardised household when assessed using approved calculation tools.

4.3 In accordance with the methodology approved by the Welsh Ministers ~~Secretary of State~~ in the Notice of Approval[2], the ***TER*** for individual ***dwellings*** must be calculated using SAP 2012 ~~2009~~.

4.4 The ***TER*** is calculated as the CO_2 emissions from a ***dwelling*** of the same size and shape as the actual ***dwelling*** and which is constructed according to the elemental values set out in Table 1 2013 Elemental Recipe. No values may be varied from these reference values when establishing the ***TER***.

[2] Notice of Approval of the methodology of calculation of the energy performance of buildings in England and Wales.

*Table 1 shows the option of achieving a 40% reduction in carbon dioxide emissions compared to 2010 standards. The recipe uses kWp photovoltaic panels as a **proxy** for building integrated renewable energy generation. Part L1A does not require the installation of PV panels for compliance but consider that alongside good standards of energy efficiency, PV panels are likely to be the most cost effective option to meet the TER. The recipe for a 25% reduction in carbon dioxide emissions is the same, other than the amount of PV is Building Foundation Area(m^2) * 0.020 kWp. Further details of the recipes are provided in Chapter 6 of the Proposed Changes to Technical Guidance (Proposed changes to the NCM).*

Table 1 2015 Elemental Recipe Specification

Element or System	Elemental Recipe Values				
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area[1]				
External Walls [8]	0.15 W/m²K				
Party Walls	0.0 W/m²K				
Floor	0.15 W/m²K				
Roof	0.11 W/m²K				
Windows, roof windows, glazed rooflights and glazed doors	1.4 W/m²K [2,3] (whole window u-value)				
Opaque doors	1.0 W/m²K				
Semi glazed doors	1.2 W/m^2K				
Air tightness	6.0 m^3/h.m² at 50Pa				
Linear thermal transmittance	0.09 x total exposed surface area (W/K)				
Ventilation type	Natural (with extract fans)[4]				
Air conditioning	None				
Fuel Type	**Gas**	**LPG**	**Oil**	**Electric**	**Biomass**
Heating System	Boiler with radiators	Boiler with radiators	Boiler with radiators	Heat pump with radiators[7]	Boiler with radiators
	Room sealed	Room sealed	Room sealed		Room sealed
	Fan flue	Fan flue	Fan flue		Fan flue
	SEDBUK 2009 89% efficient	SEDBUK 2009 89% efficient	SEDBUK 2009 90.9% efficient	COP 3.2[5]	SEDBUK 2009 86% efficient HETAS approved
Controls	Time and temperature zone control[6] Weather compensation				
	Modulating boiler with interlock				Modulating boiler with interlock
Hot water storage system	Stored hot water from boiler			Stored hot water from heat pump and electric immersion	Stored hot water from boiler
	Thermostat controlled Separate time control for space and water heating				
Primary Pipework	Fully Insulated				
Hot water cylinder loss factor (if specified)	Declared loss factor equal or better than 0.024(10+0.25V)kWh/day				
Secondary Space Heating	None	None	None	10% Electric	None
Low Energy Lighting	100% Low Energy Lighting				
Photovoltaic System (SE/S/SW orientation , 30-45° inclination, no overshading)	Yes - Building Foundation Area(m^2) * 0.036 kWp				No

Notes:

1. The Building Regulations do not specify minimum daylight requirements. However, reducing window area produces conflicting impacts on the predicted CO_2 emissions: reduced solar gain but increased use of electric lighting. As a general guide, if the area of glazing is much less than 20 per cent of the total floor area, some parts of the dwelling may experience poor levels of daylight, resulting in increased use of electric lighting.
2. Glazing in the elemental building will have the same G-value as specified in the actual building. The G-value influences the amount of solar gain received through glass. Designers should be aware of the impact of G-value on space heating loads as well as to the risk of overheating and optimise their design including suitable solar control accordingly.

Contd

3. The orientation of the elemental building is the same as the actual building. In plotting buildings onto a site designers should consider the benefits of orientating buildings to the south (with large windows orientated south and smaller windows orientated north) to benefit from passive solar gains through having lower space heating demands. Designers should be aware of the risk of overheating through excessive solar gain in the summer and design shading to avoid excessive summer heat gain.
4. See SAP 2012 section 11: 2 fans for TFA up to 70m²; 3 fans for 70 < TFA < 100m2 ; 4 fans for TFA > 100m2 . A recipe approach can be followed if extract fans are replaced with the same number of passive vents.
5. Output data according to EN14511 European Standards. An ASHP with a COP of 3.2 provides a comparable dwelling carbon intensity to a gas condensing boiler (assuming 50% DHW from immersion heater, 10% space heating from secondary electric)
6. In order for a system to be specified with time and temperature zone control, it must be possible to program the heating times of at least two heating zones independently, as well as having independent temperature controls. These two heating zones must be space heating zones. For single storey open plan dwellings in which the living area is greater than 70% of total floor area, sub zone of temperature control is not appropriate and the recipe will default to programmer and room stat.
7 Space heating systems supplied by heap pumps should be designed to operate at low flow and return temperatures. Typically good system design will include underfloor heating or oversized radiators. If the option of selecting low temperature distribution is implemented in SAP 2012 this option will be applied to the electric recipe specification
8 Opaque elements of curtain walling are treated as an external wall

4.5 The fuel to be used in the 2013 recipe is the one used to provide space heating to the actual ***dwelling*** as follows:

a. Where all the space heating appliances are served by the same fuel, the fuel used in those appliances, as described in Table 1, *except* the cases described below.
b. Where the main space heating system can *only* use a liquid biofuel, the **TER** is calculated for biomass (and the **DER** is calculated using the actual fuel).
c. Where the ***dwelling*** is served by more than one appliance, a multi fuel appliance or an appliance powered by a blended fuel mix, the ***TER*** (and ***DER***) should use the 2013 recipe for the fuel with the highest CO_2 emission factor. This applies to :
    i. blends of liquid fuels (including B30K and B30D) or multi-fuel oil appliance (use oil for both ***TER*** and ***DER***)
    ii. two main systems (use system with highest emission factor for both ***TER*** and ***DER***)

    with the following exception:
    iii. Where the main space heating system uses solid multifuel or mineral fuel e.g. coal, the ***TER*** should use the 2013 recipe for oil (whereas the ***DER*** is calculated using the actual fuel).
d. For dwellings connected to a community heating system the fuel to be used in the 2013 recipe is the one used to provide heating and hot water to the actual dwelling as follows:
    i. Where all the space heating and domestic hot water heat supplied by the communal heat network are served by the same fuel, the fuel used to serve the network e.g. an actual dwelling supplied by heat from a community network, powered by gas combined heat and power and gas boilers, would be compared to a ***TER*** calculated from an individual gas heated dwelling as described in Table 1.
    ii. Where the community heating system has more than one heat source feeding into a circuit providing both space heating and/or domestic hot water and these are served by different fuels the ***TER*** is calculated using the appropriate recipe package for each fuel and the overall ***TER*** is obtained by weighting the ***TER*** value for each fuel by the fraction of community heat supplied by each fuel. The ***DER*** is calculated for the actual configuration.

    Therefore where community heating solutions are delivered some additional 'effort' will be required to compensate for distribution losses and, where systems are not designed to operate in condensing mode, poorer efficiency associated with non condensing operation. For efficient community heating systems the inclusion of CHP and or biomass will act to reduce the amount of PV that would be required to achieve the TER.

~~**4.4** The ***TER*** is calculated in two stages:~~

~~a. First calculate the CO_2 emissions from a 2002 notional ***dwelling*** of the same size and shape as the actual ***dwelling*** and which is constructed according to the reference values set out in Appendix R of SAP 2009. No values may be~~

varied from these reference values when establishing the ***TER***. The calculation tool will report the CO_2 emissions (based on SAP2005 CO_2 emission factors) arising from:

i. The provision of space heating and hot water (which includes the energy used by pumps and fans), C_H

ii. The use of internal lighting, C_L

b. Secondly, calculate the 2010 ***TER*** using the following formula:

$$TER_{2010} = (C_H \times FF \times EFA_H + C_L \times EFA_L) \times (1 - 0.2) \times (1 - 0.25)$$

Where FF is the fuel factor[8] taken from Table 1 in accordance with the guidance in paragraph 4.5.

Where EFA is the Emission Factor Adjustment with separate values for heating and lighting. EFA is the ratio of the CO_2 emission factor for the relevant fuel at 2010 divided by the value used in the 2006 edition of Part L (see table 12 of SAP 2009 and table 12 of SAP 2005 for the relevant values). For those fuels with a fuel factor of 1.0, the EFA should always be based upon mains gas.

Note that the notional ***dwelling*** *used to determine C_H has a party wall heat loss of zero. This means that the targeted improvement of 25 per cent is in addition to treating the party wall loss (see paragraphs 5.3 to 5.8).*

[8] The fuel factor is the greater of 1.0 and the square root of the ratio of the CO_2 emission factor for the fuel to the emission factor for mains gas (both taken from table 12 of SAP 2005) rounded to two decimal places.

4.5 The fuel to be used for determining the fuel factor from Table 1 is one of those used to provide heating and hot water to the actual ***dwelling*** as follows:

b. Where all the space heating and domestic hot water heating appliances are served by the same fuel, the fuel used in those appliances.

c. Where the ***dwelling*** has more than one appliance for space heating and/or domestic hot water and these are served by different fuels,

i. mains gas if any of the appliances are fired by mains gas,

ii. otherwise the fuel used for the main space heating system.

c. Where the ***dwelling*** is served by a community heating scheme,

i. mains gas if the community scheme used mains gas for any purpose,

ii. otherwise the fuel that provides the most heat for the community scheme.

Table 1 **Fuel factor**

Heating fuel	**Fuel factor**[1]
Mains gas	1.00
LPG	1.10
Oil	1.17
B30K	1.00
Grid electricity for direct acting and storage systems	1.47
Grid electricity for heat pumps[2]	1.47
Solid mineral fuel[3]	1.28
Any fuel with a CO_2 emission factor less than that of mains gas	1.00
Solid multi-fuel[3]	1.00

Notes:

1. The fuel factors in Table 1 will be kept under review as progress is made towards the zero carbon target.
2. The fuel factor for electric heat pumps will be reviewed after the renewable heat incentive is introduced.
3. The specific fuel factor should be used for those appliances that can only burn the particular fuel. Where an appliance is classed as multi-fuel, the multi-fuel factor should be used except where the dwelling is in a Smoke Control Area. In such cases the solid mineral fuel figure should be used, unless the specific appliance type has been approved for use within Smoke Control Areas.

Buildings containing multiple dwellings

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

$\{(TER_1 \times \text{Floor area}_1) + (TER_2 \times \text{Floor area}_2) + (TER_3 \times \text{Floor area}_3) + \ldots)\}$
$\div\{(\text{Floor area}_1 + \text{Floor area}_2 + \text{Floor area}_3) + \ldots\}$

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

CRITERION 1 - ACHIEVING THE *TER*

4.7 Regulation 26~~17C~~ states that:

CO_2 emission rates for new buildings ~~New buildings~~ – Regulation 26~~17C~~
Where a building is erected, it shall not exceed the target CO_2 emission rate for the building that has been approved pursuant to regulation 25~~17B~~.

4.8 To comply with regulation 26~~17C~~, the ***DER*** must be no worse than the ***TER*** calculated as set out in paragraphs 4.2 to 4.6. One way of achieving a compliant solution would be to design and to construct to the appropriate recipe for the fuel type given in Table 1: *Elemental Recipe Specification*. Where it is not possible or desirable to exactly follow a recipe, a compliant solution will need to be developed using SAP 2012 as the design assessment tool. Examples where the actual dwelling specification will vary from the recipe requiring a compliant solution to be developed using SAP2012 include:

a) where the opening area (doors, windows and roof lights) is greater than 25% of the total floor area
b) where u values are greater (worse) than those described in Table 1
c) where the dwelling features secondary heating (except ASHP with secondary electric heating)
d) where the dwelling features a chimney or open flue.
e) where the dwelling is heated from a community heating system
f) where installed PV panels are:
    i. Orientated outside a southerly arc from SE to SW (e.g. E/W, N, NE/NW).
    ii. Over shaded (defined as if ≥20% of sky blocked by obstacles)[1]
    iii. inclined at an angle to the horizontal of greater than 45°, or less than 30°
g) where renewable energy generation other than PV panels are installed

[1] SAP Table H2

~~**4.8a** The final ***DER*** calculation produced in accordance with regulation 20D (see paragraph 4.11 below) must be based on the building as constructed, incorporating:~~
~~a. any changes to the list of specifications that have been made during construction; and~~
~~b. the ***assessed air permeability.*** The ***assessed air permeability*** shall be determined as follows:~~
~~i. where the ***dwelling*** has been pressure tested, the ***assessed air permeability*** is the measured ***air permeability***;~~
~~ii. where the ***dwelling*** has not been tested, the ***assessed air permeability*** is the average test result obtained from other ***dwellings*** of the same ***dwelling type*** on the development increased by a margin of +2.0 m³/(h.m²) at 50 Pa;~~
~~iii. on small developments (see paragraph 5.23), where the builder has opted to avoid testing, the ***assessed air permeability*** is the value of 15 m³/(h.m²) at 50 Pa.~~

~~*Note that builders can test a greater proportion of their **dwellings** and take credit for the increased robustness of the data, compared to option ii), where the **assessed air permeability** is taken as the average of other test results plus a safety margin. This margin has been taken as approximately one standard deviation as derived from the analysis of a large sample of data from post-2006 **dwellings**. The outcome of this change is that the **design air permeability** should be at most 8.0 m³/(h.m²) at 50 Pa, so that untested **dwellings** should achieve an **assessed air permeability** less than the limiting value of 10 m³/(h.m²) at 50 Pa. If the design is aiming to achieve a low **design air permeability**, then the margin added under paragraph ii will have a significant impact on*~~

~~*the calculated **DER**. In such cases, the builder should consider testing the **dwelling** so that the measured permeability can be included in the calculation.*~~

CO_2 emission rate calculations

4.9 Regulation 27 ~~20D~~[9] states:

27~~**20D.**~~–(1) This regulation applies where a building is erected and regulation 26~~17C~~ applies.

(2) Not later than the day before the work starts, the person carrying out the work shall give the local authority a notice which specifies–
a. the target CO_2 emission rate for the building,
b. the calculated CO_2 emission rate for the building as designed, and
c. a list of specifications to which the building is to be constructed.

(3) Not later than five days after the work has been completed, the person carrying out the work shall give the local authority–
a. a notice which specifies–
i. the target CO_2 emission rate for the building,
ii. the calculated CO_2 emission rate for the building as constructed, and
iii. whether the building has been constructed in accordance with the list of specifications referred to in paragraph (2) (c), and if not a list of any changes to those specifications; or
b. a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).

(4) A local authority is authorised to accept, as evidence that the requirements of regulation 26~~17C~~ have been satisfied, a certificate to that effect by an energy assessor who is accredited to produce such certificates for that category of building.

(5) In this regulation, '~~energy assessor' means an individual who is a member of an accreditation scheme approved by the Secretary of State in accordance with regulation 17F; and~~
'specifications' means specifications used for the calculation of the CO_2 emission rate.

[9] Please see regulation 20 of the ~~There is a similar regulation (Regulation 12D) in the~~ Building (Approved Inspectors etc.) Regulations 2010 ~~2000~~ (SI 2010/2215 ~~2000/2532~~) which applies when an approved inspector is the BCB.

CO_2 emission rate calculation *before commencement of work*

4.10 As required by regulations 26 and 27 ~~17C and 20D~~, before the work starts, the builder shall carry out a calculation that demonstrates that the ***DER*** of the ***dwelling*** as-designed is not greater than the ***TER***. This design-based calculation shall be provided to the ***BCB***, along with a list of specifications used in calculating the ***DER.***

4.10a The fuels used to calculate the ***DER*** of the ***dwelling*** are those used to provide space and hot water heating to the actual ***dwelling*** as follows:
a. Where all the space heating and hot water heating appliances are served by the same fuel, the fuel used in those appliances, except the cases described below.
b. Where the main space heating system uses B30K or B30D the ***DER*** should use oil as the heating fuel.
c. Where the ***dwelling*** is served by a more than one appliance, a multi fuel appliance or an appliance powered by a blended fuel mix the ***DER*** should use the fuel with the highest CO_2 emission factor. This applies to:
    i. solid multi-fuel (use coal for ***DER***)
    ii. blends of liquid fuels or multi-fuel oil appliance (use oil for ***DER***)
    iii. two main systems (use system with highest emission factor for ***DER***)

d. For dwellings connected to a community heating system the fuel to be used in the calculation of the ***DER*** is the one used to provide space and hot water heating to the actual dwelling as follows:
    i. Where all the space heating and domestic hot water heat supplied by the communal heat network are served by the same fuel, the fuel used to serve the network.
    ii. Where the community heating system has more than one heat source feeding into a circuit providing both space heating and/or domestic hot water or separate circuits providing space heating and hot water and these are served by different fuels the DER is calculated for the actual configuration of fuels planned

*This design stage calculation and provision of a list of specifications will assist the **BCB** to confirm that what is being built aligns with the claimed performance. For builders following the elemental recipe specification, Table 1 provides a standardised route to compliance. SAP calculations are still required to demonstrate that the **dwelling** does not have a high likelihood of overheating, and to provide a final check of overall compliance but iteration of built specification can be avoided. As set out at Appendix A, it is expected that software implementations of SAP2012~~09~~ will be used to produce the list of specifications and highlight those features of the design that are critical to achieving compliance. These 'key features' can be used to prioritise the risk-based inspection of the **dwelling** as part of confirming compliance with Regulation 26~~17C~~. If a provisional energy rating is calculated at this stage and an interim recommendations report is therefore available, the recommendations should be reviewed by the developer to see if further carbon mitigation measures might be incorporated in a cost effective manner.*

CO_2 emission rate calculation *after completion*

4.10b The final ***DER*** calculation produced in accordance with regulation 27 ~~20D~~ (see paragraph 4.11 below) must be based on the building as constructed, incorporating:
a. any changes to the list of specifications that have been made during construction; and
b. the ***assessed air permeability.*** The ***assessed air permeability*** shall be determined as follows:
    i. where the ***dwelling*** has been pressure tested, the ***assessed air permeability*** is the measured ***air permeability***;
    ii. where the ***dwelling*** has not been tested, the ***assessed air permeability*** is the average test result obtained from other ***dwellings*** of the same ***dwelling type*** on the development increased by a margin of +2.0 $m^3/(h.m^2)$ at 50 Pa;
    iii. on small developments (see paragraph 5.23), where the builder has opted to avoid testing, the ***assessed air permeability*** is the value of 15 $m^3/ (h.m^2)$ at 50 Pa.

*Note that builders can test a greater proportion of their **dwellings** and take credit for the increased robustness of the data, compared to option ii), where the **assessed air permeability** is taken as the average of other test results plus a safety margin. This margin has been taken as approximately one standard deviation as derived from the analysis of a large sample of data from post-2006 **dwellings**. The outcome of this change is that the **design air permeability** should be at most 8.0 $m^3/(h.m^2)$ at 50 Pa, so that untested **dwellings** should achieve an **assessed air permeability** less than the limiting value of 10 $m^3/(h.m^2)$ at 50 Pa. If the design is aiming to achieve a low **design air permeability**, then the margin added under paragraph ii will have a significant impact on the calculated **DER**. In such cases, the builder should consider testing the **dwelling** so that the measured permeability can be included in the calculation.*

This text was previously under Para 4.8.

4.11 After work has been completed, the builder must notify the ***BCB*** of the on constructed values of the ***TER*** and ***DER,*** *thereby confirming that the completed dwelling complies with Regulation* 26. *The builder must also notify* whether the building has been constructed in accordance with the list of specifications submitted to the ***BCB*** before work started. If not, a list of any changes to the design-stage list of specifications must be

given to the ***BCB***. ***BCB***s are authorised to accept, as evidence of compliance, a certificate to this effect signed off by a suitably accredited energy assessor.

*It would be useful to provide additional information to support the values used in the **DER** calculation and the list of specifications. For example, U-values might be determined from a specific calculation, in which case the details should be provided, or from an accredited source, in which case a reference to that source would be sufficient. For example, for a boiler, the model reference and fuel type is sufficient evidence to allow the claimed performance to be checked against the SEDBUK (Seasonal Efficiencies of Domestic Boilers in the UK) database. It would also be useful if evidence was provided that demonstrates that the **dwelling** as designed satisfies the requirements of Criteria 2 and 3.*

Secondary heating

4.12 A secondary heating appliance may meet part of the space heat demand. As per Table 1, with the exception of an electric heat pump, the elemental recipe does not include secondary heating. Where secondary heating is specified the elemental recipe specification will not offer a compliant solution and further improvements will be required to ensure the final ***TER*** is lower than the ***DER***. When calculating the ***DER***, the fraction provided by the secondary heating system must be as defined by SAP 2009~~09~~12 for the particular combination of main heating system and secondary heating appliance. The following secondary heating appliance must be used when calculating the ***DER***:

a. Where a secondary heating appliance is fitted, the efficiency of the actual appliance with its appropriate fuel must be used in the calculation of the ***DER***;
b. Where a chimney or flue is provided but no appliance is actually installed, then the presence of the following appliances shall be assumed when calculating the ***DER***:
    i. if a gas point is located adjacent to the hearth, a decorative fuel effect gas fire open to the chimney or flue with an efficiency of 20 per cent;
    ii. if there is no gas point, an open fire in grate for burning multi-fuel with an efficiency of 37 per cent, unless the ***dwelling*** is in a smoke control area when the fuel should be taken as smokeless solid mineral fuel;
c. Otherwise it shall be assumed that the secondary heating system has the same efficiency as the main heating system and is served by the same fuel, i.e. the equivalent of having no secondary heating system.

Internal lighting

4.13 In all cases the ***DER*** shall be calculated assuming the proportion of low-energy lamps as actually installed in the fixed lighting locations.

This means that low-energy lighting provision is tradable. The minimum amount that would be reasonable provision in the actual building is given in the Domestic Building Services Compliance Guide.

Buildings containing multiple dwellings

4.14 Where a building contains more than one ***dwelling*** (such as in a terrace of houses or in a block of flats), compliance with regulation 26~~17C~~ is achieved if:

a. EITHER every individual ***dwelling*** has a ***DER*** that is no greater than its corresponding ***TER***;
b. OR the average ***DER*** is no greater than the average ***TER***. The average ***DER*** is the floor-area-weighted average of all the individual ***DERs***, and is calculated in the same way as the average ***TER***. Block averaging is permitted only across multiple ***dwellings*** in a single building, NOT across multiple buildings on a development site (see paragraph 4.6).

*When adopting the average **DER** approach, it will still be necessary to provide information for each individual **dwelling**, as required by regulation 27~~20D~~.*

Achieving the target

4.15 Provided the ***dwelling*** satisfies the limits on design flexibility as set out in Criterion 2, the compliance procedure allows the designer full flexibility to achieve the ***TER*** utilising fabric and system measures and the integration of low and zero carbon (LZC) technologies in whatever mix is appropriate to the scheme. For builders seeking the simplification of the regulations, building to the elemental recipe set out in Table 1 will provide a compliant solution in the majority of building applications/situations/sites/locations. The approved compliance tools include appropriate algorithms that enable the designer to assess the role LZC technologies (including local renewable and low-carbon schemes driven by planning requirements~~10~~) can play in achieving the ***TER***.

~~10 See the Planning Policy Statement Planning and climate change and its supporting practice guidance at: www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/ppsclimatechange/~~

4.16 Where a ***dwelling*** is connected to a community energy system, the annual percentage heat supplied from each heat source should be the same for each newly connected dwelling ~~the same percentage reduction in emissions should be attributed to each connected ***dwelling***, and .T~~the submission should demonstrate that the capacity of the community scheme is sufficient to provide the percentage that is assumed.

The predicted effect of all buildings proposed to be newly connected to the system in the year of application must be included in the calculation of the emission factor so that the increased operation of any marginal plant (e.g. gas boilers) is properly accounted for.

4.17 In order to facilitate incorporation of improvements in system efficiencies and the integration with low and zero carbon technologies, the designer should:

a. consider adopting heating system designs that use low distribution temperatures; and
b. where multiple systems serve the same end use, organise the control strategies such that priority is given to the least carbon-intensive option; and

For example, where a solar hot water system is available, the controls should be arranged so that the best use is made of the available solar energy.

c. consider making the ***dwelling*** easily adaptable by facilitating the integration of additional low and zero carbon technologies at a later date. Providing appropriate facilities at the construction stage can make subsequent enhancements much easier and cheaper, e.g. providing capped off connections that can link into a planned community heating scheme.

CRITERION 2 – LIMITS ON DESIGN FLEXIBILITY

REGULATION XX (Final Approved Document statutory guidance will be produced to accompany the final regulatory changes)

4.18 While the approach to complying with Criterion 1 allows considerable design flexibility, paragraph L1(a)(i) of Schedule 1 to the Building Regulations requires that reasonable provision should be made to limit heat gains and losses through the fabric of the building, and paragraphs L1(b)(i) and (ii) require that energy-efficient ***fixed building services*** with effective controls should be provided.

4.19 Regulation XX requires a minimum performance of the fabric of the building. The following paragraphs provide the worst acceptable parameters for the fabric elements

4.19a One way of showing that the requirement has been satisfied with regard to ***fixed building services*** is to satisfy the minimum energy efficiency standards for building services specified in the following paragraphs.

*Note that in order to satisfy the **TER**, the building specification will need to be considerably better than the stated values in many aspects of the design.*

Fabric standards

4.20a In order to achieve an acceptable level of fabric energy efficiency, Regulation XX states: (Final Approved Document statutory guidance will be produced to accompany the final regulatory changes)

4.20b To meet Regulation XX, the fabric parameters must be as good as or better than the worst acceptable values for fabric set-out in Table 2 below. The stated values represent the area-weighted average value for all elements of that type. In general, the achievement of the ***TER*** is likely to require significantly better fabric performance than the worst acceptable parameters.

Table 2 Worst acceptable fabric parameters	2013	2010
External walls and opaque curtain walls	0.21 W/m².K	~~0.30 W/M².K~~
Party walls	0.20 W/m².K	~~0.20 W/M².K~~
Floor	0.18 W/m².K	~~0.25 W/M².K~~
Roof	0.15 W/m².K	~~0.20 W/M².K~~
Windows, roof windows, glazed roof lights, and pedestrian doors	1.60 W/m².K	~~2.00 W/M².K~~
Air permeability	10.00 m³/h.m² at 50 Pa	10.00 m³/h.m² at 50 Pa
Linear thermal transmittance	0.15 x total exposed surface area (W/K)	0.15 x total exposed surface area (W/K)

Approved Document C gives limiting values for individual elements to minimise condensation risk.

~~**4.20** Table 2 sets out the worst acceptable standards for fabric properties. The stated value represents the area-weighted average value for all elements of that type. In general, the achievement of the ***TER*** is likely to require significantly better fabric performance than is set out in Table 2.~~

4.21 U-values shall be calculated using the methods and conventions set out in BR 443[3], and should be based on the whole element or unit (e.g. in the case of a window, the combined performance of the glazing and the frame). In the case of windows, the U-value can be taken as that for:

a. the smaller of the two standard windows defined in BS EN 14351-1[4]; or
b. the standard configuration set out in BR 443; or
c. the specific size and configuration of the actual window.

For domestic-type construction, SAP 2009~~09~~12 Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.

4.22 The U-values for roof windows and roof lights given in this Approved Document are based on the U-value having been assessed with the roof window or roof light in the vertical position. If a particular unit has been assessed in a plane other than the vertical, the standards given in this Approved Document should be modified by making an adjustment that is dependent on the slope of the unit following the guidance given in BR 443.

Introducing an elemental recipe specification offers one route to compliance but does not remove the considerable design flexibility available in complying with criterion 1. Hence, we propose to continue to include limiting fabric parameters so that delivered solutions will include a reasonable provision for energy efficiency prior to the utilisation of renewable energy solutions.

System efficiencies

4.23 The energy efficiency of each ***fixed building service*** should equal or exceed that of ~~Each ***fixed building service*** should be at least as efficient as~~ the worst acceptable value for the particular type of appliance or system as set out in the *Domestic Building Services Compliance Guide*[5]. If the type of appliance is not covered by the Guide, then reasonable provision would be to demonstrate that the proposed system is not less efficient than a comparable system that is covered by the Guide.

To not inhibit innovation.

The previous text referred to achieving minimum values for each fixed building service. However, not all of the guidance in the Domestic Building Services Compliance Guide is in the form of minimum values e.g. the need to insulate pipework. Hence, the proposed change for clarification purposes.

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

CRITERION 3 – LIMITING THE EFFECTS OF SOLAR AND OTHER HEAT GAINS IN SUMMER

4.25 As required by paragraph L1(a)(i) of Schedule 1 to the Building Regulations, reasonable provision should be made to limit solar gains. Solar gains are beneficial in winter as a means of offsetting heating demand, but can contribute to overheating in the

[3] BR 443 Conventions for U-value calculations, BRE, 2006.
[4] EN 14351-1, *Windows and doors – Product standard, performance characteristics*, 2006.

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

summer months. Limiting the effects of solar gain in summer can be achieved by an appropriate combination of window size and orientation, solar protection through shading and other solar control measures, ventilation (day and night) and high thermal capacity. If ventilation is provided using a balanced mechanical system, consideration should be given to providing a summer bypass function during warm weather (or allow the ***dwelling*** to operate via natural ventilation) so that the ventilation is more effective in reducing overheating.

4.26 SAP ~~2009~~ 2012 Appendix P contains a procedure enabling designers to check whether solar gains are excessive. Reasonable provision would be achieved if the SAP assessment indicates that the ***dwelling*** will not have a high risk of high internal temperatures. This assessment should be done regardless of whether or not the ***dwelling*** has mechanical cooling. If the ***dwelling*** has mechanical cooling, the assessment should be based on the design without the cooling system operating, but with an appropriate assumption about effective air change rate through openable windows.

*Following the **Elemental Recipe** **Specification** **does not** provide compliance with Criterion 3. A SAP assessment following Appendix P or similar assessment of risk of overheating is **required** to demonstrate that reasonable provision has been made to avoid excessive gains.*

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

4.27 When seeking to limit solar gains, consideration should be given to the provision of adequate levels of daylight. BS 8206 – 2 Code of practice for daylighting[7] ~~15~~ gives guidance on maintaining adequate levels of daylight.

*The Building Regulations do not specify minimum daylight requirements. However, reducing window area produces conflicting impacts on the predicted CO_2 emissions: reduced solar gain but increased use of electric lighting. As a general guide, if the area of glazing is much less than 20 per cent of the total floor area, some parts of the **dwelling** may experience poor levels of daylight, resulting in increased use of electric lighting. Designers should be aware of the impact of site layout on internal daylight.BR 209 'Site layout planning for daylight and sunlight' PJ Littlefair 2nd edition gives guidance on this issue.*

~~15 BS 8206–2:2008 Lighting for buildings. Code of practice for daylighting.~~

4.27a As required by paragraph L1(a)(ii) of Schedule 1 of the Building Regulations, reasonable provision should be made to limit heat losses from circulation pipes used for hot water services. Paragraph 4.23 states that reasonable provision to limiting such heat losses would be to adopt the standards set out in the *Domestic Building Services Compliance Guide*. This includes guidance on insulating primary circulation pipes for domestic hot water. In the case of apartment blocks, this includes insulating primary circulation pipes for hot water (and space heating) within the communal spaces.

In particular, during the summer months, such uncontrolled heat losses can contribute both to an excess of energy use and to overheating.

[6] TM36 Climate change and the indoor environment: impacts and adaptation, CIBSE, 2005.

[7] 15 BS 8206–2:2008 Lighting for buildings. Code of practice for daylighting.

Section 5: Quality of construction and commissioning

CRITERION 4 – BUILDING PERFORMANCE CONSISTENT WITH *DER*

5.1 ***Dwellings*** should be constructed and equipped so that performance is consistent with the calculated ***DER***. As indicated in paragraph 4.8, a final calculation of the ***DER*** is required to take account of any changes in performance between design and construction and to demonstrate that the building as constructed meets the ***TER*** as required by regulation 26~~17C~~. The following paragraphs in this section set out what in normal circumstances would be reasonable provision to ensure that the actual performance of the building is consistent with the ***DER***.

The provision of information referred to in paragraph 4.10 will assist ***BCBs*** *in checking that the key features of the design are included during the construction process.*

5.2 In accordance with Part L and regulation 7, the building fabric should be constructed to a reasonable standard so that:
a. the insulation is reasonably continuous over the whole building envelope; and
b. the ***air permeability*** is within reasonable limits.

Party walls and other thermal bypasses

5.3 ~~Contrary to previous assumptions,~~ Party cavity-walls may not be zero heat loss walls because air flow in the cavity provides a heat loss mechanism.

Where outside air is able to flow into the party wall cavity a cold zone is created which results in heat flux through the wall sections on either side. The extent of air flow and heat flux will depend on external conditions such as wind and temperatures and also on the setting up of a ventilation stack effect caused by the warmed air rising in the cavity to be replaced by cooler air drawn in from outside. The air movements involved can be significant and, if no steps are taken to restrict flows, the resulting heat losses can be large equivalent to a U-value of 0.5W/m^{2}K or greater.

5.4 The heat loss can be reduced by measures that restrict air movement through the cavity, either by means of fully filling the cavity and/or by providing effective sealing around the perimeter. ~~Generic solutions to minimising party wall heat loss are available at www.planningportal.gov.uk~~. The extent to which heat loss can be reduced will be dependent on the detailed design and the quality of construction. In the absence of any specific, independent scientific field evidence, reasonable provision would be to adopt the guidance on U-values in paragraph 5.5.

Fully filling the cavity may have implications for sound transmission through party walls. Developers who follow this route must satisfy the ***BCB*** *that the requirements of Part E will be satisfied, either by adopting a full fill detail accredited under the Robust Details scheme, or through specific site testing.*

5.5 In calculating the ***DER*** for a ***dwelling***, the party wall U-value to be assumed for the type of construction adopted is set out in Table 3.

5.6 In applying the U-values in Table 3 it is important that where edge sealing is adopted, either on its own or in conjunction with a fully filled cavity, the sealing is effective in restricting air flow and is aligned with the thermal envelope. Although effective sealing may be part of a cavity barrier which is provided in order to comply with Part B (Fire), a cavity barrier on its own may not be effective in restricting air flow. In order to claim a

reduced U-value (0.2 or 0.0) it will be necessary to demonstrate that the design adopted is likely to be robust under normal site conditions. In addition, it is important that the sealing system be applied in such a way as to be in line with the thermal envelope. Any solution to reducing party wall heat loss must take into account all the requirements in Schedule 1, but particular attention should be given to the requirements of Part E.

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

5.7 In considering heat losses via party walls it is important to remember that wherever the wall penetrates an insulation layer, such as when the blockwork of a masonry party wall penetrates insulation at ceiling level, a thermal bridge is likely to exist. This will be the case even where the party wall U-value is zero. The evaluation of thermal bridges should ensure that any bridging at the party wall is taken into account along with other thermal bridges. It is important also to be satisfied that any solution to the party wall bypass does not contravene other parts of the Regulations, in particular Part E (Sound).

Table *2* U-values for party walls

Party wall construction	U-value (W/m²K)
Solid	0.0
~~Unfilled cavity with no effective edge sealing *~~	~~0.5~~
Unfilled cavity with effective sealing around all exposed edges and in line with insulation layers in abutting elements	0.2
A fully filled cavity with effective sealing at all exposed edges and in line with insulation layers in abutting elements	0.0

**Option removed as worse than the proposed mandatory worst acceptable value.*

5.8 The party wall is a particular case of the more general thermal bypass problem that occurs where the air barrier and the insulation layer are not contiguous and the cavity between them is subject to air movement. To avoid the consequent reduction in thermal performance, either the insulation layer should be contiguous with the air barrier at all points in the building envelope, or the space between them should be filled with solid material such as in a masonry wall.

Thermal bridges

5.9 The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements, and at the edges of elements such as those around window and door openings.

5.10 Reasonable provision would be to:

a. Adopt approved design details such as those set out in the DCLG Accredited Construction Details[8]. If the Accredited Construction Details are adopted a y-value of 0.09 W/m²K can be input into the SAP calculation without the requirement to input individual linear thermal transmittance values and lengths into the DER calculation, or;

b. Calculate linear thermal transmittances and temperature factors following the guidance set out in BR 497[9]. The linear thermal transmittance values can be

[8] www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/bcassociateddocuments9/acd/
[9] BRE 497 Conventions for calculating linear thermal transmittance and temperature factors, BRE 2007.

used directly in the DER calculation. Reasonable provision for the temperature factors is that they should achieve a performance no worse than that set out in BRE IP 1/06[10] or;

c. Use a conservative default y-value of 0.15 in the DER calculation.

5.11 Where approved design details are available for some junctions but not for all junctions a default y-value (e.g. 0.09 W/m²K for Accredited Construction Details) may not be used. In such a case, the calculated linear thermal transmittance values can be used directly in the calculation of the ***DER*** and the values in the 'default' column of Table K1 in SAP 2012 can be used for those junctions for which a linear thermal transmittance is not available. Alternatively, the linear thermal transmittance of these latter junctions can be calculated as in (b) above.

5.12 In addition, when adopting the approaches in Paragraphs 5.10 (a) and (b), the builder would have to demonstrate that an appropriate system of site inspection is in place to give confidence that the construction procedures achieve the required standard of consistency. If adopting the approach in Paragraph 5.10(a), a way of achieving this would be to produce a report demonstrating that the compliance checklists outlined in the DCLG Accredited Construction Details have been completed and show satisfactory results. If adopting the approach in Paragraph 5.10(b), a way of achieving this would be to produce a report including evidence of site quality control during the construction period of the thermal performance of the junction and air barrier continuity (e.g. photographs, check sheets etc).

It could be helpful if such reports are signed by a suitably qualified person.

~~**5.10** Where calculated in support of the approaches set out in paragraphs 5.12a and 5.12b, linear thermal transmittances and temperature factors should be calculated following the guidance set out in BR 497[16]. Reasonable provision would be to demonstrate that the specified details achieve a temperature factor that is no worse than the performance set out in BRE IP 1/06[17].~~

~~[16] BR 497 Conventions for calculating linear thermal transmittance and temperature factors, BRE 2007.~~
~~[17] IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, BRE 2006.~~

~~**5.11** Similarly, in support of the approaches set out in paragraphs 5.12a and 5.12b, the builder would have to demonstrate that an appropriate system of site inspection is in place to give confidence that the construction procedures achieve the required standards of consistency.~~

~~**5.12** Ways of demonstrating that reasonable provision has been made are:~~
~~a. To adopt a quality-assured accredited construction details approach in accordance with a scheme approved by the Secretary of State. If such a scheme is utilised then the calculated linear thermal transmittance can be used directly in the ***DER*** calculation;~~

~~*For new buildings, such scheme(s) accredit and quality assure the calculation of the linear thermal transmittance, accredit details in terms of buildability and have an associated quality assurance regime that inspects a sample of sites to confirm that the details are being implemented correctly. The use of such schemes may also allow a reduction in the Building Control charges.*~~

~~b. To use details that have not been subject to independent assessment of the construction method. However, in this case, the linear thermal transmittance should still have been calculated by a person with suitable expertise and experience following the guidance set out in BR 497, and a process flow sequence should be provided to the ***BCB*** indicating the way in which the detail should be constructed. The calculated~~

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

~~value increased by 0.02 W/mK or 25 per cent whichever is greater can then be used in the ***DER*** calculation;~~

~~*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. Builders following this route will inevitably add to the burden of checking required of the **BCB** and adopting this route may attract higher building control fees than the alternative approaches.*~~

~~c. To use unaccredited details, with no specific quantification of the thermal bridge values. In such cases a conservative default y value of 0.15 must be used in the ***DER*** calculation.~~

~~**5.13** The alternative approaches a and b above are not mutually exclusive. For example, a builder could use the accredited construction details scheme approach for the majority of the junctions, but use a bespoke detail for the window head. In this case, the 0.02 W/mK or 25 per cent, whichever is greater margin, would apply only to the thermal transmittance of the window head detail.~~

Air permeability and pressure testing

5.14 In order to demonstrate that an acceptable ***air permeability*** has been achieved, Regulation 43 ~~20B~~ states:

Pressure testing
43 ~~**20B.**~~–(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 ~~17C~~ and paragraph L1(a)(i) of Schedule 1:
a. ensure that:
   i. pressure testing is carried out in such circumstances as are approved by the Secretary of State; and
   ii. the testing is carried out in accordance with a procedure approved by the Secretary of State; and
b. subject to paragraph (5), give notice of the results of the testing to the local authority.

(3) The notice referred to in paragraph (2)(b) shall:
a. record the results and the data upon which they are based in a manner approved by the Secretary of State; and
b. be given to the local authority not later than seven days after the final test is carried out.

(4) A local authority is authorised to accept, as evidence that the requirements of paragraph (2)(a)(ii) have been satisfied, a certificate to that effect by a person who is registered by the British Institute of Non-destructive Testing 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.

5.15 The approved procedure for pressure testing is given in the ATTMA publication *Measuring air permeability of building envelopes*[11], and, specifically, the method that tests the building envelope. The preferred test method is that trickle ventilators should be temporarily sealed rather than just closed. ***BCBs*** should be provided with evidence that test equipment has been calibrated within the previous 12 months using a UKAS-

[11] Measuring air permeability in the envelopes of dwellings, Technical Standard L1, ATTMA, 2010

accredited facility. The manner approved for recording the results and the data on which they are based is given in section 4 of that document.

5.16 ***BCBs*** are authorised to accept, as evidence of compliance, a certificate offered under regulation 43(4) ~~20B(4).~~ It should be confirmed to the ***BCB*** that the person has received appropriate training and is registered to test the specific class of building concerned.

5.17 The approved circumstances under which the Secretary of State requires pressure testing to be carried out are set out in paragraphs 5.18 to 5.23.

5.18 On each development, an air pressure test should be carried out on three units of each ***dwelling type*** or 50 per cent of all instances of that ***dwelling type***, whichever is the less. For the purposes of this Approved Document, a block of flats should be treated as a separate development irrespective of the number of blocks on the site. The ***dwelling(s)*** to be tested should be taken from the first completed batch of units of each ***dwelling type***.

Most larger developments will include many ***dwelling types*** *– and multiple units of each type should be tested to confirm the robustness of the designs and the construction procedures.*

5.19 The specific ***dwellings*** making up the test sample should be selected by the ***BCB*** in consultation with the pressure tester. They should be selected so that about half of the scheduled tests for each ***dwelling type*** are carried out during construction of the first 25 per cent of each ***dwelling type***. All tests on ***dwellings*** in the sample shall be reported to the ***BCB***, including any test failure (see paragraphs 5.20 to 5.22).

The aim is to enable lessons to be learned and adjustments to design and/or site procedures to be made before the majority of the ***dwellings*** *are built.*

Showing compliance with regulation 43 ~~20B~~ and the consequences of failing a pressure test

5.20 Compliance with the requirements would be demonstrated if:

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

This means that if a design adopted a low (i.e. better) ***design air permeability*** *in order to achieve a performance better than the* ***TER****, it would not fail to comply with Part L if the pressure test achieved the limit value and the* ***TER*** *was achieved.*

5.21 If satisfactory performance is not achieved, then remedial measures should be carried out on the ***dwelling*** and a new test carried out until the ***dwelling*** achieves the criteria set out in paragraph 5.20. In addition, a further ***dwelling*** of the same ***dwelling type*** should be tested, thereby increasing the overall sample size.

5.22 In addition to the remedial work on a ***dwelling*** that failed the initial test, other ***dwellings*** of the same ***dwelling type*** that have not been tested should be examined and, where appropriate, similar remedial measures applied.

Alternative to pressure testing on small developments

5.23 As an alternative approach to specific pressure testing on development sites where no more than two ***dwellings*** are to be erected, reasonable provision would be:

a. to demonstrate that during the preceding 12 month period, a ***dwelling*** of the same ***dwelling type*** constructed by the same builder had been pressure tested according to

the procedures given in paragraphs 5.14 to 5.19 and had achieved the ***design air permeability***; or

b. avoid the need for any pressure testing by using a value of 15 m³/(h.m²) at 50 Pa for the ***air permeability*** when calculating the ***DER***.

The effect of using this cautious value would then have to be compensated for by improved standards elsewhere in the ***dwelling*** *design.*

COMMISIONING OF HEATING AND HOT WATER SYSTEMS

5.24 Paragraph L1(b)(iii) of Schedule 1 to the Building Regulations requires ***fixed building services*** to be commissioned by testing and adjustment as necessary to ensure that they use no more fuel and power than is reasonable in the circumstances. In order to demonstrate that the heating and hot water systems have been adequately commissioned, regulation 44 ~~20C~~ states:

44 ~~20C~~ **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) ~~15(4)~~ is required to be given; or
(b) where that regulation does not apply, not more than 30 days after completion of the work.

5.25 It would be useful to prepare a commissioning plan, identifying the systems that need to be tested and the tests that will be carried out and provide this with the design stage ***TER/DER*** calculation so that the ***BCB*** can check the ***commissioning*** is being done as the work proceeds.

The use of the templates in the Model Commissioning Plan (BSRIA BG 8/2009) is a way of documenting the process in an appropriate way.

5.26 Not all ***fixed building service***s will need to be commissioned. With some systems adjustment is not possible as the only controls are ‘on’ and ‘off’ switches. Examples of this would be some mechanical extraction systems or single fixed electrical heaters. In other cases ***commissioning*** would be possible but in the specific circumstances would have no effect on energy use. ***Fixed building services*** which do not require ***commissioning*** should be identified in the commissioning plan, along with the reason for not requiring ***commissioning***.

5.27 Where ***commissioning*** is carried out it must be done in accordance with a procedure approved by the Secretary of State~~.~~ For hot water systems the approved procedures are set out in the *Domestic building services compliance guide*. For

ventilation systems, the approved procedure is set out in the *Domestic Ventilation: Installation and Commissioning Compliance Guide*[12].

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

5.29 Where a building notice or full plans have been given to a local authority ***BCB*** the notice of completion of ***commissioning*** should be given to that ***BCB*** within five days of the completion of the ***commissioning*** work. In other cases, for example where work is carried out by a person registered with a competent person scheme (see paragraph 3.9), it must be given within 30 days.

5.30 Where an approved inspector is the ***BCB*** the notice of completion of ***commissioning*** should generally be given to the approved inspector within five days of the completion of work. However, where the work is carried out by a person registered with a competent person scheme (see paragraph 3.9) the notice must be given within 30 days. Where the installation of ***fixed building services*** which require ***commissioning*** is carried out by a person registered with a competent person scheme the notice of ***commissioning*** will be given by that person.

5.31 Until the ***BCB*** receives the commissioning notice it is likely that it cannot be reasonably satisfied that Part L has been complied with and consequently is unlikely to be able to give a completion/final certificate.

[12] Domestic Ventilation: Installation and Commissioning Compliance Guide, CLG, 2010.

Section 6: Providing information

CRITERION 5 – PROVISIONS FOR ENERGY-EFFICIENT OPERATION OF THE DWELLING

6.1 In accordance with Regulation 40 ~~paragraph L1(c) of Schedule 1~~, the owner of the ***dwelling*** should be provided with sufficient information about the building, the ***fixed building services*** and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

6.2 A way of complying with the requirement would be to provide a suitable set of operating and maintenance instructions aimed at assisting the occupiers of the home achieve the expected level of energy efficiency. The documentation should be specific to the dwelling, and be in a durable format that can be kept and referred to over the service life of the various systems and components. The documentation should include a "quick start guide" which contains the key information in an easily understood format. An example of a suitable format is contained in the SBSA publication "Guidance For Living in a Low Carbon Home" (ref http://www.scotland.gov.uk/Resource/Doc/217736/0116377.pdf).

6.3 Without prejudice to the need to comply with health and safety requirements, the "quick start guide" should:

a) Explain the essential design principles (building form, insulation, materials, etc.) and the key features, with floor plans showing the location of the main heating and ventilation components (boiler, heat pump, programmer, MVHR, etc.) in the home.

b) Explain how to operate, control and maintain the following systems:
   i. Space heating system
   ii. Hot water heating system
   iii. Ventilation system
   iv. Any other technology which has been included in the dwelling to enable the ***DER*** to meet the ***TER***, e.g. PV array or other low and zero carbon technology, or a technology for which SAP Appendix Q has been utilised for the calculation of the ***DER***.

c) Signpost other important documentation which should be provided in hard copy form in a convenient binder. Such documentation should include:
   iii. appliance manuals
   iv. the data used to calculate the ***TER*** and the ***DER***
   v. 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 dwelling might be further improved.

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

~~**6.2** A way of complying with the requirement would be to provide a suitable set of operating and maintenance instructions aimed at achieving efficiency in the use of fuel and power in a way that householders can understand, in a durable format that can be kept and referred to over the service life of the system(s). The instructions should be directly related to the particular system(s) installed in the ***dwelling***.~~

6.3 Without prejudice to the need to comply with health and safety requirements, the instructions should explain to the occupier of the ***dwelling*** how to operate the system(s) efficiently. This should include:

a. how to make adjustments to the timing and temperature control settings; and
b. what routine maintenance is needed to enable operating efficiency to be maintained at a reasonable level through the service live(s) of the system(s).

6.4 The data used to calculate the ***TER*** and the ***DER*** should be included with the operating and maintenance instructions. The occupier should also be provided with the recommendations report generated in parallel with the 'on-construction' Energy Performance Certificate. This will inform the occupier how the energy performance of the ***dwelling*** might be further improved.

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

Section 7: Model designs

7.1 Some builders may prefer to adopt model design packages rather than to engage in design for themselves. These model packages of fabric U-values, boiler seasonal efficiencies, window opening allowances, etc. should achieve compliant overall performance within certain constraints. The construction industry may develop model designs for this purpose, with information about such designs being made available at www.modeldesigns.info

7.2 It will still be necessary to demonstrate compliance in the particular case by going through the procedures described in paragraphs 4.7 to 4.14.

Appendix A: Reporting evidence of compliance

1. To facilitate effective communication between the builder and ***BCB***, it would be beneficial to adopt a standardised format for presenting the evidence that demonstrates compliance with the ***energy efficiency requirements***. (Other than the CO_2 target, which is mandatory, the other compliance criteria represent reasonable provision in normal circumstances. In unusual circumstances, alternative limits may represent reasonable provision, but this would have to be demonstrated in the particular case.)

2. Since the data in SAP 2012 ~~2009~~ and the results they calculate can provide a substantial proportion of the evidence in support of the compliance demonstration, it is anticipated that software implementations of SAP 2012 ~~2009~~ will produce this report as a standard output option.

3. It is anticipated that two versions of the standardised report would be produced by software implementations of SAP 2012 ~~2009~~: the first before commencement of works to include the ***TER/DER*** calculation plus supporting list of specifications and the second after completion to include the as built ***TER/DER*** calculation 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.

4. An important part of demonstrating compliance is to make a clear connection between the product specifications and the data inputs required by the compliance software (e.g. what is the wall construction that delivers 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 builder/developer that details the specification corresponding to each unique reference code in the data input.
   b. By providing a fee-text entry facility along with each input parameter that has a unique reference code, thereby allowing the software to capture the specification of each item and so include the full details in an integrated output report.
   c. By including one or more utility programs that derive the data input from the specification, e.g. a U-value calculator that conforms to BR 443 and that calculates the U-value based on the layer thicknesses and conductivities, repeating thermal bridge effects etc. Outputs from such a utility program could then automatically generate the type of integrated report described at b. above.

   It would also help the ***BCB*** if the software included a facility to compare the 'as designed' and 'as constructed' data input files and automatically produce a schedule of changes.

5. The report should highlight any items whose specification is better than typically expected values. The ***BCB*** can then give particular attention to such 'key features', as their appropriate installation will be critical in achieving the ***TER***. The ***BCB*** should give particular attention to those aspects where the claimed specification delivers an energy efficiency standard in advance of that defined in the following schedule.

Parameter	
Wall U-value	0.15 ~~0.20~~ W/m²K
Roof U-value	0.11 ~~0.13~~ W/m²K
Floor U-value	0.15 ~~0.20~~ W/m²K
Window/door U-value	1.4 ~~1.50~~ W/m²K
Party wall U-value	0.~~2~~0 W/m²K
Thermal bridging value	0.04 W/m²K
Design air permeability	5.0 m³/(h.m²) at 50 Pa
Any secondary heating appliance	
Any item involving SAP Appendix Q	
Use of any low carbon or renewable energy technology	

Note: Solutions using electric resistance heating may have to better several of these fabric parameters ~~if the design does not include an element of renewable energy provision.~~

Appendix B: Documents referred to

Air Tightness Testing and Measurement Association (ATTMA)
www.attma.org

Measuring air permeability in the air envelopes of dwellings, Technical Standard L1, 2010.

BRE
www.bre.co.uk

BR 443 Conventions for U-value calculations, 2006. (Available at 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. ISBN 978 1 86081 986 5. See also 2010 updates: 'Amendments to BR497 to clarify certain text and make corrections. - Amendment No. 1' (2010) and 'New conventions on separating wall/ground floor junctions, where the separating wall penetrates the insulation layer of the ground floor.' (2010). Available at: http://www.bre.co.uk/page.jsp?id=1051

BSRIA
www.bsria.co.uk

BSRIA BG 8/2009 Model Commissioning Plan

CIBSE
www.cibse.org

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

Department for Business, Innovation and Skills
www.bis.gov.uk

Technical Standards and Regulations Directive 98/34/EC (as amended by Directive 98/48/EC). Available at: www.bis.gov.uk/policies/innovation/infrastructure/standardisation/tech-standards-directive

Department of Energy and Climate Change (DECC)
www.decc.gov.uk

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2012 ~~09~~. ~~(Available at www.bre.co.uk/sap2009)~~ SEDBUK Boiler Efficiency Database (Available at www.sedbuk.com)

Department for Communities and Local Government
www.communities.gov.uk

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

National Planning Policy Framework (available to download from: http://www.communities.gov.uk/publications/planningandbuilding/nppf)

~~Planning Policy Statement Planning and Climate Change (Available to download from: www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/ppsclimatechange/)~~

Health and Safety Executive (HSE)

www.hse.gov.uk

L24 Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations1992, Approved Code of Practice and Guidance.

NBS (on behalf of Communities and Local Government)

www.thebuildingregs.com

Domestic Building Services Compliance Guide, CLG, 2013 ~~2010~~.

Domestic Ventilation Compliance Guide, CLG, 2013 ~~2010~~.

(Both available to download from: http://www.planningportal.gov.uk.)

Legislation

Building Regulations 2010 (SI 2010/2214)

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

EU Construction Products Regulation (305/2011)

UK Construction Products Regulations 2013 (TBC)

~~SI 1991/1620 Construction Products Regulations 1991~~

~~SI 1994/3051 Construction Products (Amendment) Regulations 1994~~

SI 1994/3260 Electrical Equipment (Safety) Regulations 1994

~~SI 2000/2532 The Building (Approved Inspectors etc.) Regulations 2000~~

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

~~As implemented by the Electromagnetic Compatibility Regulations 2006 (SI 2006/3418)~~

~~Decision No 1/95 of the EC-Turkey Association Council of 22 December 1995~~

Appendix C: Standards referred to

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

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

BS EN 14351-1:2006 Windows and doors. Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics (+A1:2010).

Chapter 2: Proposed changes to Welsh Approved Document L1B: Existing dwellings (full draft) – *old format*

This chapter is a draft version of Welsh Approved Document L1B (Conservation of fuel and power in existing dwellings) and has been produced for consultation purposes. Final Approved Document statutory guidance will be produced to accompany the final regulatory changes. Where text from the Building Regulations 2010 is reproduced in this document, the only change which has been made is to update the numbering of the regulations in accord with Statutory Instrument 2010:2214. Further changes to the Regulations themselves are likely to be required to reflect decisions on final policy following consultation.

Text from the 2010 version is shown in black.

Deletions from the 2010 version are shown in ~~black strikethrough.~~

Text which is new to this version is shown in blue for new statutory guidance and *italic blue for new supplementary (non-statutory) advice*.

Explanatory text (which is provided to assist the consultation process and will not feature in the final Approved Document) is shown in *purple italic*.

Contents

Section 1: Introduction

What is an Approved Document?

1.1 This Approved Document, which takes effect on June 2014 has been approved and issued by the ~~Secretary of State~~ Welsh Ministers to provide practical guidance on ways of complying with the ***energy efficiency requirements*** (see Section 2) and regulation 7 of the Building Regulations 2010~~00~~ (SI ~~2000~~2010/2214~~2531~~) in ~~England and~~ Wales~~, as amended~~. Regulation 2(1) of the Building Regulations defines the ***energy efficiency requirements*** as the requirements of regulations 23~~4A~~, 26~~17C~~, 28~~17D,~~ 29, 40~~17E~~ and Part L of Schedule 1. The Building Regulations 2010~~00~~ are referred to throughout the remainder of this Document as 'the Building Regulations'.

1.2 The intention of issuing Approved Documents is to provide guidance about compliance with specific aspects of 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) of building regulations to which they refer.

1.3 If guidance in an Approved Document is followed there will be a presumption of compliance with the requirement(s) covered by the guidance. However, this presumption can be overturned, so simply following guidance does not guarantee compliance; 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 well be other ways of achieving compliance with the requirements. **There is therefore no obligation to adopt any particular solution contained in this Approved Document if you would prefer to meet the relevant requirement in some other way. Persons intending to carry out building work should always check with their building control body, either the local authority or an approved inspector, that their proposals comply with building regulations.**

1.4 It is important to note that this Approved Document, as well as containing guidance, also contains extracts from the Building Regulations. Such regulatory text must be complied with as stated. For example, the requirement that ***fixed building services*** must be commissioned (regulation 44~~20C~~) is a regulatory requirement. There is therefore no flexibility to ignore this requirement; neither can compliance with this particular regulation be demonstrated via any route other than that set out in regulation 44~~20C~~.

1.5 The guidance contained in this Approved Document relates only to the particular requirements of the Building Regulations that the document addresses (set out in Section 2). However, building work may be subject to more than one requirement of building regulations. In such cases the work will also have to comply with any other applicable requirements of building regulations.

1.6 There are Approved Documents that give guidance on each of the Parts of Schedule 1 and on regulation 7. A full list of these is provided at the back of this document.

Consideration of technical risk

1.7 Building work to existing ***dwellings*** must satisfy all the technical requirements set out in regulations 22~~4A~~, 23~~4B~~, 28~~17D~~ and 29~~17E~~ of, and Schedule 1 to, the Building Regulations. When considering the incorporation of energy efficiency measures in ***dwellings***, attention should also be paid in particular to the need to comply with Part B (fire safety), Part C (site preparation and resistance to contaminants and moisture), Part E (resistance to the passage of sound), Part F (ventilation), paragraph G3 (hot water supply and systems), Part J (combustion appliances and fuel storage systems) and Part P (electrical safety) of Schedule 1 to the Building Regulations, as well as Part L. The

adoption of any particular energy efficiency measure should not involve unacceptable technical risk of, for instance, excessive condensation. Designers and builders should refer to the relevant Approved Documents and to other generally available good practice guidance to help minimise these risks.

How to use this Approved Document

1.8 This Approved Document is subdivided into seven sections as detailed below. These sections are followed by supporting appendices.

This **introductory** section sets out the general context in which the guidance in this Approved Document must be considered.

Section 2 sets out the relevant legal requirements contained in the Building Regulations.

Section 3 contains general guidance, including the definition of key terms, the types of building work covered by this Approved Document, the types of building work that are exempt, procedures for notifying work, materials and workmanship and health and safety issues.

Section 4 gives guidance on reasonable provision for various types of building work.

Section 5 deals with the particular case of work to ***thermal elements***.

Section 6 gives guidance in support of the requirement for ***consequential improvements*** for buildings ~~over 1,000 m².~~**.**

Section 7 describes the information that should be provided to occupiers to help them achieve reasonable standards of energy efficiency in practice.

1.9 In this document the following conventions have been adopted to assist understanding and interpretation:

a. Texts shown against a green background are extracts from the Building Regulations or Building (Approved Inspectors etc.) Regulations 2010~~00~~ (SI 2010~~00/2532~~2215) ('the Approved Inspectors Regulations'), both as amended, and set out the legal requirements that relate to compliance with the ***energy efficiency requirements*** of building regulations. As stated previously, there is no flexibility in respect of such text; it defines a legal requirement, not guidance for typical situations. It should also be remembered that, as noted above, building works must comply with all the other applicable requirements of building regulations.
b. Key terms are defined in paragraph 3.1 and are printed in ***bold italic text***.
c. Details of technical publications referred to in the text of this Approved Document will be given in footnotes and repeated as references at the end of the document. A reference to a publication is likely to be made for one of two main reasons. The publication may contain additional or more comprehensive technical detail, which it would be impractical to include in full in the Approved Document but which is needed to fully explain ways of meeting the requirements; or it is a source of more general information. The reason for the reference will be indicated in each case. The reference will be to a specified edition of the document. The Approved Document may be amended from time to time to include new references or to refer to revised editions where this aids compliance.
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.

Where you can get further help

1.10 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 seek further assistance:

- the Welsh Government website: www.wales.gov.uk/topics/planning/buildingregs
- the Planning Portal website: www.planningportal.gov.uk;
- if you are the person undertaking the building work, you can seek assistance either from your local authority building control service or from your approved inspector (depending on which building control service you are using;
- persons registered with a competent person self-certification scheme may be able to get technical advice from their scheme operator;
- 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.

Responsibility for compliance

1.11 It is important to remember that if you are the person (e.g. designer, builder, installer) carrying out building work to which any requirement of building regulations applies you have a responsibility to ensure that the work complies with any such requirement. The building owner may also have a responsibility for ensuring compliance with building regulation requirements and could be served with an enforcement notice in cases of non-compliance.

Section 2: The requirements

2.1 This Approved Document deals with the ***energy efficiency requirements*** in the Building Regulations 2010~~(as amended)~~. Regulation 2(1) of the Building Regulations defines the ***energy efficiency requirements*** as the requirements of regulations 23~~4A~~, 26~~17C~~, 28,~~17D~~ 29 and 40 ~~17E~~ and Part L of Schedule 1. The ***energy efficiency requirements*** relevant to existing ***dwellings*** are in regulations 23~~4A~~, 28,~~17D~~ 29 and 40 ~~17E~~ of, and Part L of Schedule 1 to, those Regulations, as set out below.

Requirements relating to thermal elements – Regulation ~~4A~~23

(1) Where a person intends to renovate a thermal element, such work shall be carried out as is necessary to ensure that the whole thermal element complies with the requirements of paragraph L1(a)(i) of Schedule 1.

(2) Where a thermal element is replaced, the new thermal element shall comply with the requirements of paragraph L1(a) (i) of Schedule 1.

Consequential improvements to energy performance Regulation ~~17D~~28

(1) Paragraph (2) applies to an existing building with a total useful floor area over 1000 m² where the proposed building work consists of or includes—
(a) an extension;
(b) the initial provision of any fixed building services; or
(c) an increase to the installed capacity of any fixed building services.

(2) Subject to paragraph (3), where this paragraph applies, such work, if any, shall be carried out as is necessary to ensure that the building complies with the requirements of Part L of Schedule 1.

(3) Nothing in paragraph (2) requires work to be carried out if it is not technically, functionally or economically feasible.

Energy performance certificates – Regulation ~~17E~~29

(1) This regulation applies where—
(a) a building is erected; or
(b) a building is modified so that it has a greater or lesser ~~fewer~~ number of parts designed or altered for separate use than it previously had, where the modification includes the provision or extension of any of the fixed services for heating, hot water, air conditioning or mechanical ventilation.

(2) The person carrying out the work shall—
(a) give an energy performance certificate for the building to the owner of the building; and
(b) give to the local authority notice to that effect, including the reference number under which the energy performance certificate has been registered in accordance with regulation ~~17F(4)~~30(4).

(3) The energy performance certificate and notice shall be given not later than five days after the work has been completed.

~~(4) The energy performance certificate must be accompanied by a recommendation report containing recommendations for the improvement of the energy performance of the building, issued by the energy assessor who issued the energy performance certificate.~~

(4~~5~~) An energy performance certificate must—
(a) express the asset rating of the building in a way approved by the Secretary of State under regulation ~~17A~~24;
(b) include a reference value such as a current legal standard or benchmark;
(c) be issued by an energy assessor who is accredited to produce energy performance certificates for that category of building; and
(d) include the following information—
(i) the reference number under which the certificate has been registered in accordance with regulation ~~17F(4)~~30(4);
(ii) the address of the building, or in the case of a portable building the address of the owner;
(iii) an estimate of the total useful floor area of the building;
(iv) the name of the energy assessor who issued it;
(v) the name and address of the energy assessor's employer, or, if ~~he is~~ self-employed, the name under which the assessor trades and the assessor's address;
(vi) the date on which it was issued; and
(vii) the name of the approved accreditation scheme of which the energy assessor is a member.

(5) The energy performance certificate must be accompanied by a recommendation report containing

recommendations for the improvement of the energy performance of the building, issued by the energy assessor who issued the energy performance certificate.

(6) Certification for apartments or units designed or altered for separate use in blocks may be based—
(a) except in the case of a dwelling, on a common certification of the whole building for blocks with a common heating system; or
(b) on the assessment of another representative apartment or unit in the same block.

(7) Where—
(a) a block with a common heating system is divided into parts designed or altered for separate use; and
(b) one or more, but not all, of the parts are dwellings, certification for those parts which are not dwellings may be based on a common certification of all the parts which are not dwellings.

Information about use of fuel and power – Regulation 40

(1) This regulation applies where paragraph L1 of Schedule 1 imposes a requirement in relation to building work;
(2) The person carrying out the work shall not later than 5 days after the work has been completed provide to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances

Requirement	*Limits on application*
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; and (c) providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.	

LIMITATION ON REQUIREMENTS

2.2 In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D, F to K, N and P (except for paragraphs G2, H2 and J7~~6~~) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

2.3 Paragraph G2 is excluded as it deals with water efficiency and paragraphs H2 and J7~~6~~ are excluded from regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound, and access to and use of buildings) are excluded from regulation 8 because they address the welfare and convenience of building users. Part L is excluded from regulation 8 because it addresses the conservation of fuel and power.

2.4 In addition, regulation ~~4(1A)~~ 4(2) of the Building Regulations states that where the work is being carried out in order to comply with regulation ~~4A~~22 (requirements relating to a change of a building's energy status), regulation 23 (requirements relating to ***renovation*** or replacement of a ***thermal element***), ~~regulation 4B (requirements relating~~

~~to a change of a building's energy status~~ or regulation ~~17D~~ 28 (***consequential improvements*** to energy performance), and is not a material alteration, it need comply only with the applicable requirements of Part L.

Section 3: General guidance

Key terms

3.1 The following are key terms used in this document:

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

Commissioning means the advancement of a ***fixed building service*** following installation, replacement 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.

Consequential improvements means those energy efficiency improvements required by regulation ~~17D~~28.

Controlled service or fitting means a service or fitting in relation to which Part G (sanitation, hot water safety and water efficiency), H (drainage and waste disposal), J (combustion appliances and fuel storage systems), L (conservation of fuel and power) or P (electrical safety) of Schedule 1 to the Building Regulations imposes a requirement.

Dwelling means a self-contained unit, including a house or a flat, designed to be used separately to accommodate a single household. (***Rooms for residential purposes*** are not ***dwellings*** so Approved Document L2B applies to work in such buildings.)

Energy efficiency requirements means the requirements of regulations ~~4A~~23, ~~17C~~26, ~~17D~~28, ~~17E~~29 and 40 of, and Part L of Schedule 1 to, the Building Regulations.

*In respect of existing **dwellings** the applicable requirements consist of Part L and regulations ~~4A~~23 and ~~17D~~28.*

Fixed building services means any part of, or any controls associated with:
a. fixed internal or external lighting systems, but does not include emergency escape lighting or specialist process lighting; or
b. fixed systems for heating, hot water, air conditioning, or mechanical ventilation.

Room for residential purposes means a room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, an hotel, a boarding house, a hall of residence or a residential home~~, whether or not the room is separated from or arranged in a cluster group with other rooms~~, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.~~ and, for the purposes of this definition, a "cluster" is a group of rooms for residential purposes which is:
separated from the rest of the building in which it is situated by a door which is designed to be locked; and
not designed to be occupied by a single household.~~

'Renovation' in relation to a thermal element means the provision of a new layer in the thermal element (other than where that new layer is provided solely as a means of repair to a flat roof) or the replacement of an existing layer, but excludes decorative finishes, and 'renovate' shall be construed accordingly.

Simple payback means the amount of time it will take to recover the initial investment through energy savings, and is calculated by dividing the marginal additional cost of implementing an energy efficiency measure by the value of the annual energy savings achieved by that measure taking no account of VAT. When making this calculation the following guidance should be used:

a. the marginal additional cost is the additional cost (materials and labour) of incorporating (e.g.) additional insulation, not the whole cost of the work;
b. the cost of implementing the measure should be based on prices current at the date the proposals are made known to the ***BCB*** and be confirmed in a report signed by a suitably qualified person;
c. the annual energy savings should be estimated using SAP 2012~~09~~[13], taking account of VAT in both the cost and the saving;
d. for the purposes of this Approved Document, the energy prices that are current at the time of the application to building control should be used when evaluating the annual energy savings. Current energy prices can be obtained from the DECC website[14].

Thermal element is defined in regulation ~~2(2A)~~ 2(3) of the Building Regulations as follows:

2(3) ~~(2A)~~ In these Regulations 'thermal element' means a wall, floor or roof (but does not include windows, doors, roof windows or roof-lights) which separates a thermally conditioned part of the building ('the conditioned space') from:

a. the external environment (including the ground); or
b. in the case of floors and walls, another part of the building which is:
   i. unconditioned;
   ii. an extension falling within class VII in Schedule 2; or
   iii. where this paragraph applies, conditioned to a different temperature,

and includes all parts of the element between the surface bounding the conditioned space and the external environment or other part of the building as the case may be.

2(4) ~~(2B)~~ Paragraph 3 ~~(2A)~~(b)(iii) only applies to a building which is not a dwelling, where the other part of the building is used for a purpose which is not similar or identical to the purpose for which the conditioned space is used.

*Note that this definition encompasses the walls and floor of a swimming pool basin where this is part of an existing **dwelling**.*

Types of work covered by this Approved Document

3.2 This Approved Document is intended to give guidance on what, in ordinary circumstances, may be considered reasonable provision for compliance with the requirements of regulation ~~4A~~23 and ~~17D~~28 of, and Part L of Schedule 1 to, the Building Regulations for those carrying out building work to existing ***dwellings***. In addition it gives guidance on compliance with regulations 27, ~~20B~~43 and ~~20C~~44 ~~20D~~ of the Building Regulations and regulation ~~12B~~20,~~12C and 12D~~ of ~~the Building (Approved Inspectors etc) Regulations 2000 (SI 2000/2532)~~ the Approved Inspectors Regulations.

*Buildings exclusively containing **rooms for residential purposes** such as nursing homes, student accommodation and similar are not **dwellings**, and in such cases Approved Document L2B applies.*

[13] www.bre.co.uk/sap2012~~09~~
[14] www.decc.gov.uk/en/content/cms/statistics/publication/prices/prices.aspx

3.3 In particular, this Approved Document gives guidance on compliance with the ***energy efficiency requirements*** where the following occurs:

a. the construction of an extension (see paragraphs ~~4.1~~ 4.0 to 4.9);
b. a material change of use, or a change to the building's energy status, including such work as loft and garage conversions (paragraphs 4.11 to 4.16a);
c. the provision or extension of a ***controlled service*** or ***controlled fitting*** (paragraphs 4.17 to 4.37);
d. the replacement or ***renovation*** of a ***thermal element*** (Section 5);
e. ***consequential improvements*** in energy performance (Section 6)

3.4 Where the activities include building work in a ***dwelling*** that is part of a mixed-use building, account should also be taken of the guidance in Approved Document L2B in relation to those parts of the building that are not ***dwellings***, including any common areas.

*It should be noted that **dwellings** are defined as self-contained units**. Rooms for residential purposes** are not **dwellings**, and so Approved Document L2B applies to them.*

Dwellings within the scope of the energy efficiency requirements

3.5 The ***energy efficiency requirements*** of the Building Regulations apply only to buildings which are roofed constructions having walls and which use energy to condition the indoor climate. For ***dwellings*** the requirements will apply to:

- the erection of a ***dwelling*** (guidance on this is given in Approved Document L1A);
- the extension of a ***dwelling*** other than some extensions falling within Class VII in Schedule 2 to the Building Regulations; or
- the carrying out of any building work to or in connection with an existing ***dwelling*** or an extension to an existing ***dwelling***.

Dwellings exempt from the energy efficiency requirements

3.6 There are two exemptions from the ***energy efficiency requirements*** that may apply to building work to existing ***dwellings*** or extensions to existing ***dwellings***:

a. Buildings which are:

- listed in accordance with section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990;
- in a conservation area designated in accordance with section 69 of that Act; or
- included in the schedule of monuments maintained under section 1 of the Ancient Monuments and Archaeological Areas Act 1979.

For these buildings the exemption applies only to the extent that compliance with the ***energy efficiency requirements*** would unacceptably alter the character or appearance of such existing ***dwellings***. Guidance on these buildings is given in paragraphs 3.7 to 3.14 below.

b. Carports, covered yards, covered ways and some conservatories or porches attached to existing ***dwellings***. Guidance on these is given at paragraphs 3.15 and 3.16 below.

Historic and traditional buildings which may have an exemption

3.7 As mentioned above in paragraph 3.6a, the following classes of buildings have an exemption from the ***energy efficiency requirements*** where compliance would unacceptably alter the character or appearance of the buildings.

a. listed buildings;
b. buildings in conservation areas; and
c. scheduled ancient monuments.

Historic and traditional buildings where special considerations may apply

3.8 There are three further classes of buildings where special considerations in making reasonable provision for the conservation of fuel or power may apply:

a. buildings which are of architectural and historical interest and which are referred to as a material consideration in a local authority's development plan or local development framework;
b. buildings which are of architectural and historical interest within national parks, areas of outstanding natural beauty, registered historic parks and gardens, registered battlefields, the curtilages of scheduled ancient monuments, and world heritage sites;
c. buildings of traditional construction with permeable fabric that both absorbs and readily allows the evaporation of moisture.

3.9 When undertaking work on or in connection with a building that falls within one of the classes listed above, the aim should be to improve energy efficiency as far as is reasonably practicable. The work should not prejudice the character of the host building or increase the risk of long-term deterioration of the building fabric or fittings.

3.10 The guidance given by English Heritage[15] should be taken into account in determining appropriate energy performance standards for building work in historic buildings.

In addition English Heritage has produced detailed technical guidance on how to implement specific energy efficiency measures. (See list of available guidance documents at http://www.english-heritage.org.uk/professional/advice/advice-by-topic/climate-change/energy-efficiency/).

3.11 In general, new extensions to historic or traditional ***dwellings*** should comply with the standards of energy efficiency as set out in this Approved Document. The only exception would be where there is a particular need to match the external appearance or character of the extension to that of the host building (see paragraph 4.2).

3.12 Particular issues relating to work in historic buildings that warrant sympathetic treatment and where advice from others could therefore be beneficial include:

a. restoring the historic character of a building that has been subject to previous inappropriate alteration, e.g. replacement windows, doors and rooflights;
b. rebuilding a former historic building (e.g. following a fire or filling a gap site in a terrace);
c. making provisions enabling the fabric of historic buildings to 'breathe' to control moisture and potential long-term decay problems.

3.13 In assessing reasonable provision for energy efficiency improvements for historic buildings of the sort described in paragraphs 3.7 and 3.8, it is important that the ***BCB*** takes into account the advice of the local authority's conservation officer. The views of the conservation officer are particularly important where building work requires planning permission and/or listed building consent.

3.14 Other classes of buildings to which special considerations apply are usually non-domestic in character, and so are covered in ADL2A and ADL2B.

Conservatories and porches

3.15 Regulation 21~~9~~ of the Building Regulations exempts some conservatory and porch extensions from the ***energy efficiency requirements***. The exemption applies only for conservatories or porches:

- which are at ground level;
- where the floor area is less than 30 m²;

[15] www.english-heritage.org.uk/

- where the existing walls, doors and windows in the part of the ***dwelling*** which separates the conservatory are retained or, if removed, replaced by walls, windows and doors which meet the ***energy efficiency requirements***; and
- where there is no heating or cooling installed.
- ~~where the heating system of the ***dwelling*** is not extended into the conservatory or porch.~~

3.16 Where any conservatory or porch does not meet all the requirements in the preceding paragraph, it is not exempt and must comply with the relevant ***energy efficiency requirements*** including ***consequential improvements*** (see paragraphs 4.8 and 4.9 and Section 6 below).

Notification of work covered by the Energy Efficiency requirements

3.17 In most instances in order to comply with the Building Regulations it will be necessary to notify a ***BCB*** before the work starts. Where you choose to use the local authority and any work relates to the common parts of a block of flats, this must be by deposit of full plans. For other existing ***dwellings*** this could be either in the form of a deposit of full plans or by a building notice. There is no set procedure where the ***BCB*** is an Approved Inspector provided they have been notified at least 5 days before work starting.

3.18 In certain situations, however, you do not need to notify a ***BCB***:

a. Where the work is being carried out by a person registered with a relevant competent person self-certification scheme listed in Schedule ~~2A~~3 to the Building Regulations, no advance notification to the ***BCB*** is needed (see paragraphs 3.19 to 3.22).
b. Where the work involves an emergency repair, e.g. to a failed boiler or a leaking hot water cylinder, in accordance with regulation 12(~~7~~8) of the Building Regulations there is no need to delay making the repair in order to make an advance notification to the ***BCB***. However, in such cases it will still be necessary for the work to comply with the relevant requirements and to give a notice to the ***BCB*** at the earliest opportunity, unless an installer registered under an appropriate competent person scheme carries out the work. A completion certificate can then be issued in the normal way.
c. Where the work is of a minor nature as described in the schedule of non-notifiable work (Schedule ~~2B~~4 to the Building Regulations), the work must still comply with the relevant requirements but need not be notified to the ***BCB*** (see paragraphs 3.23 to 3.25).

Competent person self-certification schemes

3.19 It is not necessary to notify a ***BCB*** in advance of work which is to be carried out by a person registered with a competent person self-certification scheme listed in Schedule ~~2A~~3 to the Building Regulations. 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.

3.20 Where work is carried out by a person registered with a competent person scheme, regulation ~~16A~~20 of the Building Regulations ~~2000~~ and regulation ~~11A~~20(1) of the ~~Building (~~Approved Inspectors ~~etc)~~ Regulations ~~2000~~ require that the occupier of the building 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. There is also a requirement to give the ***BCB*** a notice of the work carried out, again within 30 days of the completion of the work. These certificates and notices are usually made available through the scheme operator.

3.21 ***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.

3.22 A list of authorised self-certification schemes and the types of work for which they are authorised can be found at the Welsh Government website: www.wales/xxxxx ~~www.communities.gov.uk~~

Work which need not be notified

3.23 Schedule ~~2B~~4 to the Building Regulations sets out types of work where there is no requirement to notify a ***BCB*** that work is to be carried out. These types of work are mainly of a minor nature where there is no significant risk to health, safety or energy efficiency. Note that the health, safety and ***energy efficiency requirements*** continue to apply to these types of work, and that only the need to notify a ***BCB*** has been removed. In addition, where only non-notifiable work is carried out by a member of a competent person self-certification scheme there is no requirement for a certificate of building regulations compliance to be given to the occupier or the ***BCB***.

3.24 The types of non-notifiable work in Schedule ~~2B~~4 relevant to the ***energy efficiency requirements*** of the Regulations are:

a. In a heating, hot water, ventilation or air-conditioning system, the replacement of any part which is not a combustion appliance (such as a radiator, valve or pump) or the addition of an output device (such as a radiator or fan) or the addition of a control device (such as a thermostatic radiator valve). However, the work will remain notifiable whenever ***commissioning*** is possible and necessary to enable a reasonable use of fuel and power (see paragraphs 4.30 to 4.37).
b. The installation of a stand-alone, self-contained fixed heating, hot water, ventilation or air-conditioning service. Such services must consist only of a single appliance and any associated controls, and must not be connected to, or form part of, any other ***fixed building service***. Examples of non-notifiable services would be a fixed electric heater, a mechanical extractor fan in a kitchen or bathroom, and a room air-conditioning unit. However, if any of the following apply, the work will remain notifiable building work:
    i. the service is a combustion appliance;
    ii. any electrical work associated with the installation is notifiable;
    iii. ***commissioning*** is possible and would affect the service's energy efficiency (see paragraphs 4.30 to 4.38);
    iv. in the case of a ventilation appliance, the appliance is installed in a room containing a natural draught open-flued combustion appliance or service, such as a gas fire which uses a chimney as its flue.
c. Installation of thermal insulation in a roof space or loft space where this is the only work carried out and the work is not carried out to comply with any requirement in the Building Regulations, i.e. the work is carried out voluntarily.

3.25 Schedule 4~~2B~~ also sets out what types of electrical installation work in ***dwellings*** are non-notifiable. Full information on this is given in Approved Document P.

Materials and workmanship

3.26 Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations should be carried out in accordance with Regulation 7. Guidance on meeting these requirements on materials and workmanship is contained in the Approved Document to Regulation 7.

3.27 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.

3.28 When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

This text is amended to reflect the proposed changes to the Regulation 7 Approved Document. See Chapter 7 of the Consultation Document for more details.

~~**3.26** Any building work which is subject to the requirements imposed by Schedule 1 to the Building Regulations should, in accordance with regulation 7, be carried out with proper materials and in a workmanlike manner.~~

~~**3.27** You may show that you have complied with regulation 7 in a number of ways. These include demonstrating the appropriate use of:~~

- ~~a product bearing CE marking in accordance with the Construction Products Directive (89/106/EC)[4] as amended by the CE Marking Directive (93/68/EC)[5], the Low Voltage Directive (2006/95/EC)[6] and the EMC Directive (2004/108/ EC)[7];~~
- ~~a product complying with an appropriate technical specification (as defined in those Directives mentioned above), a British Standard, or an alternative national technical specification of a Member State of the European Union or Turkey [8], or of another State signatory to the Agreement on the European Economic Area (EEA) that provides an equivalent level of safety and protection;~~
- ~~a product covered by a national or European certificate issued by a European Technical Approval Issuing body, provided the conditions of use are in accordance with the terms of the certificate.~~

~~[4] As implemented by the Construction Products Regulations 1991 (SI 1991/1620).~~
~~[5] As implemented by the Construction Products (Amendment) Regulations 1994 (SI 1994/3051).~~
~~[6] As implemented by the Electrical Equipment (Safety) Regulations 1994 (SI 1994/3260).~~
~~[7] As implemented by the Electromagnetic Compatibility Regulations 2006 (SI 2006/3418).~~
~~[8] Decision No 1/95 of the EC - Turkey Association Council of 22 December 1995.~~

~~**3.28** You will find further guidance in the Approved Document which specifically supports regulation 7 on materials and workmanship.~~

~~**Independent certification schemes**~~

~~**3.29** There are many UK product certification schemes. Such schemes certify compliance with the requirements of a recognised standard that is appropriate to the purpose for which the material is to be used. Materials which are not so certified may still conform to a relevant standard.~~

~~**3.30** Many certification bodies that approve products under such schemes are accredited by the United Kingdom Accreditation Service (UKAS). Such bodies can issue certificates only for the categories of product covered under the terms of their accreditation.~~

~~**3.31** ***BCBs*** may take into account the certification of products, components, materials or structures under such schemes as evidence of compliance with the relevant standard. Similarly, ***BCBs*** may accept the certification of the installation or maintenance of products, components, materials or structures under such schemes as evidence of compliance with the relevant standard. Nonetheless, before accepting that certification constitutes compliance with building regulations, a ***BCB*** should establish in advance that the relevant scheme is adequate for that purpose.~~

~~**Standards and technical specifications**~~

~~**3.32** Building regulations are made for specific purposes including: securing the health, safety, welfare and convenience of people in or about buildings; furthering the conservation of fuel and power; furthering the protection or enhancement of the environment; and facilitating sustainable development. Guidance contained in standards and technical approvals referred to in Approved Documents may be relevant to compliance with building regulations to the extent that it relates to those purposes. However, it should be noted that guidance in standards and technical approvals may also address other aspects of performance such as serviceability, or aspects which, although they relate to health and safety, are not covered by building regulations.~~

~~**3.33** When an Approved Document makes reference to a named standard or document the relevant version of the standard or document is the one listed at the end of the Approved Document. Until the reference in the Approved Document is revised, the standard or document listed remains the approved source, but if the issuing body has published a revised or updated version, any content that addresses the relevant requirements of the Building Regulations may be used as a source of guidance.~~

~~**3.34** The appropriate use of a product that complies with a European Technical Approval as defined in the Construction Products Directive will meet the relevant requirements.~~

~~**3.35** Communities and Local Government intends to issue periodic amendments to its Approved Documents to reflect emerging harmonised European standards. Where a national standard is to be replaced by a European harmonised standard, there will be a coexistence period during which either standard may be referred to. At the end of the coexistence period the national standard will be withdrawn.~~

The Workplace (Health, Safety and Welfare) Regulations 1992

3.29~~36~~ 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, 1996.

3.30~~37~~ 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.

Section 4: Guidance relating to building work

THE EXTENSION OF A DWELLING

4.0 Under Regulation 28 of the Building Regulations, the construction of an extension triggers the requirement for ***consequential improvements*** of the ***dwelling***. The guidance in Section 6 should be followed in respect of the ***consequential improvement*** in addition to following the specific guidance in relation to the extension.

Reference method

Fabric standards

4.1 Reasonable provision would be for the proposed extension to incorporate the following:

a. newly constructed ***thermal elements*** that meet the standards set out in paragraphs 5.1 to 5.6;
b. doors, windows, roof windows and rooflights that meet the standards set out in paragraphs 4.19 to 4.23;
c. improvements to fabric elements that are to become ***thermal elements***, following the guidance in paragraphs 5.6 to 5.11.

Area of windows, roof windows and doors

4.2 In most circumstances reasonable provision would be to limit the total area of windows, roof windows and doors in extensions so that it does not exceed the sum of:

a. 25 per cent of the floor area of the extension; plus
b. the total area of any windows or doors which, as a result of the extension works, no longer exist or are no longer exposed.

*As a general guide, if the area of glazing is much less than 20 per cent of the total floor area, some parts of the extension and especially the part of the **dwelling** it covers may experience poor levels of daylight, resulting in increased use of electric lighting. For further guidance see BS 8206-2:2008 Lighting for buildings: Code of practice for daylighting.*

Areas of glazing greater than 25 per cent may be acceptable, especially if this is required to make the extension consistent with the external appearance or character of the host building. In such cases and where practical, either the U-value of the window should be improved relative to the standard set out in paragraph 4.1b, or other compensating measures applied following the guidance set out in paragraphs 4.4 to 4.7.

Heating and lighting in the extension

4.3 Where a ***fixed building service*** is provided or extended as part of constructing the extension, reasonable provision would be to follow the guidance in paragraphs 4.26 to 4.39.

Optional approaches with more design flexibility

4.4 The approach set out in paragraphs 4.1 to 4.3 is somewhat prescriptive. The following paragraphs offer more flexible approaches to demonstrating that reasonable provision has been made. These alternative approaches allow some elements of the design to be relaxed through compensating measures elsewhere.

Area-weighted U-value method

4.5 One way of complying would be to show that the area-weighted U-value of all the elements in the extension is no greater than that of an extension of the same size and shape that complies with the fabric standards referred to in paragraph 4.1 and the opening area standards in paragraph 4.2. Any ***fixed building service*** provided or extended as part of constructing the extension should follow the guidance in paragraphs 4.24 to 4.37.

The area-weighted U-value is given by the following expression:
$\{(U_1 \times A_1) + (U_2 \times A_2) + (U_3 \times A_3) + \ldots)\}$
$\div \{(A_1 + A_2 + A_3 + \ldots)\}$

Whole dwelling calculation method

4.6 Where even greater design flexibility is required, reasonable provision would be to use SAP 2012 ~~2009~~ to show that the calculated carbon dioxide (CO_2) emission rate from the ***dwelling*** with its proposed extension is no greater than for the ***dwelling*** plus a notional extension built to the standards of paragraphs 4.1 to 4.3. The openings in the notional extension should conform with paragraph 4.2 with door area set equal to the door area of the proposed extension, with the remainder of the openings being classified as windows. The data in SAP 2012 ~~2009~~ Appendix S can be used to estimate the performance of the elements of the existing building where these are unknown.

Approved Document C gives limiting values for individual elements to minimise condensation risk.

4.7 If, as part of achieving the standard set out in paragraph 4.6, upgrades are proposed to the existing ***dwelling***, such upgrades should be implemented to a standard that is no worse than set out in the relevant guidance contained in this Approved Document. The relevant standards for improving retained ***thermal elements*** are as set out in column (b) of Table 3.

Where it is proposed to upgrade the original building, the standards set out in this Approved Document are cost-effective and should be implemented in full. It will be worthwhile implementing them even if the improvement is greater than necessary to achieve compliance. In some cases, therefore, the standard of the extended ***dwelling*** *may be better than that required by paragraph 4.6 alone. Paragraph 4.7 sets limits on design flexibility and ensures that no cost-effective improvement opportunities are traded away.*

Conservatories and porches

4.8 Where the extension is a conservatory or porch that is not exempt from the ***energy efficiency requirements*** (see paragraphs 3.15 and 3.16 above), the conservatory or porch is an extension, and paragraphs 4.0 to 4.7 and Section 6 applies. In addition, ~~then~~ reasonable provision would be to provide:

a. Effective thermal separation between the heated area in the existing ***dwelling***, i.e. the walls, doors, and windows between the ***dwelling*** and the extension, should be insulated and draught proofed to at least the same extent as in the existing ***dwelling***.
b. Independent temperature and on/off controls to any heating system installed within the extension. Any ***fixed building service*** installed within the extension should also conform to the standards set out in paragraphs 4.24 to 4.37.
c. Glazed elements should meet the standards set out in Table 1 and opaque elements should meet the standards set out in Table 2. However, the limitations on total area of windows, roof windows and doors as set out at paragraph 4.2 above do not apply.

4.9 Removing, and not replacing, any or all of the thermal separation between the ***dwelling*** and an existing exempt extension, or extending the **dwelling's** heating system

into the extension, means the extension ceases to be exempt (see paragraphs 3.15 and 3.16 above). This constitutes a change to the building's energy status (Regulation 22 ~~4B~~). In such situations, the extension should be treated as a conventional extension and reasonable provision would be to demonstrate that the extension meets the guidance set out in paragraphs 4.0 ~~4.1~~ to 4.7 and Section 6 below.

Swimming pool basins

4.10 Where a swimming pool is being provided in a building, the U-value of the basin (walls and floor) should be not worse than 0.25 W/m².K as calculated according to BS EN ISO 13370[9].

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

Design considerations should be taken with regards to compressive creep, insulation boards not being fully supported and the effects of point loading. Care should be taken to avoid thermal bridging particularly around basin wall and floor junctions with foundations.

MATERIAL CHANGE OF USE AND CHANGE OF ENERGY STATUS

Material change of use

4.11 Material changes of use (see regulation 5 of the Building Regulations) covered by this document are where, after the change:

a. the building is used as a ***dwelling***, where previously it was not;
b. the building contains a flat, where previously it did not; or
c. the building, which contains at least one ***dwelling***, contains a greater or lesser number of ***dwellings*** than it did previously.

Change of energy status

4.12 A change to a building's energy status is defined in regulation 2(1) as:

any change which results in a building becoming a building to which the energy efficiency requirements of these Regulations apply, where previously it was not.

4.13 The requirements relating to a change to energy status are in regulation 22~~4B(1)~~:

Where there is a change in a building's energy status, such work, if any, shall be carried out to ensure that the building complies with the applicable requirements of Part L of Schedule 1.

4.14 In this regulation 'building' means the building as a whole or parts of the building that have been designed or altered to be used separately.

*For example, this could occur where a previously unheated building, or parts of the building that have been designed or altered to be used separately, were to be heated in future, or where a previously exempt building were no longer within the exempted categories. Where this also results in an increase in habitable area e.g. a loft or integral garage conversion the requirements for **consequential improvements** are triggered. A material alteration (regulation 3(2) and (3)) may result in a change in buildings energy status.*

4.15 In normal circumstances, reasonable provision where there is a material change of use or a change to the building's energy status would be:

a. Where ***controlled services or fittings*** are being provided or extended, to meet the standards set out in paragraphs 4.17 to 4.37. If the area of openings in the newly created ***dwelling*** is more than 25 per cent of the total floor area, either the area of openings should be reduced to be not greater than 25 per cent, or the larger area should be compensated for in some other way using the procedure described in paragraph 4.16.
b. Where the work involves the provision of a ***thermal element***, to meet the standards set out in paragraphs 5.1 to 5.6.

For the purposes of Building Regulations, provision means both new and replacement elements.

c. Where any ***thermal element*** is being retained, to upgrade it following the guidance given in paragraphs 5.11 to 5.13.
d. Where an existing window (including roof window or rooflight) or door which separates a conditioned space from an unconditioned space or the external environment has a U-value that is worse than 3.3 W/m².K, to provide replacement units following the guidance in paragraphs 4.19 to 4.23.

Option providing more design flexibility

4.16 To provide more design flexibility, SAP 2012 ~~2009~~ can be used to demonstrate that the total CO_2 emissions from all the ***dwellings*** in the building as it will become are no greater than if each ***dwelling*** had been improved following the guidance set out in paragraph 4.15.

See newly formatted Approved Document for further options

Increase in habitable area

4.16a Where the habitable area of a ***dwelling*** is increased by converting a loft, integral garage or similar unheated space, the building work triggers a requirement for a ***consequential improvement*** under Regulation 28. The guidance in Section 6 should be followed in respect of the ***consequential improvement***. The increased area of habitable space created by the work should follow the guidance relating to a change in a building's energy status.

WORK ON CONTROLLED FITTINGS AND SERVICES

4.17 ***Controlled services or fittings*** are defined in regulation 2 as follows:

Controlled service or fitting means a service or fitting in relation to which Part G, H, J, L or P of Schedule 1 imposes a requirement;

4.18 In the context of this Approved Document, the application of the term ***controlled fitting*** to a window, roof window, rooflight or door refers to a whole unit, i.e. including the frame. Consequently, replacing the glazing whilst retaining an existing frame is not providing a ***controlled fitting***, and so such work is not notifiable and does not have to meet the Part L standards, although where practical it would be sensible to do so. Similar arguments apply to doors, where the controlled fitting refers to the complete door set (leaf plus frame). Replacing a door leaf whilst retaining the existing frame is not notifiable and does not need to meet the Part L standards, although where practical it would be sensible to do so. ~~Similar arguments apply to a new door in an existing frame.~~

Controlled fittings

4.19 Where windows, roof windows, rooflights or doors are to be provided or replaced, reasonable provision in normal cases would be the installation of draught-proofed units whose performance is no worse than given in Table 1. In addition, insulated cavity closers should be installed where appropriate. Where the replacement windows are unable to meet the requirements of Table 1 because of the need to maintain the external appearance of the façade or the character of the building, replacement windows should meet a centre pane U-value of 1.2W/m²K, where the centre-pane U-value is defined as the U-value determined in the central area of the glazing unit, making no allowance for edge spacers or window frame. As an alternative, ~~or~~ single glazing should be supplemented with low-e secondary glazing. In this latter case, the weather stripping should be on the secondary glazing to minimise condensation risk between the primary and secondary glazing.

"Replaced" has been inserted to clarify that this text applies to both the installation of a new or replacement fixed building service.

4.20 U-values shall be calculated using the methods and conventions set out in BR 443[16], and should be based on the whole unit (i.e. in the case of a window, the combined performance of the glazing and frame). The U-value of the window can be calculated for:
a. the smaller of the two standard windows defined in BS EN 14351-1[17]; or
b. the standard window configuration set out in BR 443; or
c. the specific size and configuration of the actual window.

The U-value of the door can be calculated for the standard size as laid out in BS EN 14351-1, or the specific size and configuration of the actual door.

SAP 2012 ~~2009~~ Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.

4.21 The U-values for roof windows and rooflights given in this Approved Document are based on the U-value having been assessed with the roof window or rooflight in the vertical position. If a particular unit has been assessed in a plane other than the vertical, the standards given in this Approved Document should be modified by making an adjustment that is dependent on the slope of the unit following the guidance in BR 443.

Table 1 **Standards for controlled fittings**

Fitting	Standard
Window, roof window or rooflight	WER Band C or better (see paragraph 4.22), or U-value 1.6 W/m².K
Doors with >50% of internal face glazed	Door Set Energy Rating (DSER) Band E or better (see paragraph 4.22), or U-value = 1.6 ~~1.8~~ W/m².K
Other doors	Door Set Energy Rating (DSER) Band E or better (see paragraph 4.22), or U-value = 1.6 ~~1.8~~ W/m².K

4.22 The Window Energy Rating (WER) is given by the following equation;
WER = 196.7 x ((1 – f) x g_{glass}) – 68.5
x (U + (0.0165 x AL))

Where f is the frame factor i.e the percentage of the window obscured by frame and gaskets; g_{glass} is the normal total solar energy transmittance of the glass as determined by BS EN 410,

U is the whole window U-value as specified in paragraph 4.20 and 4.21; and

[16] BR 443 Conventions for U-value calculations, BRE, 2006.
[17] EN 14351-1 Windows and doors – Product standard, performance characteristics, 2006 (+A1:2010).

AL is the air leakage through the window in $m^3/h.m^2$ at 50 Pa pressure difference based on testing to BS 6375–1:2009. Note that AL is based on the whole window area, not per unit length of opening light.

The following rating bands define the window energy rating label:

Band A	WER >=0
Band B	0<WER=<–10
Band C	–10<WER=<–20
Band D	–20<WER=<–30
Band E	–30<WER=<–50
Band F	–50<WER=<–70
Band G	WER>–70

BCBs may accept a WER declaration from a certification scheme that provides a quality-assured process and supporting audit trail from calculating the performance of the window through to installation as evidence of compliance. Notwithstanding the suggested performance values set out above, guidance on energy-efficient windows is available from the Energy Saving Trust.[18]

The Door Set Energy Rating[19] is given by the following equation:

DSER= -68.5 * (Udoor + Effective L_{50})

Where Udoor is the door U-value as specified in Paragraph 4.20; and

Effective L50 is [XX].

The following rating bands define the door energy rating label:

Band A	DSER>=-70
Band B	-70 < DSER <= -85
Band C	-85 < DSER <= -100
Band D	-100 < DSER <= -115
Band E	-115 < DSER <= -130
Band F	-130 < DSER <= -145
Band G	DSER < -145

The DSER equation/scale applies to pedestrian doors. Glazed patio and sliding folding doors use the window formula and rating scale.

4.23 If a window or door is enlarged or a new one created, then the area of windows, roof windows, rooflights and doors should not exceed 25 per cent of the total floor area of the ***dwelling*** unless compensating measures are included elsewhere in the work.

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Controlled services

4.24 Whenever a ***fixed building service*** is extended, replaced or provided, reasonable provision would be demonstrated by following the guidance set out in the *Domestic Building Services Compliance Guide*[20]. The Guide covers the following services:

a. heating and hot water systems (including insulation of pipes, ducts and vessels;
b. mechanical ventilation;
c. mechanical cooling/air-conditioning;
d. fixed internal lighting;

[18] http://www.energysavingtrust.org.uk/Home-improvements-andproducts/Home-insulation-glazing/Glazing
[19] **http://www.fenestration-news.com/news/newsitem.aspx?id=9119**
[20] Domestic Building Services Compliance Guide, CLG, 20131~~0~~ edition.

e. fixed external lighting;
f. renewable energy systems.

"Replaced" has been inserted to clarify that this text applies to both the installation of a new or replacement fixed building service.

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

4.26 When replacing an existing appliance, the efficiency of the new appliance should not be significantly less than the efficiency of the appliance being replaced. If the replacement involves a fuel switch, then the relative carbon emissions associated with the new and existing fuels should be considered when assessing the reasonableness of the proposed new appliance. The *Domestic Building Services Compliance Guide* contains the detailed guidance on this issue.

4.27 If a renewable energy generator such as a wind turbine or photovoltaic array is being replaced, the new system should have an electrical output that is not less than the original installation.

4.28 When replacing a heating appliance, consideration should be given to connecting to any existing local heat networks. If the work involves pipework changes, consideration should be given to providing capped off connections to facilitate subsequent connection to a planned local heat network.

4.29 If a particular technology is not covered in the *Domestic Building Services Compliance Guide*, reasonable provision would be demonstrated by showing that the proposed technology gives a performance that is no worse than a reference system of the same type whose details are given in the Guide.

COMMISSIONING OF FIXED BUILDING SERVICES

4.30 Paragraph L1(b)(iii) of Schedule 1 to the Building Regulations requires ***fixed building services*** to be commissioned by testing and adjustment as necessary to ensure that they use no more fuel and power than is reasonable in the circumstances. In order to demonstrate that the heating and hot water systems have been adequately commissioned, regulation ~~20C~~44 states:

~~20C~~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 165(4) is required to be given; or
b. where that regulation does not apply, not more than 30 days after completion of the work.

4.31 Reasonable provision would be to prepare a ***commissioning*** plan, identifying the systems that need to be tested and the tests that will be carried out. The notice required by regulation ~~20C~~44 should confirm that the ***commissioning*** plan has been followed and that every system has been inspected in an appropriate sequence and to a reasonable standard and that the test results confirm that performance is reasonably in accordance with the design requirements.

4.32 Not all ***fixed building services*** will need to be commissioned. With some systems adjustment is not possible as the only controls are 'on' and 'off' switches. Examples of this would be some mechanical extraction systems or single fixed electrical heaters. In other cases ***commissioning*** would be possible but in the specific circumstances would have no effect on energy use.

Fixed building services *which do not require* ***commissioning*** *should be identified in the* ***commissioning*** *plan, along with the reason for not requiring* ***commissioning****.*

4.33 Where ***commissioning*** is carried out it must be done in accordance with a procedure approved by the Welsh Ministers~~Secretary of State~~. For heating and hot water systems the approved procedures are set out in the *Domestic Building Services Compliance Guide*. For ventilation systems, an approved procedure would be to follow the guidance in the *Domestic Ventilation Compliance Guide*[21].

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

4.35 Where a building notice or full plans have been given to a local authority ***BCB,*** the notice of completion of ***commissioning*** shall ~~should~~ be given to local authority ~~that ***BCB*** within~~ not more than 5 days after the work has been completed. ~~of the completion of the ***commissioning*** work.~~ In other cases, for example where work is carried out by a person registered with a competent person scheme (see paragraphs 3.19 to 3.22), it must be given within 30 days.

4.36 Where an approved inspector is the ***BCB***, the notice of completion of ***commissioning*** shall ~~should~~ generally be given to the approved inspector not more than ~~within~~ 5 days after that work has been completed ~~of the completion of work~~. However, where the work is carried out by a person registered with a competent person scheme (see paragraph 3.19 to 3.22), the notice must be given within 30 days. Where the installation of ***fixed building services*** which require ***commissioning*** is carried out by a person registered with a competent person scheme the notice of ***commissioning*** will be given by that person.

4.37 Until the ***BCB*** receives the ***commissioning*** notice it cannot be reasonably satisfied that Part L has been complied with and consequently is unlikely to be able to give a completion/final certificate.

[21] Domestic Ventilation Compliance Guide, CLG, 2010.

Section 5: Guidance on thermal elements

5.1 New ***thermal elements*** must comply with Part L1(a)(i) of Schedule 1 to the Building Regulations. Work on existing ***thermal elements*** must comply with regulation ~~4A~~23 of the Building Regulations which states:

~~**4A**~~**23.**–(1) Where a person intends to renovate a thermal element, such work shall be carried out as is necessary to ensure that the whole thermal element complies with the requirements of paragraph L1(a)(i) of Schedule 1.

(2) Where a thermal element is replaced, the new thermal element shall comply with the requirements of paragraph L1(a)(i) of Schedule 1.

THE PROVISION OF THERMAL ELEMENTS

U-values

5.2 U-values shall be calculated using the methods and conventions set out in BR 443.

5.3 Reasonable provision for newly constructed ***thermal elements*** such as those constructed as part of an extension would be to meet the standards set out in Table 2.

5.4 Reasonable provision for those ***thermal elements*** constructed as replacements for existing elements would be to meet the standards set out in Table 2.

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Table 2 **Standards for new thermal elements**

Element[1]	**Standard (W/m².K)**
Wall	0.21 ~~0.28~~[2]
Pitched roof – insulation at ceiling level	0.15 ~~0.16~~
Pitched roof – insulation at rafter level	0.15 ~~0.18~~
Flat roof or roof with integral insulation	0.15 ~~0.18~~
Floors[3]	0.18 ~~0.22~~[4]
Swimming pool basin	0.25

Notes:
1. 'Roof' includes the roof parts of dormer windows, and 'wall' includes the wall parts (cheeks) of dormer windows.
2. Area-weighted average values.
3. A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.
4. A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels. The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

Continuity of insulation and airtightness

5.5 The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements, and at the edges of elements such as those around window and door openings. Reasonable provision should also be made to reduce unwanted air leakage through the new envelope parts. The work should comply with all the requirements of Schedule 1, but particular attention should be paid to Parts F and J.

5.6 A suitable approach to showing the requirement has been achieved would be to adopt Accredited Construction Details at www.planningportal.gov.uk.

It is impractical to expect thermal bridge and temperature factor calculations for work in existing buildings.

RENOVATION OF THERMAL ELEMENTS

5.7 For the purposes of this Approved Document, ***renovation*** of a ***thermal element*** through:

a. the provision of a new layer means either of the following activities:
   i. Cladding or rendering the external surface of the ***thermal element***; or
   ii. Dry-lining the internal surface of a ***thermal element***.
b. the replacement of an existing layer means either of the following activities:
   i. Stripping down the element to expose the basic structural components (brick/ blockwork, timber/metal frame, joists, rafters, etc.) and then rebuilding to achieve all the necessary performance requirements. As discussed in paragraph 3.9, particular considerations apply to renovating elements of traditional construction; or
   ii. Replacing the water proof membrane on a flat roof.

5.8 Where a ***thermal element*** is subject to a ***renovation*** through undertaking an activity listed in paragraph 5.7a or 5.7b, the performance of the whole element should be improved to achieve or better the relevant U-value set out in column (b) of Table 3, provided the area to be renovated is greater than 50 per cent of the surface of the individual element or 25 per cent of the total building envelope. When assessing this area proportion, the area of the element should be taken as that of the individual element, not all the elements of that type in the building. The area of the element should also be interpreted in the context of whether the element is being renovated from inside or outside, e.g. if removing all the plaster finish from the inside of a solid brick wall, the area of the element is the area of external wall in the room. If removing external render, it is the area of the elevation in which that wall sits.

This means that if all the roofing on the flat roof of an extension is being stripped down, the area of the element is the roof area of the extension, not the total roof area of the ***dwelling****. Similarly, if the rear wall of a single-storey extension was being re-rendered, it should be upgraded to the standards of Table 3 column (b), even if it was less than 50 per cent of the total area of the building elevation when viewed from the rear. If plaster is being removed from a bedroom wall, the relevant area is the area of the external wall in the room, not the area of the external elevation which contains that wall section. This is because the marginal cost of dry-lining with insulated plasterboard rather than plain plasterboard is small.*

5.9 If achievement of the relevant U-value set out in column (b) of Table 3 is not technically or functionally feasible or would not achieve a ***simple payback*** of 15 years or less, the element should be upgraded to the best standard that is technically and functionally feasible and which can be achieved within a ***simple payback*** of no greater than 15 years. Guidance on this approach is given in Appendix A. Generally, this lesser standard should not be worse than column (a) of Table 3 to minimise the risk of surface condensation and mould growth.

5.10 When renovating ***thermal elements***, the work should comply with all the requirements in Schedule 1, but particular attention should be paid to Parts F and J.

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RETAINED THERMAL ELEMENTS

5.11 Part L of Schedule 1 to the Building Regulations applies to retained ***thermal elements*** in the following circumstances:

a. where an existing ***thermal element*** is part of a building subject to a material change of use;
b. where an existing element is to become part of the thermal envelope where previously it was not, e.g. as part of a loft or garage conversion where the space is now to be heated.

5.12 Reasonable provision would be to upgrade those ***thermal elements*** ~~whose U-value is worse than the threshold value in column (a) of Table 3~~ to achieve the U-values given in column (b) of Table 3 provided this is technically, functionally and economically feasible. A reasonable test of economic feasibility is to achieve a ***simple payback*** of 15 years or less. Where the standard given in column (b) is not technically, functionally or economically feasible, then the ***thermal element*** should be upgraded to the best standard that is technically and functionally feasible and delivers a ***simple payback*** period of 15 years or less. ~~Generally, this lesser standard should not be worse than 0.7 W/m².K.~~ Generally, this lesser standard should not be worse than column (a) of Table 3 to minimise the risk of surface condensation and mould growth.

Examples of where lesser provision than column (b) might apply are where the thickness of the additional insulation might reduce usable floor area of any room by more than 5 per cent or create difficulties with adjoining floor levels, or where the weight of the additional insulation might not be supported by the existing structural frame.

5.12a The improved U-values given in Table 3 represent minimum acceptable standards in normal circumstances.

5.13 When upgrading retained ***thermal elements***, the work should comply with all the requirements in Schedule 1, but particular attention should be paid to Parts F and J.

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Table 3 **Upgrading retained thermal elements**

Element[1]	**(a) Threshold U-value W/m²·K**	**(b) Improved U-value W/m²·K**
Wall – cavity insulation[2]	0.70	0.55
Wall – external or internal insulation[3]	0.70	0.30
Floor[4,5]	0.70	0.25
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation between rafters[6]	0.35	0.18
Flat roof or roof with integral insulation[7]	0.35	0.18

1 'Roof' includes the roof parts of dormer windows and 'wall' includes the wall parts (cheeks) of dormer windows.
2 This applies only in the case of a wall suitable for the installation of cavity insulation. Where this is not the case, it should be treated as 'wall – external or internal insulation'.
3 A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.
4 The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged building.
5 A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.
6 A lesser provision may be appropriate where meeting such a standard would create limitations on head room. In such cases, the depth of the insulation plus any required air gap should be at least to the depth of the rafters, and the thermal performance of the chosen insulant should be such as to achieve the best practicable U-value.
7 A lesser provision may be appropriate if there are particular problems associated with the load-bearing capacity of the frame or the upstand height.

Section 6: Consequential improvements to energy performance

6.1 Regulation 28 ~~17D~~ of the Building Regulations may require additional work to be undertaken to make an existing building more energy efficient when certain types of building work are proposed. The additional work is termed ***consequential improvement***.

6.2 This requirement arises in existing ***dwellings***~~buildings with a total useful floor area of over 1,000 m²~~ where the proposed work consists of:

~~a.~~ an extension (including a non-exempt conservatory) or an increase in habitable area;

~~b. the initial provision of any ***fixed building service*** (other than a renewable energy generator);~~

~~c. an increase to the installed capacity of any ***fixed building service*** (other than a renewable energy generator);~~

6.2a The extension or increase in habitable area must comply with the ***energy efficiency requirements*** in the normal way. Increases in habitable area include such activities as loft and integral-garage conversions.

6.3 ***Consequential improvements*** should only be carried out to the extent that they are technically, functionally and economically feasible.

6.4 ~~Only a relatively small number of existing ***dwellings*** will exceed 1,000 m² in size. Where there is doubt the ***BCB*** can be consulted for advice.~~

6.4 Where the proposed work is the construction of an extension or increase in habitable area that increases the floor area by 10m^2 or more , reasonable provision for consequential improvements would be to implement measures (a) to (c) below in the dwelling.

a. if the dwelling has uninsulated or partially insulated cavity walls, fill with insulation where suitable; and
b. if there is no loft insulation or it is <200 mm thick, provide 250 mm insulation or increase it to 250 mm; and
c. upgrade any hot water cylinder insulation as follows:
    i. if the hot water cylinder is uninsulated, provide a 160 mm insulated jacket; or
    ii. if the hot water cylinder has insulated jacket < 100 mm thick, add a further insulated jacket to achieve a total thickness of 160 mm; or
    iii. if the hot water cylinder has factory-fitted solid foam insulation < 25 mm thick, add an 80 mm insulated jacket.

6.5 Where the proposed work is the construction of an extension or increase in habitable area that increases the floor area by less than 10m^2, reasonable provision for consequential improvements would be to implement the upgrade in loft insulation in Paragraph 6.4b only.

Note: When the trigger is a loft conversion, upgrading the loft insulation is still a valid consequential improvement as there is likely to be some areas of the loft floor that sit outside the newly created habitable space (e.g. adjacent to the eaves). Implementation costs are likely to be less than a full loft insulation upgrade, because the area to be treated is smaller, and appropriate tradesman will be working in the loft space as part of constructing the primary works.

~~Technical guidance on achieving compliance with regulation 17D28 is not given in this Approved Document but where the regulation applies it is available in Approved Document L2B.~~

Section 7: Providing information

7.1 On completion of the work, in accordance with Regulation 40 ~~paragraph L1(c)of Schedule 1~~, the owner of the ***dwelling*** should be provided with sufficient information about the building, the ***fixed building services*** and their operating and maintenance requirements so that the ***dwelling*** can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances. This requirement applies only to the work that has actually been carried out, e.g. if the work involves replacing windows, there is no obligation on the contractor to provide details on the operation of the heating system.

7.2 Where the work involves the provision of a new heating system, a way of complying would be to provide a suitable set of operating and maintenance instructions aimed at achieving economy in the use of fuel and power in terms that householders can understand in a durable format that can be kept and referred to over the service life of the system(s). The instructions should be directly related to the particular system(s) installed as part of the work that has been carried out.

7.3 Without prejudice to the need to comply with health and safety requirements, any instructions should explain to the occupier of the ***dwelling*** how to operate the system(s) efficiently. This should include:

a. the making of adjustments to timing, temperature and flow control settings;
b. what routine maintenance is needed to enable operating efficiency to be maintained at a reasonable level through the service live(s) of the system(s).

Appendix A: Work to thermal elements

1 Where work involves the ***renovation*** of a ***thermal element***, an opportunity exists for cost-effective insulation improvements to be undertaken at marginal additional cost. This appendix provides guidance on the cost-effectiveness of insulation measures when undertaking various types of work on a ***thermal element***.

2 Table A1 sets out the circumstances and the level of performance that would be considered reasonable provision in ordinary circumstances. When dealing with existing ***dwellings*** some flexibility in the application of standards is necessary to ensure that the context of each scheme can be taken into account while securing, as far as possible, the reasonable improvement. The final column in Table A1 provides guidance on a number of specific issues that may need to be considered in determining an appropriate course of action. As part of this flexible approach, it will be necessary to take into account technical risk and practicality in relation to the ***dwelling*** under consideration and the possible impacts on any adjoining building. In general the proposed works should take account of:

a. the requirements of any other relevant parts of Schedule 1 to the Building Regulations;
b. the general guidance on technical risk relating to insulation improvements contained in BR 262[22];
c. for buildings falling within the categories set out in paragraphs 3.7 to 3.8, the guidance produced by English Heritage.

Where it is not reasonable in the context of the works project to achieve the performance set out in Table A1 the level of performance achieved should be as close to this as practically possible.

3 Table A1 incorporates, in outline form, examples of construction that would achieve the proposed performance, but designers are free to use any appropriate construction that satisfies the energy performance standard, so long as they do not compromise performance with respect to any other part of the Building Regulations.

4 General guidance is available from such sources as the Energy Saving Trust and relevant British Standards.

[22] BR 262 Thermal insulation: Avoiding risks, BRE, 2002.

Table A1 **Cost-effective U-value targets when undertaking renovation works to thermal elements**

Proposed works	**Target U-value ($W/m^2.K$)**	**Typical construction**	**Comments (reasonableness, practicability and cost- effectiveness)**
Pitched roof constructions[16]			
Renewal of roof covering – No living accommodation in the roof void – existing insulation (if any) at ceiling level. No existing insulation, existing insulation less than 50 mm, in poor condition, and/ or likely to be significantly disturbed or removed as part of the planned work	0.16	Provide loft insulation – 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent	Assess condensation risk in roof space and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide access to and insulation of services in the roof void
Renewal of roof covering – Existing insulation in good condition and will not be significantly disturbed by proposed works. Existing insulation thickness 50 mm or more but less than 100 mm	0.16	Top up loft insulation to at least 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent. This may be boarded out	Assess condensation risk in roof space and make appropriate provision in line with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide insulation and access to services in the roof void Where the loft is already boarded out and the boarding is not to be removed as part of the work, the practicality of insulation works would need to be considered
Renewal of the ceiling to cold loft space. Existing insulation at ceiling level removed as part of the works	0.16	Provide loft insulation – 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent. This may be boarded out	Assess condensation risk in roof space and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide insulation and access to services in the roof void Where the loft is already boarded out and the boarding is not to be removed as part of the work, insulation can be installed from the underside but the target U-value may not be achievable
Renewal of roof covering – Living accommodation in roof space (room-in- the-roof type arrangement), with or without dormer windows	0.18	Cold structure – Insulation (thickness dependent on material) placed between and below rafters Warm structure – Insulation placed between and above rafters	Assess condensation risk (particularly interstitial condensation), and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation (Clause 8.4 of BS 5250:2002 and BS EN ISO 13788:2002 Practical considerations with respect to an increase in structural thickness (particularly in terraced dwellings) may necessitate a lower performance target
Dormer window constructions			
Renewal of cladding to side walls	0.30	Insulation (thickness dependent on material) placed between and/or fixed to outside of wall studs. Or fully external to existing structure depending on construction	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C
Renewal of roof covering	–	Follow guidance on improvement to pitched or flat roofs as appropriate	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C

Table A1 **Cost-effective U-value targets when undertaking renovation works to thermal elements**

Proposed works	Target U-value (W/m².K)	Typical construction	Comments (reasonableness, practicability and cost- effectiveness)
Flat roof constructions			
Renewal of roof covering – Existing insulation, if any, less than 100 mm, mineral fibre (or equivalent resistance) or in poor condition and likely to be significantly disturbed or removed as part of the planned work	0.18	Insulation placed between and over joists as required to achieve the target U-value – Warm structure	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C. Also see BS 6229:2003 for design guidance
Renewal of the ceiling to flat roof area. Existing insulation removed as part of the works	0.18	Insulation placed between and to underside of joists to achieve target U-value	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C. Also see BS 6229:2003 for design guidance. Where ceiling height would be adversely affected, a lower performance target may be appropriate
Solid wall constructions			
Renewal of internal finish to external wall or applying a finish for the first time	0.30	Dry-lining to inner face of wall – insulation between studs fixed to wall to achieve target U-value – thickness dependent on insulation and stud material used Insulated wall board fixed to internal wall surface to achieve the required U-value – thickness dependent on material used	Assess the impact on internal floor area. In general it would be reasonable to accept a reduction of no more than 5% in the area of a room. However, the use of the room and the space requirements for movement and arrangements of fixtures, fittings and furniture should be assessed In situations where acoustic attenuation issues are particularly important (e.g. where insulation is returned at party walls) a less demanding U-value may be more appropriate. In such cases, the U-value target may have to be increased to 0.35 or above depending on the circumstances Assess condensation and other moisture risks and make appropriate provision in accordance with the requirements of Part C. This will usually require the provision of a vapour control and damp protection to components. Guidance on the risks involved is provided in BR 262 and, on the technical options, in Energy Saving Trust publications
Renewal of finish or cladding to external wall area or elevation (render or other cladding) or applying a finish or cladding for the first time	0.30	External insulation system with rendered finish or cladding to give required U-value	Assess technical risk and impact of increased wall thickness on adjoining buildings
Ground floor constructions			
Renovation of a solid or suspended floor involving the replacement of screed or a timber floor deck	See comment	Solid floor – replace screed with an insulated floor deck to maintain existing floor level Suspended timber floor – fit insulation between floor joists prior to replacement of floor deck	The cost-effectiveness of floor insulation is complicated by the impact of the size and shape of the floor (perimeter/area ratio). In many cases existing un-insulated floor U-values are already relatively low when compared with wall and roof U-values. Where the existing floor U-value is greater than 0.70 W/m².K, then the addition of insulation is likely to be cost-effective. Analysis shows that the cost–benefit curve for the thickness of added insulation is very flat, and so a target U-value of 0.25 W/m².K is appropriate subject to other technical constraints (adjoining floor levels, etc.)

Appendix B: Documents referred to

BRE
www.bre.co.uk

BR 262 *Thermal insulation: avoiding risks*, 20021. ISBN 1860815154 978 186081 515 7

BRE Report BR 443 *Conventions for U-value calculations*, 2006.
(Available at www.bre.co.uk/uvalues)

Department for Business, Innovation and Skills
www.bis.gov.uk

Technical Standards and Regulations Directive 98/34/EC (As amended by Directive 98/48/EC).
(Available at www.bis.gov.uk/policies/innovation/infrastructure/Standardisation/techstandards-directive)

Department of Energy and Climate Change (DECC)
www.decc.gov.uk

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2009. (Available at www.bre.co.uk/sap2009)

Current Energy Prices
(www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx)

Department for Communities and Local Government (DCLG)
www.communities.gov.uk

Accredited Construction Details for Part L
(Available to download from www.planningportal.gov.uk/england/professionals/en/1115314255826.html)

Energy Saving Trust (EST)
www.est.org.uk

Energy Efficient Glazing – guidance (Available at www.energysavingtrust.org.uk/Home-improvements-and-products/Home-insulation-glazing/Glazing)

English Heritage
www.english-heritage.org.uk

Building Regulations and Historic Buildings, 2002 (revised 2004) and other guidance

Health and Safety Executive (HSE)
www.hse.gov.uk

L24 Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations1992, Approved Code of Practice and Guidance, The Health and Safety Commission 1992. ISBN 978 0 71760 413 5

NBS (on behalf of Department for Communities and Local Government)

www.thebuildingregs.com

Domestic Building Services Compliance Guide, CLG 2013.

Domestic Ventilation Compliance Guide, CLG 2013.

(Both available to download from www. planningportal.gov.uk)

Legislation

Ancient Monuments and Archaeological Areas Act 1979

Planning (Listed Buildings and Conservation Areas) Act 1990

Construction Products Regulation (305/2011/EU-CPR)

UK Construction Products Regulations 2013 (TBC)

~~SI 1991/1620 Construction Products Regulations 1991~~

~~SI 1994/3051 Construction Products (Amendment) Regulations 1994~~

SI 1994/3260 Electrical Equipment (Safety) Regulations 1994

SI 2010/2214 The Building Regulations 2010

~~SI 2000/2531 The Building (Approved Inspectors etc.) Regulations 2000~~

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

~~SI 2000/2532 The Building (Approved Inspectors etc.) Regulations 2000~~

SI 2006/3418 Electromagnetic Compatibility Regulations 2006

Decision No 1/95 of the EC-Turkey Association Council of 22 December 1995

Appendix C: Standards referred to

BS EN ISO 13370:2007 Thermal performance of buildings. Heat transfer via the ground. Calculation methods.

BS EN 14351-1:2006 Windows and doors. Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics.

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

~~**BS EN 410:1998** Glass in building. Determination of luminous and solar characteristics of glazing.~~

BS 6375-1:2009 Performance of windows and doors. Classification for weathertightness and guidance on selection and specification (incorporating corrigendum No. 1).

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

BS EN ISO 13788:2002 Hygrothermal performance of building components and building elements.

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

Chapter 3: Proposed changes to Welsh Approved Document L1B: Existing dwellings (full draft) – *new format*

This chapter is a draft version of Welsh Approved Document L1B (Conservation of fuel and power in existing dwellings) and has been produced for consultation purposes. Final Approved Document statutory guidance will be produced to accompany the final regulatory changes. Where text from the Building Regulations 2010 is reproduced in this document, the only change which has been made is to update the numbering of the regulations in accord with Statutory Instrument 2010:2214. Further changes to the Regulations themselves are likely to be required to reflect decisions on final policy following consultation.

Text from the 2010 version is shown in black.

Deletions from the 2010 version are shown in ~~black strikethrough.~~

Text which is new to this version is shown in blue for new statutory guidance and *italic blue for new supplementary (non-statutory) advice*.

Explanatory text (which is provided to assist the consultation process and will not feature in the final Approved Document) is shown in *purple italic*.

1 Introduction

1.1 What is an Approved Document?

1.1.1 This Approved Document takes effect on June 2014 and has been approved and issued by Welsh Ministers to provide practical guidance on ways of complying with the energy efficiency requirements of the Building Regulations 2010 (2010/2214) for Wales, 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, will be accepted as 'reasonable provision' for compliance with the relevant requirements of the Building Regulations 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 the 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 well 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 in some other way. However, you must always check with your building control body, either the local authority or an approved inspector, that your proposals comply with the Building Regulations.**

1.1.4 As well as containing guidance, the approved documents also contain certain extracts from the Building Regulations that must be complied with as stated. For example, the requirement that fixed building services must be commissioned is a regulatory requirement.

1.1.5 This Approved Document is concerned with the energy efficiency requirements. However, building work to existing dwellings is likely to be subject to the requirements of other sections of the Building Regulations as well, for example relating to 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 should be consulted when building work is considered. A full list of these is provided in Appendix H: Approved Documents.

1.2 Types of Work Covered by This Approved Document

1.2.1 This Approved Document gives guidance on how to comply with the energy efficiency requirements for those carrying out building work to existing dwellings.

1.2.2 The energy efficiency requirements only 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 garages, outbuildings and some conservatories or porches, are exempt. Guidance on which conservatories and porches are exempt is given in section 9.

1.2.3 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 in such cases guidance is given in Approved Document L2B.

1.3 How to Use This Approved Document

1.3.1 This Approved Document is subdivided into thirteen sections that are followed by supporting appendices. It gives guidance how to comply with the energy efficiency requirements for common building works to an existing dwelling.

This introductory section sets out the general context for the guidance in the Approved Document.

Section 2 gives guidance on **extensions**.

Section 3 gives guidance on **conversions**.

Section 4 gives guidance on the requirement for additional energy efficiency improvements called **consequential improvements**.

Section 5 gives guidance on **renovations**.

Section 6 gives guidance on **changes of use**.

Section 7 gives guidance on the provision, extension, alteration or replacement of **building services**.

Section 8 gives guidance on **work to windows and doors**.

Section 9 gives guidance on **conservatories and porches**.

Section 10 gives guidance on **indoor swimming pools**.

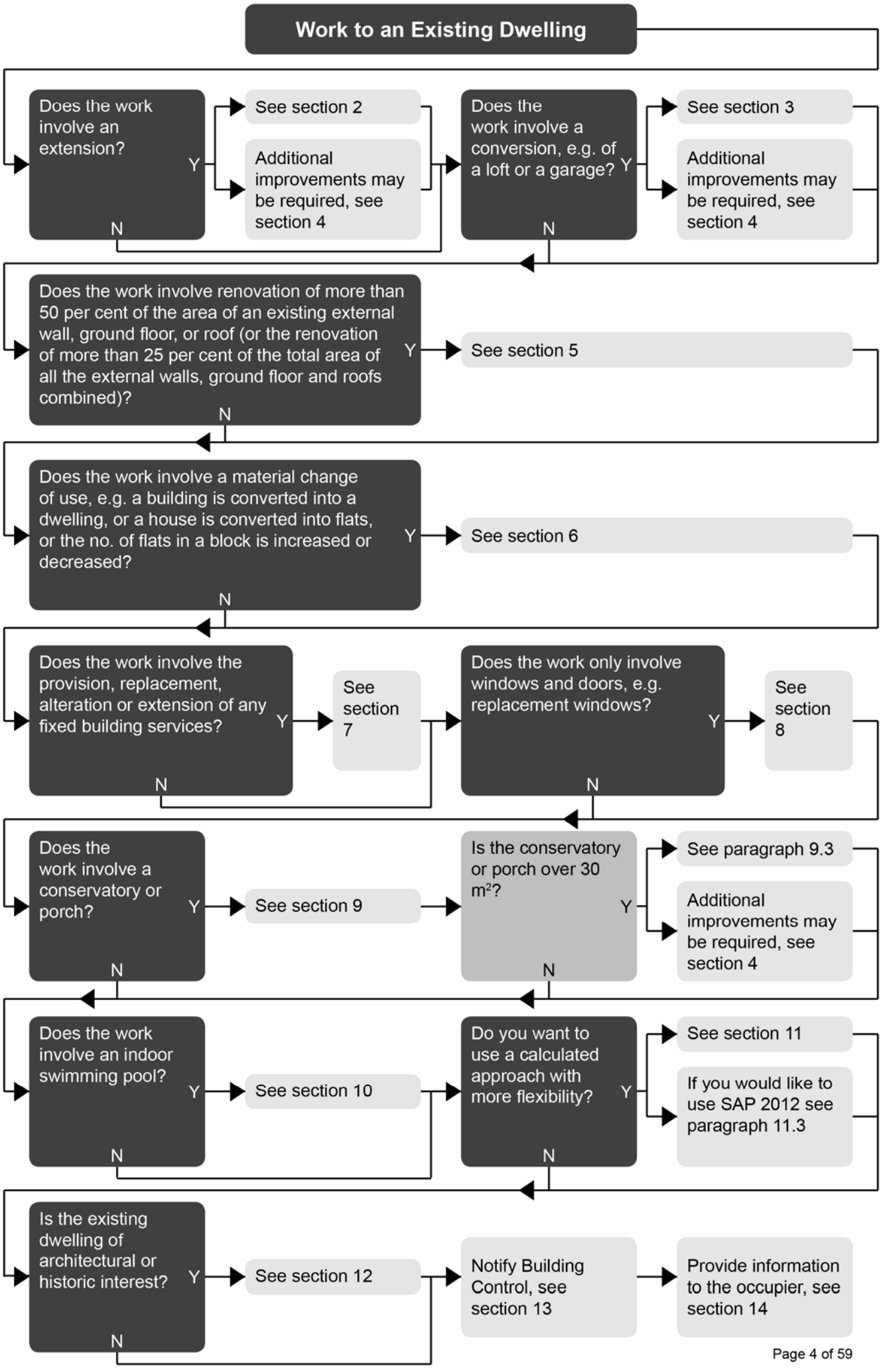
Section 11 gives guidance on **optional alternative approaches that offer more design flexibility**

Section 12 gives guidance on **dwellings of architectural and historic interest**.

Section 13 gives guidance on **notifying building control**.

Section 14 gives guidance on **providing information to the occupier**.

1.3.2 In most situations you will find the relevant guidance in several sections. The flow chart overleaf can be used to work out which sections of this Approved Document to consult. For example, if you are intending to install replacement windows, renovate a roof and add a new extension following the standards based approach you can follow the guidance in sections 2, 4, 5, 7, 8, 13 and 14.


Work to an Existing Dwelling
Does the work involve an extension?
Y
N
See section 2
Additional improvements may be required, see section 4
Does the work involve a conversion, e.g. of a loft or a garage?
Y
N
See section 3
Additional improvements may be required, see section 4
Does the work involve renovation of more than 50 per cent of the area of an existing external wall, ground floor, or roof (or the renovation of more than 25 per cent of the total area of all the external walls, ground floor and roofs combined)?
Y
N
See section 5
Does the work involve a material change of use, e.g. a building is converted into a dwelling, or a house is converted into flats, or the no. of flats in a block is increased or decreased?
Y
N
See section 6
Does the work involve the provision, replacement, alteration or extension of any fixed building services?
Y
N
See section 7
Does the work only involve windows and doors, e.g. replacement windows?
Y
N
See section 8
Does the work involve a conservatory or porch?
Y
N
See section 9
Is the conservatory or porch over 30 m²?
Y
N
See paragraph 9.3
Additional improvements may be required, see section 4
Does the work involve an indoor swimming pool?
Y
N
See section 10
Do you want to use a calculated approach with more flexibility?
Y
N
See section 11
If you would like to use SAP 2012 see paragraph 11.3
Is the existing dwelling of architectural or historic interest?
Y
N
See section 12
Notify Building Control, see section 13
Provide information to the occupier, see section 14

1.3.3 To make the guidance in this Approved Document as clear as possible references to the Building Regulations by clause or paragraph letter are avoided. The relevant Building Regulations are reproduced in Appendix A: The Building Regulations.
Full reference to the Building Regulations is available at: [reference to be included in the final Approved Document].

1.3.4 In this Approved Document, certain terms have specific meanings and are defined in the text.

1.3.5 Details of technical publications referred to in this Approved Document are given in Appendix I: List of references. A reference to a publication is likely to be made for one of two main reasons. The publication may contain additional or more comprehensive technical detail, which it would be impractical to include in full in this Approved Document, but which is needed to fully explain ways of meeting the requirements; or it is a source of more general information. The reference will be to a specific edition of the publication. This Approved Document may be amended from time to time to include new references or to refer to revised editions.

1.3.6 When considering the incorporation of energy efficiency measures in dwellings, attention should also be paid to interrelated issues such as ventilation, water ingress and possible risk of condensation. It is important to consider the dwelling as a whole and understand the interaction between all the relevant requirements of the Building Regulations. For example, where work carries a risk of condensation, such risk must be effectively mitigated by careful specification of the construction and if necessary the ventilation system for the dwelling; one approach would be to follow the guidance set out in BRE Report 262 *Thermal Insulation: Avoiding the risks*. Designers and builders should refer to the relevant approved documents and to other generally available good practice guidance to help minimise these risks.

1.4 Where You Can Get Further Help

1.4.1 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.

1.5 Responsibility for Compliance

1.5.1 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 building owner may also have a responsibility for ensuring compliance with the Building Regulations and could be served with an enforcement notice in cases of non-compliance.

2 Extensions

2.1 Introduction

2.1.1 In this Approved Document, ***extension*** describes when new building fabric is added to an existing dwelling to create an extra room or rooms.

2.1.2 Guidance is given in section 3 for when part of a dwelling, which previously was not subject to the energy efficiency requirements, is converted into a heated or cooled space to create an extra room or rooms, for example loft or garage conversions.

2.1.3 Adding an extension to increase the habitable volume of an existing dwelling triggers a requirement for additional energy efficiency improvements – consequential improvements – that are set out in section 4.

2.1.4 Two alternative optional approaches that offer more design flexibility by allowing some requirements to be relaxed if compensated for elsewhere are set out in section 11.

2.2 Building Fabric

2.2.1 New thermal elements constructed as part of an extension should **achieve or better** the U-values set out in Table 1.

2.2.2 ***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.

Table 1: U-values for new thermal elements in W/m^2.K

	Maximum U-values[23] for new fabric
Walls[24]	0.21
Floors[25]	0.18
Roofs[26]	0.15

2.2.3 If an extension incorporates a part of the existing structure, which previously was not subject to the energy efficiency requirements, for example if the extension is built against a garage, this part should be treated as a retained thermal element and follow the guidance set out in section 3, paragraphs 3.2.1-3.2.5.

2.3 Windows and Doors

2.3.1 New windows and doors installed as part of an extension should be draughtproofed units that **achieve or better** the U-values set out in Table 2. Insulated cavity closers should be installed around the windows and doors where appropriate.

[23] See Appendix B: How to calculate U-values.

[24] 'Walls' include the walls or cheeks of dormer windows.

[25] The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

[26] 'Roofs' include the roofs of dormer windows.

2.3.2 In this Approved Document, ***windows and doors*** refers to windows and external doors that separate 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. Windows and doors are described as ***controlled fittings*** in the Building Regulations, i.e. windows and doors on which various parts of the Building Regulations impose a requirement.

Table 2: U-values for new windows and doors in W/m^2.K

	Maximum U-values[27] for new windows and doors
Windows, roof windows and skylights	1.6 or WER Band C[28]
Doors	1.6 or DSER Band E[29]

2.3.3 The total area of windows and doors in the extension should not exceed the sum of:

a. 25 per cent of the internal floor area of the extension; plus

b. the total area of any windows and doors which, as a result of the new extension, no longer exist or are no longer exposed.

2.3.4 It is advisable to ensure that the total area of windows and doors in the extension is not less than 20 per cent of the internal floor area of the extension, as this would mean that the extension and the part of the existing building that it abuts are likely to experience low levels of daylight, resulting in increased use of electric lighting and consumption of fuel and power. For further guidance see *BS 8206-2:2008 Lighting for buildings. Code of practice for daylighting*.

2.3.5 In the case of dwellings of architectural and historic interest where special consideration applies, a greater total area of windows and doors may be acceptable. For example, there may be a need for the extension to be consistent with the character of the existing building. In such cases, where practicable, the performance of the windows and doors should be improved or other compensating improvements undertaken following either of the alternative approaches set out in section 11.

2.4 Building Services

2.4.1 Where an extension to an existing dwelling includes the provision, extension, alteration or replacement of any fixed building services systems, those systems should comply with the appropriate standards in section 7.

2.5 Design and Installation Standards

2.5.1 When extending an existing dwelling, new, upgraded and renovated building fabric should be carefully designed, detailed and constructed to:

a. avoid gaps in the insulation; and

b. minimise air leakage; and

c. limit reasonably avoidable thermal bridges.

[27] See Appendix B: How to calculate U-values.

[28] See Appendix C: Energy Ratings for Doors and Windows.

[29] See Appendix C: Energy Ratings for Doors and Windows.

Particular attention should be paid around window and door openings, to junctions between building elements, such as between the walls and roof, and at changes of geometry, for example a corner in a wall or a hip in a roof. For new building fabric in an extension, this requirement can be achieved by adopting the Accredited Construction Details for Part L available at:
http://www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/bcassociateddocuments9/acd.

2.5.2 ***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 skins of a wall, floor or roof by bridging the insulation.

3 Conversions

3.1 Introduction

3.1.1 In this Approved Document, ***conversion*** describes when part of a dwelling, which previously was not subject to the energy efficiency requirements, is converted into a heated or cooled space, for example a loft or garage conversion where the space is now to be heated. This is described as a ***change in energy status*** in the Building Regulations.

3.1.2 In the case of a conversion, a retained thermal element is an existing element that becomes a thermal element where previously it was not, for example the gable wall in a loft conversion.

3.1.3 ***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.

3.1.4 Converting part of an existing dwelling to increase the habitable volume triggers a requirement for additional energy efficiency improvements – consequential improvements – that are set out in section 4.

3.1.5 Two alternative optional approaches that offer more design flexibility by allowing some requirements to be relaxed if compensated for elsewhere are set out in section 11.

3.2 Building Fabric

3.2.1 Retained thermal elements should be upgraded to **achieve or better** U-values set out in column (a) of Table 3.

Table 3: U-values for retained thermal elements in W/m^2.K

	(a) Maximum U-values for retained fabric	(b) Limiting U-values[30] for retained fabric
Walls[31] – cavity insulation[32]	0.55	0.70
Walls – external or internal insulation	0.30	0.70
Floors[33]	0.25	0.70
Pitched roofs[34] – insulation at ceiling level	0.16	0.35
Pitched roofs – insulation between the rafters	0.18	0.35
Flat roofs or roofs with integral insulation	0.18	0.35

3.2.3 Where the U-value set out in column (a) of Table 3 is not economically, functionally or technically feasible, the thermal element should be upgraded to as close to the maximum U-value as is practicably possible. Generally, this lesser U-value should not be worse than the limiting U-values set out in column (b) of Table 3 to minimise the risk of surface condensation and mould growth.

3.2.4 The test of the economic feasibility of an energy efficiency measure is to calculate if the measure achieves a payback of the initial cost within 15 years through energy savings. This is calculated by dividing the cost of implementing the measure (not the whole cost of the project) by the annual energy saving achieved by that measure, estimated using the latest version of SAP, taking account of VAT in both the cost and the saving.

3.2.5 An energy efficiency measure is not deemed to be functionally or technically feasible if the thickness of insulation needed to achieve the U-values set out in column (a) of Table 3 would:

a. reduce the internal floor area of a room by more than 5 per cent; or
b. cause significant problems with adjoining floor levels; or
c. create insufficient headroom; or
d. could not be supported by the existing structure.

In such cases, the choice of insulant should be based on the best thermal performance that is practicable to achieve a U-value as close to the improved U-values as possible. In cases of insufficient headroom, the depth of the insulation plus any required air gap should be at least equal to the depth of the rafters.

3.2.6 If any new or replacement thermal elements are constructed as part of a conversion the guidance for new thermal elements set out in section 2, paragraphs 2.2.1-2.2.2, should be followed.

30 See Appendix B: How to calculate U-values.

31 'Walls' include the walls or cheeks of dormer windows.

32 If a wall has a cavity but it is not suitable for filling with cavity insulation, it should be treated as 'wall – external or internal insulation'.

33 The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

34 'Roofs' include the roofs of dormer windows.

3.3 Windows and Doors

3.3.1 New and replacement windows and doors should be draughtproofed units that achieve or better the U-values set out in column (a) of Table 4. Insulated cavity closers should be installed around the windows and doors where appropriate.

3.3.2 If an existing window or door has a U-value worse than the threshold U-values set out in column (c) of Table 4, then it should be replaced with draughtproofed units that achieve or better the U-values set out in column (a) of Table 4. Insulated cavity closers should be installed around the windows and doors where appropriate.

3.3.3 In this Approved Document, ***windows and doors*** refers to windows and external doors that separate 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. Windows and doors refer to the whole units, i.e. including the frames. Consequently, replacing just the glazing or door leaf while retaining an existing frame is not notifiable and does not have to meet the energy efficiency requirements. However, in such cases it would be sensible to upgrade the window or door to as close to the U-values set out in column (a) of Table 4 as is practicably possible. Windows and doors are described as ***controlled fittings*** in the Building Regulations, i.e. windows and doors on which various parts of the Building Regulations impose a requirement.

Table 4: U-values for windows and doors in W/m^2.K

	(a) Maximum U-values[35] for new and replacement windows and doors	(b) Alternative maximum U-values for replacement windows	(c) Threshold U-values for retained windows and doors
Windows, roof windows and skylights	1.6 or WER Band C[36]	1.2 centre pane or low-e secondary glazing	3.3
Doors	1.6 or DSER Band E[37]	n/a	3.3

3.3.4 In the case of dwellings of architectural and historic interest where special consideration applies or in other cases where there is a need to maintain the character of a façade, if replacement windows are unable to achieve the U-values set out in column (a) of Table 4, then they should achieve or better the lesser U-values set out in column (b) of Table 4.

3.3.5 Where low-e secondary glazing is installed, the draughtproofing should be on the secondary glazing to minimise the risk of condensation forming between the primary and secondary glazing.

3.3.6 Where an existing window or door is enlarged or a new one created the total area of windows and doors should not exceed 25 per cent of the total floor area of the dwelling.

[35] See Appendix B: How to calculate U-values.

[36] See Appendix C: Energy Ratings for Doors and Windows.

[37] See Appendix C: Energy Ratings for Doors and Windows.

3.4 Building Services

3.4.1 Where a conversion includes the provision, extension, alteration or replacement of any fixed building services systems, those systems should comply with the appropriate standards in section 7.

3.5 Design and Installation Standards

3.5.1 When converting an existing dwelling, new, and upgraded building fabric should be carefully designed, detailed and constructed to:

a. avoid gaps in the insulation; and

b. minimise air leakage; and

c. limit reasonably avoidable thermal bridges.

Particular attention should be paid around window and door openings, to junctions between building elements, such as between the walls and roof, and at changes of geometry, for example a corner in a wall or a hip in a roof.

3.5.2 ***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 skins of a wall, floor or roof by bridging the insulation.

4 Consequential Improvements

4.1 ***Consequential improvements*** describe **additional** energy efficiency improvements that should be undertaken where an existing dwelling is extended or part of the dwelling is converted, increasing the habitable volume. The dwelling could be extended by means of a conventional extension or a non-exempt conservatory or porch.

4.2 Where consequential improvements are triggered by extensions (including non-exempt conservatories or porches) and conversions, the work should still comply with the relevant guidance: see section 2 for guidance on extensions; see section 3 for guidance on conversions; see section 9 for guidance on conservatories and porches.

4.3 Where an existing dwelling is extended or converted increasing the habitable area by less than 10 m^2, if there is no loft insulation or it is less than 200 mm thick, provide 250 mm of loft insulation or increase it to 250 mm.

4.4 Where an existing dwelling is extended or converted increasing the habitable area by more than 10 m^2 the following energy efficiency improvements should be undertaken:

a. if the dwelling has uninsulated or partially insulated cavity walls, fill with insulation where suitable (cavity wall insulation may not be suitable for sites exposed to driving rain); and

b. if there is no loft insulation or it is less than 200 mm thick, provide 250 mm insulation or increase it to 250 mm; and

c. upgrade any hot water cylinder insulation as follows:

i. if the hot water cylinder is uninsulated, provide a 160 mm insulated jacket; or

ii. if the hot water cylinder has insulated jacket less than 100 mm thick, add a further insulated jacket to achieve a total thickness of 160 mm; or

iii. if the hot water cylinder has factory-fitted solid foam insulation less than 25 mm thick, add an 80 mm insulated jacket.

4.5 Where the consequential improvement to increase the thickness of the loft insulation to 250 mm is triggered by a loft conversion, the consequential improvement is still necessary as there are likely to be some areas of the loft floor remaining around the new heated or cooled volume, for example near the eaves.

4.6 Care should be taken when installing insulation to avoid any gaps. Particular attention should be paid around window and door openings, to junctions between building elements, such as between the walls and roof, and at changes of geometry, for example a corner in a wall or a hip in a roof.

5 Renovations

5.1 Introduction

5.1.1 In this Approved Document, renovation of a thermal element is defined as either the provision of a new layer or the replacement an existing layer (excluding decorative finishes) provided that the area to be renovated is greater than either 50 per cent of the area of the element or 25 per cent of the total area of all the thermal elements.

5.1.2 ***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.

5.1.3 The ***provision of a new layer*** means cladding or rendering the external surface or dry lining the internal surface. The ***replacement of an existing layer*** means stripping down the element to its basic structural components (masonry, timber frame, steel frame, etc.) and then rebuilding or replacing the waterproof membrane of a flat roof.

5.1.4 When assessing the proportion of the area to be renovated, the ***area of the element*** should be taken as that of the individual element, not all the elements of that type in the building. For example, if stripping down the roof of an extension the area of the element is the area of the extension roof, not the total roof area of the dwelling. The area of the element also differs whether the element is being renovated from the inside or the outside. For example, if removing all the plaster finish from the inside of a wall, the area of the element is the area of the wall in the room, however, if removing the external render, it is the area of the elevation in which that wall sits.

5.1.5 Two alternative optional approaches that offer more design flexibility by allowing some requirements to be relaxed if compensated for elsewhere are set out in section 11.

5.2 Building Fabric

5.2.1 Where a thermal element is renovated the performance of the whole element should be improved to **achieve or better** the U-values set out in Table 5.

Table 5: U-values for renovated thermal elements in W/m^2.K

	(a) Maximum U-values for renovated fabric	(b) Limiting U-values[38] for renovated fabric
Walls[39] – cavity insulation[40]	0.55	0.70
Walls – external or internal insulation	0.30	0.70
Floors[41]	0.25	0.70
Pitched roofs[42] – insulation at ceiling level	0.16	0.35
Pitched roofs – insulation between the rafters	0.18	0.35
Flat roofs or roofs with integral insulation	0.18	0.35

5.2.2 Where the U-value set out in column (a) of Table 5 is not economically, functionally or technically feasible, then the thermal element should be upgraded to as close to the maximum U-value as is practicably possible. Generally, this lesser U-value should not be worse than the limiting U-values set out in column (b) of Table 5 to minimise the risk of surface condensation and mould growth.

5.2.3 The test of the economic feasibility of an energy efficiency measure is to calculate if the measure achieves a payback of the initial cost within 15 years through energy savings. This is calculated by dividing the cost of implementing the measure (not the whole cost of the project) by the annual energy saving achieved by that measure, estimated using the latest version of SAP, taking account of VAT in both the cost and the saving.

5.2.4 An energy efficiency measure is not deemed to be functionally or technically feasible if the thickness of insulation needed to achieve the U-values in column (a) of Table 5 would:

a. reduce the internal floor area of a room by more than 5 per cent; or
b. cause significant problems with adjoining floor levels; or
c. create insufficient headroom; or
d. could not be supported by the existing structure.

In such cases, the choice of insulant should be based on the best thermal performance that is practicable to achieve a U-value as close to the improved U-values as possible. In cases of insufficient headroom, the depth of the insulation plus any required air gap should be at least equal to the depth of the rafters.

[38] See Appendix B: How to calculate U-values.

[39] 'Walls' include the walls or cheeks of dormer windows.

[40] If a wall has a cavity but it is not suitable for filling with cavity insulation, it should be treated as 'wall – external or internal insulation'.

[41] The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

[42] 'Roofs' include the roofs of dormer windows.

5.3 Design and Installation Standards

5.3.1 When renovating part of an existing dwelling, renovated building fabric should be carefully designed, detailed and constructed to:

a. avoid gaps in the insulation; and
b. minimise air leakage; and
c. limit reasonably avoidable thermal bridges.

Particular attention should be paid around window and door openings, to junctions between building elements, such as between the walls and roof, and at changes of geometry, for example a corner in a wall or a hip in a roof.

5.3.2 ***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 skins of a wall, floor or roof by bridging the insulation.

6 Material Change of Use

6.1 Introduction

6.1.1 In this Approved Document, a ***material change of use*** describes when:

a. the building is now used as a dwelling, where previously it was not; or

b. the building now contains a flat, where previously it did not; or

c. the building contains a greater or lesser number of flats than it did previously.

A material change of use where a previously unheated building is converted into a dwelling is described as a 'change in energy status' in the Building Regulations.

6.1.2 ***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.

6.1.3 Two alternative optional approaches that offer more design flexibility by allowing some requirements to be relaxed if compensated for elsewhere are set out in section 11.

6.2 Building Fabric

6.2.1 Existing thermal elements in a building subject to a material change of use should be upgraded to **achieve or better** the U-values set out in column (a) of Table 6.

Table 6: U-values for retained thermal elements in W/m^2.K

	(a) Maximum U-values for retained fabric	(b) Limiting U-values for retained fabric
Walls[43] – cavity insulation[44]	0.55	0.70
Walls – external or internal insulation	0.30	0.70
Floors[45]	0.25	0.70
Pitched roofs[46] – insulation at ceiling level	0.16	0.35
Pitched roofs – insulation between the rafters	0.18	0.35
Flat roofs or roofs with integral insulation	0.18	0.35

[43] 'Walls' include the walls or cheeks of dormer windows.

[44] If a wall has a cavity but it is not suitable for filling with cavity insulation, it should be treated as 'wall – external or internal insulation'.

[45] The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

[46] 'Roofs' include the roofs of dormer windows.

6.2.2 Where the U-value set out in column (a) of Table 6 is not economically, functionally or technically feasible, then the thermal element should be upgraded to as close to the maximum U-value as is practicably possible. Generally, this lesser U-value should not be worse than the limiting U-values set out in column (b) of Table 6 to minimise the risk of surface condensation and mould growth.

6.2.3 The test of the economic feasibility of an energy efficiency measure is to calculate if the measure achieves a payback of the initial cost within 15 years through energy savings. This is calculated by dividing the cost of implementing the measure (not the whole cost of the project) by the annual energy saving achieved by that measure, estimated using the latest version of SAP, taking account of VAT in both the cost and the saving.

6.2.4 An energy efficiency measure is not deemed to be functionally or technically feasible if the thickness of insulation needed to achieve the U-values in column (a) of Table 6 would:

a. reduce the internal floor area of a room by more than 5 per cent; or
b. cause significant problems with adjoining floor levels; or
c. create insufficient headroom; or
d. could not be supported by the existing structure.

In such cases, the choice of insulant should be based on the best thermal performance that is practicable to achieve a U-value as close to the improved U-values as possible. In cases of insufficient headroom, the depth of the insulation plus any required air gap should be at least equal to the depth of the rafters.

6.2.5 If any new or replacement thermal elements are constructed as part of a material change of use the guidance for new thermal elements set out in section 2, paragraphs 2.2.1-2.2.2, should be followed.

6.3 Windows and Doors

6.3.1 If an existing window or door has a U-value worse than the threshold U-values set out in column (c) of Table 7, then it should be replaced with draught-proofed units that achieve or better the U-values set out in column (a) of Table 7. Insulated cavity closers should be installed around the windows and doors, where appropriate.

6.3.2 New and replacement windows and doors should be draught-proofed units that achieve or better the U-values set out in column (a) of Table 7. Insulated cavity closers should be installed around the windows and doors, where appropriate.

6.3.3 In this Approved Document, ***windows and doors*** refers to windows and external doors that separate 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. Windows and doors refer to the whole units, i.e. including the frames. Consequently, replacing just the glazing or door leaf while retaining an existing frame is not notifiable and does not have to meet the energy efficiency requirements. However, in such cases it would be sensible to upgrade the window or door to as close to the U-values set out in column (a) of Table 7 as is practicably possible. Windows and doors are described as ***controlled fittings*** in the Building Regulations, i.e. windows and doors on which various parts of the Building Regulations

impose a requirement.

Table 7: U-values for windows and doors in W/m^2.K

	(a) Maximum U-values[47] for new and replacement windows and doors	(b) Alternative maximum U-values for replacement windows	(c) Threshold U-values for retained windows and doors
Windows, roof windows and skylights	1.6 or WER Band C[48]	1.2 centre pane or low-e secondary glazing	3.3
Doors	1.6 or DSER Band E[49]	n/a	3.3

6.3.4 Where an existing window or door is enlarged or a new one created the total area of windows and doors should not exceed 25 per cent of the total floor area of the dwelling.

6.3.5 In the case of dwellings of architectural and historic interest where special consideration applies or in other cases where there is a need to maintain the character of a façade, if replacement windows are unable to achieve the U-values set out in column (a) of Table 7, then they should **achieve or better** the lesser U-values set out in column (b) of Table 7.

6.3.6 Where low-e secondary glazing is installed, the draughtproofing should be on the secondary glazing to minimise the risk of condensation forming between the primary and secondary glazing.

6.4 Building Services

6.4.1 Where a material change of use of a building to become a dwelling includes the provision, extension, alteration or replacement of any fixed building services systems, those systems should comply with the appropriate standards in section 7.

6.5 Design and Installation Standards

6.5.1 When undertaking a change of use, the building fabric should be carefully designed, detailed and constructed to:

a. avoid gaps in the insulation; and

b. minimise air leakage; and

c. limit reasonably avoidable thermal bridges.

Particular attention should be paid around window and door openings, to junctions between building elements, such as between the walls and roof, and at changes of geometry, for example a corner in a wall or a hip in a roof.

[47] See Appendix B: How to calculate U-values.

[48] See Appendix C: Energy Ratings for Doors and Windows.

[49] See Appendix C: Energy Ratings for Doors and Windows.

6.5.2 ***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 skins of a wall, floor or roof by bridging the insulation.

7 Building Services

7.1 Where work to an existing dwelling involves the provision, replacement, alteration or extension of any fixed building service, the guidance below should be followed.

7.2 ***Fixed building service*** means any part of, or controls associated with: fixed systems for heating, hot water, air conditioning or mechanical ventilation; or fixed internal or external lighting systems (not including emergency escape lighting or specialist process lighting).

7.3 ***Fixed external lighting*** means any permanently installed external lighting system that is under the direct control of the occupants of a dwelling by having an electricity supply from that dwelling; the lights may or may not be fixed to the dwelling itself.

7.4 The efficiency claimed for any fixed building service should be based on the appropriate test standard set out in the *Domestic Building Services Compliance Guide (2013 edition)* and the test data should be certified by a notified body. In the absence of such quality-assured data, Building Control Bodies may seek other evidence that the claimed performance is justified.

7.5 Heating and hot water systems

7.5.1 Where work to an existing dwelling involves the provision, extension, alteration or replacement of a heating or hot water system, and a new heating appliance is to be installed:

a. the new appliance should have a seasonal efficiency not less than that recommended in Appendix D: Building Service Efficiencies; and

b. the new appliance should have a seasonal efficiency not less than that of any appliance that it replaces; and

c. the system should be equipped with controls consistent with the minimum controls identified for that type of system in Appendix D: Building Service Efficiencies.

7.5.2 ***Seasonal efficiency*** means the annual efficiency value used by the Standard Assessment Procedure (SAP) energy rating (2012 edition) for a heating appliance; for boilers fired by gas, LPG or oil that have been tested for efficiency. ***SEDBUK*** is the Boiler Efficiency Database at www.sedbuk.com; the database provides separate winter and summer seasonal efficiencies for boilers, which SAP 2012 uses to calculate carbon dioxide emission rates for dwellings.

7.5.3 If a new appliance uses a different fuel from the appliance that it replaces, then the annual carbon dioxide emissions associated with the use of the new appliance should be no greater than those associated with the use of the appliance that it replaces, in the same dwelling. To demonstrate this, the seasonal efficiency of the new appliance should be multiplied by the ratio of the carbon dioxide emission factor of the fuel used in the appliance being replaced to that of the fuel used in the new appliance, to obtain the 'carbon equivalent efficiency' of the new appliance, which should not be less than the seasonal efficiency of the original appliance. Carbon dioxide emission factors should be taken from Table 12 of SAP 2012. Examples of this calculation appear in the *Domestic Building Services Compliance Guide (2013 edition).*

7.5.4 When boilers are replaced, existing systems with semi-gravity circulation should be converted to fully pumped circulation.

7.5.5 All new and replacement hot water storage vessels should comply with BS 1566:2002 Part 1, BS 3198:1981 or BS 12897:2006 (as appropriate) or an equivalent standard set by an accredited test body such as the British Board of Agrément, the Water Research Council or KIWA. Primary storage vessels ('thermal stores') should meet the insulation requirements of the Hot Water Association's *Performance Specification for Thermal Stores*.

7.5.6 The standing heat loss Q kWh/day of new hot water storage vessels should not exceed the value given by $Q = 1.15 \times (0.2 + 0.051V^{2/3})$; for replacement hot water storage vessels the standing heat loss should not exceed the value given by $Q = 1.28 \times (0.2 + 0.051V^{2/3})$; in both cases V is the volume of the vessel in litres.

7.5.7 Primary circulation pipes for heating and hot water should be insulated throughout their length; all pipes connected to hot water storage vessels should be insulated to at least 1 m from their points of connection to the vessels (or up to the points where they become concealed). Wherever a boiler or hot water storage vessel is replaced in an existing system, any pipes that are exposed during the course of the work, or are otherwise accessible, should be insulated. Insulation should consist of minimum 13 mm thick closed-cell elastomeric foam (or a thermally equivalent thickness of any other type of insulation) and heat losses from pipework should not exceed 9 W/m.

7.6 Heat pumps

7.6.1 A new or replacement heat pump that is used for space heating should have a Coefficient of Performance (CoP) not less than 2.2 (i.e. a heat generator efficiency of at least 220%). A new or replacement heat pump that is used for domestic hot water should have a CoP not less than 2.0 (i.e. a heat generator efficiency of at least 200%).

7.6.2 In addition, heat pumps should have a Seasonal Performance Factors (SPFs) not less than 2.5 for air to water systems, 3.3 for ground to water systems, or 3.5 for water to water systems, as defined in BS EN 15450.

7.7 Micro combined heat and power

7.7.1 Where work to an existing dwelling involves the provision or replacement of a micro combined heat and power (micro-CHP) system, the new system should have a Heating Plant Emission Rate (HPER) less than 0.23 $kgCO_2/kWh$.

7.8 Solar water heating

7.8.1 Where work to an existing dwelling involves replacement of a solar thermal system for water heating, the thermal output of the replacement system should not be less than that of the original system.

7.8.2 New and replacement solar water heating systems should comply with BS EN 12975. The electrical input power of any circulation pump incorporated in the system should not exceed 2% of the peak thermal power of the collector, and should not be more than 50 W. The equivalent heat exchanger area of any heat exchanger used to transfer heat into a hot water storage cylinder should not be less than 10% of the net absorber area of the solar collector.

7.8.3 The dedicated solar storage volume (i.e. the volume of hot water storage dedicated to storing solar-heated water) should be at least 25 litres per square metre of net absorber area

of the solar collector, or at least 80% of the daily hot water demand estimated using SAP 2012.

7.9 Community heating

7.9.1 ***Community heating*** is a system that supplies heat and/or hot water to a number of dwellings from a common heat source. Such a system may heat a small block of flats or a large number of separate buildings. Heat may be provided by a central boiler or by one or more low carbon heat sources such as combined heat and power (CHP) plant, heat pumps or solar panels.

7.9.2 Where it is proposed to connect existing dwellings to a new or existing community heating system, the guidance in the *Domestic Building Services Compliance Guide (2013 edition)* and (for any boiler plant) in the *Non-Domestic Building Services Compliance Guide (2013 edition)* should be followed.

7.10 Ventilation systems

7.10.1 Where work to an existing dwelling involves the provision, extension or replacement of a mechanical ventilation system, the design and installation of the new system should be consistent with the recommendations in *Energy Efficient Ventilation in Dwellings – a guide for specifiers* and with the recommendations in the *Domestic Ventilation Compliance Guide (2010 edition)*. The system should also have specific fan power no greater than

a. 0.5 W/ls for intermittent extract systems; or
b. 0.7 W/l/s for continuous extract systems; or
c. 0.5 W/ls for continuous supply systems; or
d. 1.5 W/ls for continuous supply and extract systems with heat recovery.

7.10.2 Where a supply and extract ventilation system is equipped with heat recovery, the heat recovery efficiency should not be less than 70%.

7.11 Mechanical cooling systems

7.11.1 Where work to an existing dwelling involves the provision, extension or replacement of a fixed mechanical cooling system, the system should meet the following efficiency standards:

a. Air-cooled air conditioners working in cooling mode should have energy efficiency ratios (EERs) not lees than 2.4.
b. Water-cooled air conditioners working in cooling mode should have energy efficiency ratios (EERs) not less than 2.5.
c. Fixed air conditioners should also have energy efficiency classifications no worse than Class C in Schedule 3 of *The Energy Information (Household Air Conditioners) (No. 2) Regulations SI 2005/1726*.

7.11.2 EERs should be determined in accordance with BS EN14511:2004 Parts 1-4 *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling* by an independent accredited laboratory at condition T1 'moderate'.

7.11.3 Mechanical cooling systems should be equipped with controls to prevent simultaneous heating and cooling of any space. Exposed refrigeration pipework should be insulated and enclosed in protective trunking to limit accidental damage.

7.11.4 Mechanical cooling systems should be installed by trained installers approved by the manufacturers or suppliers of the equipment. All installers should be competent refrigeration and air conditioning engineers holding valid refrigerant handling certificates.

7.12 Fixed lighting

7.12.1 Where work to an existing dwelling involves the provision, extension or replacement of a fixed internal or external lighting system (including re-wiring or replacement of fittings) all new fittings should have 'low energy' lamps with a luminous efficacy greater than 45 lamp lumens per circuit-Watt and total output greater than 400 lamp lumens. Light fittings may be either:

a. dedicated fittings that have separate control gear and will accept only low energy lamps (e.g. fluorescent or compact fluorescent lamps with pin connectors, or LED lamps), or

b. standard fittings supplied with low energy lamps with integrated control gear (e.g. bayonet or Edison screw base compact fluorescent lamps).

Note that fittings with GLS tungsten filament lamps or tungsten halogen lamps do not comply with these standards.

7.12.2 All lamps should be under manual control by the occupants of the dwelling; external lamps should also automatically switch off when there is adequate daylight, and when the area lit by the lamps becomes unoccupied.

7.13 Replacement of renewable electricity systems

7.13.1 Where work to an existing dwelling involves replacement of a renewable electricity system such as a solar photovoltaic (PV) array or wind generator the replacement system should have an electrical output that is not less than that of the original system.

7.14 Commissioning

7.14.1 ***Commissioning*** means the advancement of a fixed building service, following installation, replacement 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 uses no more fuel and power than is reasonable in the circumstances. 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 any associated control systems, and recording of the system settings and the performance test results that are accepted as satisfactory.

7.14.2 Where work to an existing building involves the provision, alteration or replacement of any fixed building services, the systems and their controls should be installed and commissioned such that they are handed over in efficient working order.

7.14.3 A commissioning plan should be prepared identifying the systems that require commissioning and the tests that will be carried out. Any systems that do not require

commissioning (for example a single fixed electric heater may only have an on/off switch) should be identified in the plan.

7.14.4 Notice of commissioning of any new or replacement fixed building services should be given to the Building Control Body 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. Until the Building Control Body receives the commissioning notice it cannot be reasonably satisfied that Part L has been complied with and consequently is unlikely to be able to provide a certificate of compliance.

8 Work to Windows and Doors

8.1 Introduction

8.1.1 This section of the Approved Document gives guidance for the following building works to an existing dwelling:

a. installing replacement windows and doors; and/or

b. enlarging existing windows and doors; and/or

c. creating new windows and doors.

8.1.2 In this Approved Document, ***windows and doors*** refers to windows and external doors that separate 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. Windows and doors are described as ***controlled fittings*** in the Building Regulations, i.e. windows and doors on which various parts of the Building Regulations impose a requirement.

8.1.3 Separate guidance is given in sections 2, 3, 6 and 9 for windows and doors in extensions, conversions, material changes of use and conservatories and porches.

8.1.4 Two alternative optional approaches that offer more design flexibility by allowing some requirements to be relaxed if compensated for elsewhere are set out in section 11.

8.2 Windows and Doors

8.2.1 New or replacement windows and doors should be draughtproofed units that achieve or better the U-values set out in column (a) of Table 8. Insulated cavity closers should be installed around the windows and doors where appropriate.

8.2.3 Windows and doors refer to the whole units, i.e. including the frames. Consequently, replacing just the glazing or door leaf while retaining an existing frame is not notifiable and does not have to meet the energy efficiency requirements. However, in such cases it would be sensible to upgrade the window or door to as close to the U-values set out in column (a) of Table 8 as is practicably possible.

Table 8: U-values for new and replacement windows and doors in W/m^2.K

	(a) Maximum U-values[50] for new and replacement windows and doors	(b) Alternative maximum U-values for replacement windows
Windows, roof windows and skylights	1.6 or WER Band C[51]	1.2 centre pane or low-e secondary glazing
Doors	1.6 or DSER Band E[52]	n/a

[50] See Appendix B: How to calculate U-values.

[51] See Appendix C: Energy Ratings for Doors and Windows.

[52] See Appendix C: Energy Ratings for Doors and Windows.

8.2.4 Where an existing window or door is enlarged or a new one created the total area of windows and doors should not to exceed 25 per cent of the total floor area of the dwelling.

8.2.5 In the case of dwellings of architectural and historic interest where special consideration applies or in other cases where there is a need to maintain the character of a façade, if replacement windows are unable to achieve the U-values set out in column (a) of Table 8, then they should achieve or better the lesser U-values set out in column (b) of Table 8.

8.2.6 Where low-e secondary glazing is installed, the draughtproofing should be on the secondary glazing to minimise the risk of condensation forming between the primary and secondary glazing.

8.3 Building Services

8.3.1 Where a renovation of any part of a building includes the provision, extension, alteration or replacement of any fixed building services systems, those systems should comply with the appropriate standards in section 7.

9 Conservatories and Porches

9.1 Certain conservatories and porches are exempt from the energy efficiency requirements if they fulfil **all** of the following requirements:

a. be at ground level; and

b. have an internal floor area that is less than 30 m^2; and

c. be thermally separate from the heated or cooled area of the dwelling; and

d. not be heated or cooled.

9.2 A conservatory or porch is considered as thermally separate where the existing walls, windows and doors between the dwelling and the conservatory or porch are left in place or if they are removed, they are replaced by walls that achieve or better a U-value of 0.21 $W/m^2.K$ and windows and doors that achieve or better the U-values set out in Table 9. For guidance how to calculate U-values see Appendix B: How to calculate U-values.

Table 9: U-values for new windows and doors in $W/m^2.K$

	Maximum U-values[53] for new windows and doors
Windows, roof windows and skylights	1.6 or WER Band C[54]
Doors	1.6 or DSER Band E[55]

9.3 Where a conservatory or porch is **not** exempt, it should fulfil the following requirements:

a. new window and doors (including roof windows and skylights) should achieve or better the U-values set out in Table 9; and

b. new thermal elements (walls, floors and roofs) should achieve or better the U-values set out in Table 10; and

c. be thermally separate from the heated or cooled area of the dwelling, see paragraph 9.2; and

d. any heating or cooling system installed in the conservatory or porch should have independent temperature and on/off controls.

Table 10: U-values for new thermal elements in $W/m^2.K$

	Maximum U-values[56] for new fabric
Walls	0.21
Floors[57]	0.18
Roofs	0.15

[53] See Appendix B: How to calculate U-values.

[54] See Appendix C: Energy Ratings for Doors and Windows.

[55] See Appendix C: Energy Ratings for Doors and Windows.

[56] See Appendix B: How to calculate U-values.

[57] The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

9.4 Adding a not exempt conservatory to increase the habitable volume of an existing dwelling triggers a requirement for additional energy efficiency improvements – consequential improvements – that are set out in section 4.

9.5 Two alternative optional approaches that offer more design flexibility by allowing some requirements to be relaxed if compensated for elsewhere are set out in section 11.

9.6 If the proposed addition is not thermally separated from the dwelling and therefore does not meet all of the requirements in paragraphs 9.1 and 9.3, it should be treated as an extension and follow the guidance set out in section 2 including the limitation on the total area of windows and doors.

9.7 If the heating or cooling system of the dwelling is extended into an existing exempt conservatory or porch or if any or all of the walls, windows and doors that thermally separate an existing exempt conservatory or porch from the dwelling are removed (and not replaced) it should be treated as a conversion and follow the guidance set out in section 3.

10 Indoor Swimming Pools

10.1 New indoor swimming pool basins (walls and floors) should achieve or better a U-value of 0.25 W/m^2.K. For guidance how to calculate this U-value see Appendix B: How to calculate U-values, paragraph 6.

10.2 Two alternative optional approaches that offer more design flexibility by allowing some requirements to be relaxed if compensated for elsewhere are set out in section 11.

11 Optional Approaches With More Design Flexibility

11.1 Introduction

11.1.1 This section of the Approved Document outlines two optional alternative approaches to the standards based approach set out in the preceding sections of this Approved Document: the 'U-value trade-off approach' and 'equivalent carbon target approach', which offer more design flexibility by allowing some requirements to be relaxed if compensated for elsewhere. **Consequential improvements set out in section 4 and standards for fixed building services set out in section 7 may not be relaxed.**

11.1.2 The 'U-value trade-off approach' requires the calculation of an area-weighted average U-value and the 'equivalent carbon target approach' requires SAP 2012 energy rating assessment to calculate carbon dioxide emissions. Both approaches require two comparable calculations: the proposal should be gauged by a benchmark proposal that complies with the relevant requirements set out in the preceding sections of this Approved Document.

11.2 U-value Trade-off Approach

11.2.1 The 'U-value trade-off approach' allows some of the U-value standards and/or limit on the total area of windows and doors, set out in the relevant preceding sections of this Approved Document, to be relaxed if other U-values are improved to compensate. For example: in an extension poor performance of one wall may be traded for better performance of another wall; in a conversion poor performance of one wall may be traded for a compensatory insulation improvement elsewhere in the existing dwelling; exceeding the limit on the total area of windows and doors may be traded for better performance of the additional windows.

11.2.2 The area-weighted average U-value for **all** of the fabric, windows and doors in the proposal should be no greater than that of a **fully compliant benchmark**. Note that using the area-weighted average U-value of the existing dwelling as a benchmark does not demonstrate compliance.

11.2.3 The ***area-weighted average U-value*** shall be calculated using the following equation:

$$\{(U_1 \times A_1) + (U_2 \times A_2) + (U_3 \times A_3) + \ldots\} \div \{A_1 + A_2 + A_3 + \ldots\}$$

where:

U = the U-value of each individual thermal element in $W/m^2.K$

A = the area of each individual thermal element in m^2

11.2.4 The ***benchmark*** should comply with the relevant U-value standards and limit on the area of window and doors where work to the existing dwelling/building is proposed as set out in sections 2-10. If there are other parts of the existing dwelling where work is not proposed, the U-values for the existing fabric, windows and doors should be used in the area-weighted average U-value calculation.

11.2.5 In the cases of an extension or a conversion: the benchmark extension/conversion should be of the same size and shape as the proposed extension/conversion. If compensatory insulation improvements to the existing dwelling **are not** proposed, the area-weighted average U-value should be calculated for the proposed extension/conversion and

the benchmark extension/conversion only; if compensatory insulation improvements to the existing dwelling **are** proposed, the average U-values should be calculated for the proposed extension/conversion plus the dwelling including improvements and the benchmark extension/conversion plus the existing dwelling.

11.2.6 In all cases except extensions: if the proposal **does not** exceed the limit on the total area of window and doors of 25 per cent of the total floor area of the dwelling, the total area of windows and doors in the benchmark should be equal to that in the proposal. If the proposal **does** exceed the limit on the total area of windows and doors, the total area of windows and doors in the benchmark should be 25 per cent of the total floor area of the dwelling.

11.2.7 In the case of an extension: if the proposal **does not** exceed the limit on the total area of window and doors set out in paragraph 2.3.3, the total area of windows and doors in the benchmark should be equal to that in the proposal. If the proposal **does** exceed the limit on the total area of windows and doors, the total area of windows and doors in the benchmark should be 25 per cent of the total floor area of the dwelling plus the total area of any windows and doors which, as a result of the new extension, no longer exist or are no longer exposed.

11.2.8 Although U-value requirements may be relaxed, the U-value of any individual thermal element (wall, floor or roof) should not be worse than the limiting U-values set out in Table 11 to ensure resistance to surface condensation and mould growth.

Table 11: Limiting U-values for thermal elements in W/m^2.K

	Limiting U-values[58] for new fabric
Walls[59]	0.70
Floors[60]	0.70
Roofs[61]	0.35

11.2.9 If compensatory insulation improvements are proposed to other parts of the dwelling fabric, windows or doors, such improvements should **achieve or better** the U-value standards set out in the relevant sections of this Approved Document. This means that the area-weighted average U-value of the proposal may be better that of the benchmark.

11.3 Equivalent Carbon Target Approach

11.3.1 The 'Equivalent Carbon Target' approach allows some of the U-value standards and/or limit on the total area of windows and doors, set out in the preceding sections of this Approved Document, to be relaxed if other U-values and/or the performances of fixed building services are improved to compensate. For example: in a renovation poor performance of one wall may be traded for better efficiency of a heating boiler.

11.3.2 The carbon emission rate, calculated using SAP 2012, from the proposal should be no greater than that of a **fully compliant benchmark**. Note that using the calculated carbon emissions from the existing dwelling as a benchmark does not demonstrate compliance.

[58] See Appendix B: How to calculate U-values.

[59] 'Walls' include the walls or cheeks of dormer windows.

[60] The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

[61] 'Roofs' include the roofs of dormer windows.

11.3.3 The ***benchmark*** should comply with the relevant U-value and fixed building services standards and limit on the area of window and doors where work to the existing dwelling/building is proposed as set out in sections 2-10. If there are other parts of the existing house where work is not proposed, the U-values for the existing fabric, windows and doors should be used in the SAP assessment.

11.3.4 In the cases of an extension or a conversion: the benchmark extension/conversion should be of the same size and shape as the proposed extension/conversion. If compensatory insulation improvements to the existing dwelling **are not** proposed, the area-weighted average U-value should be calculated for the proposed extension/conversion and the benchmark extension/conversion only; if compensatory insulation improvements to the existing dwelling **are** proposed, the average U-values should be calculated for the proposed extension/conversion plus the dwelling including improvements and the benchmark extension/conversion plus the existing dwelling.

11.3.5 In all cases except extensions: if the proposal **does not** exceed the limit on the total area of window and doors of 25 per cent of the total floor area of the dwelling, the total area of windows and doors in the benchmark should be equal to that in the proposal. If the proposal **does** exceed the limit on the total area of windows and doors, the total area of windows and doors in the benchmark should be 25 per cent of the total floor area of the dwelling.

11.3.6 In the case of an extension: if the proposal **does not** exceed the limit on the total area of window and doors set out in paragraph 2.3.3, the total area of windows and doors in the benchmark should be equal to that in the proposal. If the proposal **does** exceed the limit on the total area of windows and doors, the total area of windows and doors in the benchmark should be 25 per cent of the total floor area of the dwelling plus the total area of any windows and doors which, as a result of the new extension, no longer exist or are no longer exposed.

11.3.7 Although U-value requirements may be relaxed, the U-value of any individual thermal element (wall, floor or roof) should not be worse than the limiting U-values set out in Table 11 to ensure resistance to surface condensation and mould growth.

11.3.8 If compensatory insulation improvements are proposed to other parts of the dwelling fabric, windows or doors, such improvements should **achieve or better** the U-value standards set out in the relevant sections of this Approved Document. This means that the area-weighted average U-value of the proposal may be better that of the benchmark.

11.3.9 SAP 2012 energy rating assessments should be carried out by a qualified On Construction Domestic Energy Assessor (OCDEA). Where the thermal characteristics of elements of the existing building are unknown, the data in SAP 2012 Appendix S should be used in both assessments. The two assessments should only differ in as much as the proposal differs from the benchmark – all other SAP variables (for example, air permeability, thermal bridging factors, etc.) should be the same in both assessments, in order to provide a fair comparison.

12 Dwellings of Architectural and Historic Interest

12.1 There are certain cases of building work to existing dwellings of architectural and historic interest where special consideration may apply, resulting in exemption from some or all of the energy efficiency requirements. These cases include work to existing buildings which are:

a. listed in accordance with section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990; or

b. in a conservation area designated in accordance with section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990; or

c. of architectural and historic interest and are referred to as a material consideration in a local authority's development plan or local development framework; or

d. of architectural and historic interest and are within national parks, areas of outstanding natural beauty, registered historic parks and gardens, registered battlefields, the curtilages of scheduled ancient monuments, and world heritage sites; or

e. of traditional construction with permeable fabric that both absorbs and readily allows the evaporation of moisture.

12.2 Work to such buildings is generally required to comply with the energy efficiency requirements as far as practicably possible **except** where compliance would unacceptably alter or mar the character of the building or increase the risk of long-term deterioration.

12.3 The detailed technical guidance on how to implement specific energy efficiency measures produced by English Heritage should be taken into account when determining appropriate energy performance standards for building work to existing dwellings. See list of available guidance documents at http://www.english-heritage.org.uk/professional/advice/advice-by-topic/climate-change/energy-efficiency/

12.4 In general, new extensions to dwellings of historic and architectural interest should comply with the energy efficiency requirements: guidance on how to comply is set out in section 2. The only exception would be where there is a need for the extension to be consistent with the character of the existing building, see paragraph 2.3.5.

12.5 Particular issues relating to work to dwellings of historic and architectural interest warrant sympathetic treatment and would benefit from further professional advice. These issues include:

a. restoring the historic character of a building that has been subject to a previous inappropriate alteration, for example, replacement windows and doors; or

b. rebuilding a former historic building, for example, following a fire or infilling a gap site in a terrace; or

c. enabling the fabric of historic buildings to 'breathe' to control moisture and potential long-term deterioration.

12.6 When assessing dwellings of historic and architectural interest where special consideration may apply, it is important that the Building Control Body takes into account the advice of the local authority's conservation officer, particularly where the work requires planning permission and/or listed building consent.

13 Notifying Building Control

13.1 In most instances, in order to comply with the Building Regulations, it is necessary to notify a Building Control Body: a local authority or an approved inspector, before work to an existing dwelling starts.

13.2 In certain situations, however, where the work is of a minor nature and there is no significant risk to health, safety or energy efficiency, although the work must still comply with the Building Regulations, notification is not necessary.

13.3 Examples of non-notifiable minor work include:

a. installation of thermal insulation in a roof space or loft space, where this is the only work carried out and the work is not undertaken to comply with any requirement in the Building Regulations, i.e. the work is carried out voluntarily; or

b. replacement of any part of a heating, hot water, ventilation or air-conditioning system that is not a combustion appliance, for example a radiator, valve or pump (but not a boiler) or

c. addition of an output device, for example a radiator or fan; or

d. addition of a control device, for example a thermostatic radiator valve; or

e. installation of stand-alone, self-contained fixed heating, hot water, ventilation or air-conditioning equipment. Such equipment must consist only of a single appliance and any associated controls, and must not be connected to, or form part of, any other fixed building service. Examples of stand-alone, self-contained equipment include fixed electric heaters, mechanical extractor fans in kitchens or bathrooms, and single-room air-conditioning units.

However, the work is notifiable if **any** of the following apply:

a. commissioning is necessary to enable efficient use of fuel and power; or

b. any electrical work associated with the installation is notifiable. Details of the types of electrical work that are notifiable are given in Approved Document P; or

c. the equipment is a combustion appliance; or

d. a ventilation appliance is installed in a room containing a combustion appliance with an open-flue, such as a gas fire that uses a chimney as its flue.

13.4 In other situations, where the work is being carried out by a person registered with a competent person self-certification scheme or the work involves an emergency repair, for example to a failed boiler or a leaking hot water cylinder, **advance** notification is not necessary.

13.5 Where the work is carried out by a person registered with a competent person scheme, a certificate shall be provided to the occupier of the dwelling confirming that the work complies with all applicable Building Regulations within thirty days of completion. Notification or a certificate shall also be provided to the local authority within thirty days of completion. The scheme operator provides the certificate to the occupier and the notification/certificate to the local authority.

13.6 In order to join an authorised self-certification scheme a person must demonstrate competence to carry out the type of work the scheme covers and to comply with the relevant Building Regulations. A list of authorised self-certification schemes and the types of work to

which they apply can be found at: www.communities.gov.uk.

13.7 Where the work involves an emergency repair, a Building Control Body, a local authority or an approved inspector should be notified at the earliest opportunity (unless an installer registered under an appropriate competent person scheme carries out the work).

14 Providing Information to the Occupier

14.1 On completion of work to an existing dwelling the owner of the dwelling should be provided with information about the building, the fixed building services and their operating and maintenance requirements so that the dwelling can be occupied in a manner that uses no more fuel and power than is reasonable in the circumstances. (This requirement applies only to the work that has actually been carried out, so if the work involves only window replacement there is no obligation to provide information about the operation of the heating system.)

14.2 Where the work involves provision of a new heating and/or hot water system, or a new ventilation system, the owner of the dwelling should be provided with operating and maintenance instructions explaining the efficient use of the new system(s) in terms that occupants can understand and in a durable format that can be kept and referred to over the service life of the system(s). The instructions should be specific to the system(s) installed rather than generic.

14.3 Operating and maintenance instructions should explain to the occupants of the dwelling how to operate the system(s) efficiently, including:

a. how to make adjustments to timing, temperature and flow settings; and
b. what routine maintenance is necessary for operating efficiency to be maintained at a good level throughout the service life(lives) of the system(s).

Appendix A: The Building Regulations

1 This Approved Document deals with the energy efficiency requirements in the Building Regulations 2010. Regulation 2(1) of the Building Regulations defines the energy efficiency requirements as the requirements of regulations 23, 26, 28, 29, 40 and Part L of Schedule 1. The energy efficiency requirements relevant to existing dwellings are in regulations 23, 28, 29 and 40 of, and Part L of Schedule 1 to, those Regulations, as set out below.

Requirements relating to thermal elements – Regulation 23

(1) Where a person intends to renovate a thermal element, such work shall be carried out as is necessary to ensure that the whole thermal element complies with the requirements of paragraph L1(a)(i) of Schedule 1.

(2) Where a thermal element is replaced, the new thermal element shall comply with the requirements of paragraph L1(a) (i) of Schedule 1.

Consequential improvements to energy performance Regulation 28

(1) Paragraph (2) applies to an existing building with a total useful floor area over 1000 m² where the proposed building work consists of or includes—
(a) an extension;
(b) the initial provision of any fixed building services; or
(c) an increase to the installed capacity of any fixed building services.

(2) Subject to paragraph (3), where this paragraph applies, such work, if any, shall be carried out as is necessary to ensure that the building complies with the requirements of Part L of Schedule 1.

(3) Nothing in paragraph (2) requires work to be carried out if it is not technically, functionally or economically feasible.

Energy performance certificates – Regulation 29

(1) This regulation applies where—
(a) a building is erected; or
(b) a building is modified so that it has a greater or lesser number of parts designed or altered for separate use than it previously had, where the modification includes the provision or extension of any of the fixed services for heating, hot water, air conditioning or mechanical ventilation.

(2) The person carrying out the work shall—
(a) give an energy performance certificate for the building to the owner of the building; and
(b) give to the local authority notice to that effect, including the reference number under which the energy performance certificate has been registered in accordance with regulation 30(4).

(3) The energy performance certificate and notice shall be given not later than five days after the work has been completed.

(4) An energy performance certificate must—
(a) express the asset rating of the building in a way approved by the Secretary of State

under regulation 24;
(b) include a reference value such as a current legal standard or benchmark;
(c) be issued by an energy assessor who is accredited to produce energy performance certificates for that category of building; and
(d) include the following information—
(i) the reference number under which the certificate has been registered in accordance with regulation 30(4);
(ii) the address of the building, or in the case of a portable building the address of the owner;
(iii) an estimate of the total useful floor area of the building;
(iv) the name of the energy assessor who issued it;
(v) the name and address of the energy assessor's employer, or, if self-employed, the name under which the assessor trades and the assessor's address;
(vi) the date on which it was issued; and
(vii) the name of the approved accreditation scheme of which the energy assessor is a member.

(5) The energy performance certificate must be accompanied by a recommendation report containing recommendations for the improvement of the energy performance of the building, issued by the energy assessor who issued the energy performance certificate.

(6) Certification for apartments or units designed or altered for separate use in blocks may be based—
(a) except in the case of a dwelling, on a common certification of the whole building for blocks with a common heating system; or
(b) on the assessment of another representative apartment or unit in the same block.

(7) Where—
(a) a block with a common heating system is divided into parts designed or altered for separate use; and
(b) one or more, but not all, of the parts are dwellings, certification for those parts which are not dwellings may be based on a common certification of all the parts which are not dwellings.

Information about use of fuel and power –
Regulation 40

(1) This regulation applies where paragraph L1 of Schedule 1 imposes a requirement in relation to building work;
(2) The person carrying out the work shall not later than 5 days after the work has been completed provide to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances

Requirement	*Limits on application*
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; and (c) providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.	

2 Limitation On Requirements

2.1 In accordance with regulation 8 of the Building Regulations, the requirements in Parts A to D, F to K, N and P (except for paragraphs G2, H2 and J7) of Schedule 1 to the Building Regulations do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings).

2.2 Paragraph G2 is excluded as it deals with water efficiency and paragraphs H2 and J7 are excluded from regulation 8 because they deal directly with prevention of the contamination of water. Parts E and M (which deal, respectively, with resistance to the passage of sound, and access to and use of buildings) are excluded from regulation 8 because they address the welfare and convenience of building users. Part L is excluded from regulation 8 because it addresses the conservation of fuel and power.

2.3 In addition, regulation 4(2) of the Building Regulations states that where the work is being carried out in order to comply with regulation 22(requirements relating to a change of a building's energy status), regulation 23(requirements relating to renovation or replacement of a thermal element), or regulation 28 (consequential improvements to energy performance), and is not a material alteration, it need comply only with the requirements of Part L.

Appendix B: How to Calculate U-values

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 Windows and doors – Product standard, performance characteristics*

c. the specific size and configuration of the window.

4 In the case of a door, the U-value can be calculated for the standard door set out in *BS EN 14351-1:2006 Windows and doors – Product standard, performance characteristics* or the specific size and configuration of the door.

5 The U-values for roof windows and skylights set out in Table 2 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 Table 2 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 U-values for indoor swimming pool basins shall be calculated using the methods and conventions set out in *BS EN ISO 13370:2007 Thermal Performance of Buildings. Heat transfer via the ground. Calculation methods*.

Appendix C: Energy Ratings

1 The Window Energy Rating (WER) is given by the following equation:

$$WER = 196.7 \times ((1 - f) \times g_{glass}) - 68.5 \times (U + (0.0165 \times AL))$$

where:

f is the frame factor i.e the percentage of the window obscured by frame and gaskets; and

g_{glass} is the normal total solar energy transmittance of the glass as determined by BS EN 410; and

U is the whole window U-value as specified in the relevant section of this Approved Document; and

AL is the air leakage through the window in $m^3/h.m^2$ at 50 Pa pressure difference based on testing to BS 6375–1:2009. Note that AL is based on the whole window area, not per unit length of opening light.

2 The following rating bands define the window energy rating label:

Band A	WER ≥ 0
Band B	0 < WER ≤ –10
Band C	–10 < WER ≤ –20
Band D	–20 < WER ≤ –30
Band E	–30 < WER ≤ –50
Band F	–50 < WER ≤ –70
Band G	WER < –70

3 Building Control Bodies may accept a WER declaration from a certification scheme that provides a quality-assured process and supporting audit trail from calculating the performance of the window through to installation as evidence of compliance. Notwithstanding the suggested performance values set out above, guidance on energy-efficient windows is available from the Energy Saving Trust.[62]

4 The Door Set Energy Rating (DSER)[63] is given by the following equation:

$$DSER = -68.5 \times (Udoor + Effective\ L_{50})$$

where:

Udoor is the door U-value as specified in the relevant section of this Approved Document; and

Effective L50 is [XX].

[62] http://www.energysavingtrust.org.uk/Home-improvements-andproducts/Home-insulation-glazing/Glazing

[63] http://www.fenestration-news.com/news/newsitem.aspx?id=9119

5 The following rating bands define the door set energy rating label:

Band A	DSER ≥ -70
Band B	-70 < DSER ≤ -85
Band C	-85 < DSER ≤ -100
Band D	-100 < DSER ≤ -115
Band E	-115 < DSER ≤ -130
Band F	-130 < DSER ≤ -145
Band G	DSER < -145

6 The DSER equation/scale applies to pedestrian doors. Glazed patio and sliding folding doors use the window formula and rating scale.

Appendix D: Building Service Efficiencies

Table D1: Summary of Minimum Requirements for Heating and Hot Water Systems

System or Appliance Type	Minimum Efficiency	Circulation Standards and Minimum Controls
Gas-fired condensing boiler	Seasonal efficiency (SEDBUK 2009) 88%	Systems should be fully pumped, and have 'boiler interlock' such that when there is no demand for heating or hot water the boiler and pump are switched off. When only the boiler is replaced the existing heating zone(s) may be retained. If a complete system is installed or replaced, dwellings with floor area up to 150 m^2 should be divided into two heating zones with independent temperature control, one of which is assigned to the living area; and dwellings with floor area greater than 150 m^2 should be provided with at least two heating zones, each having separate timing and temperature controls. For single-storey open-plan dwellings in which the living area is greater than 70% of the total floor area, a single heating zone is acceptable. For dwellings with a floor area greater than 150 m^2, timing of the separate heating zones can be achieved by: multiple heating zone programmers; or a single multi-channel programmer; or programmable room thermostats; or separate timers to each zone (including the hot water circuit). Where the hot water is produced instantaneously, such as with a combination boiler, time control is only required for space heating. Separate temperature control of heating zones should be provided using room thermostats or programmable room thermostats in all zones; or individual radiator controls such as thermostatic radiator valves (TRVs) on all radiators other than in bathrooms and rooms with a thermostat. Hot water systems should have a cylinder thermostat to control the stored water temperature. In dwellings with floor area greater than 150 m^2 more than one hot water circuit should be provided, each with separate timing and temperature controls. This can be achieved by: a single multi-channel programmer; or separate timers to each circuit.
Gas-fired non-condensing boiler (where permitted)	Seasonal efficiency (SEDBUK 2009) 78%	
Gas-fired range cooker boiler	Seasonal efficiency (SEDBUK 2009) 75%	

System or Appliance Type	Minimum Efficiency	Circulation Standards and Minimum Controls
Gas-fired warm air heating	Certified compliance with BS EN 778:2009 or BS EN 1319:2009, installed in accordance with BS 5864:2004 and with ductwork insulated in accordance with BS 5422:2001.	Heating only systems should have either: a programmer and room temperature sensor(s) integrated with the heater; or an external programmer and room thermostat(s); or external programmable room thermostat(s). Where water heating is also provided, the primary hot water circuit should be pumped and have independent time control. Independent control of the hot water circuit should be achieved by means of a cylinder thermostat and a timing device, wired such that when there is no demand for hot water both the pump and circulator are switched off. When only the heat generating appliance is replaced the existing heating zone(s) may be retained. If a complete system is installed or replaced, dwellings with floor area up to 150 m^2 should be divided into two space heating zones with independent temperature control, one of which is assigned to the living area; and dwellings with floor area greater than 150 m^2 should be provided with at least two space heating zones, each having separate timing and temperature controls. For single-storey open-plan dwellings in which the living area is greater than 70% of the total floor area, a single heating control zone is acceptable. For dwellings with a floor area greater than 150 m^2, timing of the separate space heating zones can be achieved by: multiple heating zone programmers; or a single multi-channel programmer; or programmable room thermostats; or separate timers to each zone. Separate temperature control of zones should be provided using room thermostats or programmable room thermostats
Gas-fired room heater	Gross efficiency 45%	Appliances should be capable, either independently or in conjunction with room thermostats or other suitable temperature sensing devices, of controlling the room temperature at a level set by the occupants.
Gas-fired decorative flame effect room heater	-	
Gas-fired room heater with back boiler: inset flame effect type	Gross efficiency 45% (natural gas) or 46% (LPG)	Appliances should be capable, either independently or in conjunction with room thermostats or other suitable temperature sensing devices, of controlling the room temperature at a level set by the occupants. Heating and hot water controls (where applicable) should be as specified for gas-fired boiler systems, above.
Gas-fired room heater with back boiler: all other types	Gross efficiency 63% (natural gas) or 64% (LPG)	

System or Appliance Type	Minimum Efficiency	Circulation Standards and Minimum Controls
Oil-fired condensing boiler	Seasonal efficiency (SEDBUK 2009) 88%	Systems should be fully pumped and have 'boiler interlock' such that when there is no demand for heating or hot water the boiler and pump are switched off. When only the boiler is replaced the existing heating zone(s) may be retained. If a complete system is installed or replaced, dwellings with floor area up to 150 m^2 should be divided into two heating zones with independent temperature control, one of which is assigned to the living area; and dwellings with floor area greater than 150 m^2 should be provided with at least two heating zones, each having separate timing and temperature controls. For single-storey open-plan dwellings in which the living area is greater than 70% of the total floor area, a single heating zone is acceptable. For dwellings with a floor area greater than 150 m^2, timing of the separate heating zones can be achieved by: multiple heating zone programmers; or a single multi-channel programmer; or programmable room thermostats; or separate timers to each zone (including the hot water circuit). Where the hot water is produced instantaneously, such as with a combination boiler, time control is only required for space heating. Separate temperature control of heating zones should be provided using room thermostats or programmable room thermostats in all zones; or individual radiator controls such as thermostatic radiator valves (TRVs) on all radiators other than in bathrooms and rooms with a thermostat. Hot water systems should have a cylinder thermostat to control the stored water temperature. In dwellings with floor area greater than 150 m^2 more than one hot water circuit should be provided, each with separate timing and temperature controls. This can be achieved by: a single multi-channel programmer; or separate timers to each circuit.
Oil-fired non-condensing boiler (where permitted)	Seasonal efficiency (SEDBUK 2009) 84%	
Oil-fired range cooker boiler	Seasonal efficiency (SEDBUK 2009) 80%	

System or Appliance Type	Minimum Efficiency	Circulation Standards and Minimum Controls
Electric boilers serving central heating systems	-	Systems should be fully pumped and fitted with flow temperature control so that they are capable of modulating the power input to the primary water depending on demand. If the boiler supplies domestic hot water the system should have a boiler interlock in which controls are wired so that when there is no call for heat or hot water then the boiler and pump are switched off. When only the boiler is replaced the existing heating zone(s) may be retained. If a complete system is installed or replaced, dwellings with floor area up to 150 m^2 should be divided into two heating zones with independent temperature control, one of which is assigned to the living area; and dwellings with floor area greater than 150 m^2 should be provided with at least two heating zones, each having separate timing and temperature controls. For single-storey open-plan dwellings in which the living area is greater than 70% of the total floor area, a single heating zone is acceptable. For dwellings with floor area greater than 150 m^2, timing of the separate heating zones can be achieved by: multiple heating zone programmers; or a single multi-channel programmer; or programmable room thermostats; or separate timers to each zone (including the hot water circuit). Separate temperature control of heating zones should be provided using room thermostats or programmable room thermostats in all zones; or individual radiator controls such as thermostatic radiator valves (TRVs) on all radiators other than in bathrooms and rooms with a thermostat. Hot water cylinders should have two thermostatically controlled electric immersion heaters. The lower heater should be capable of heating up 85% of the cylinder contents; the upper element should be capable of heating 60 litres of water. The lower element should be connected to an 'off peak' electricity supply, and the upper to an 'on peak' supply. The vessel should be designed such that following reheating to 60°C from the off peak element, at least 80% of the contents can be drawn off at 45°C or above at a flow rate of 0.25 l/s. In dwellings with floor area greater than 150 m^2 more than one hot water circuit should be provided, each with separate timing controls. This can be achieved by: a single multi-channel programmer; or separate timers to each circuit.
Electric warm air systems	-	Heating only systems should have either: a programmer and room thermostat(s); or external programmable room thermostat(s).

System or Appliance Type	Minimum Efficiency	Circulation Standards and Minimum Controls
		Where water heating is also provided, the primary hot water circuit should be pumped and have independent time control. Independent control of the hot water circuit should be achieved by means of a cylinder thermostat and a timing device, wired such that when there is no demand for hot water both the pump and circulator are switched off. When only the heat generating appliance is replaced the existing heating zone(s) may be retained. If a complete system is installed or replaced, dwellings with floor area up to 150 m^2 should be divided into two space heating zones with independent temperature control, one of which is assigned to the living area; and dwellings with floor area greater than 150 m^2 should be provided with at least two space heating zones, each having separate timing and temperature controls. For single-storey open-plan dwellings in which the living area is greater than 70% of the total floor area, a single heating control zone is acceptable. For dwellings with a floor area greater than 150 m^2, timing of the separate space heating zones can be achieved by: multiple heating zone programmers; or a single multi-channel programmer; or programmable room thermostats; or separate timers to each zone. Separate temperature control of zones should be provided using room thermostats or programmable room thermostats.
Electric panel heaters	-	Heating should be controlled by a programmable time switch integrated into the appliance, or by a separate time switch. Individual temperature control should be provided by integral thermostats or by separate room thermostats or programmable room thermostats.
Electric storage heating systems	-	Systems should incorporate automatic control of input charge. Temperature control should be provided by an adjustable damper or other thermostatically-controlled method of adjusting the rate of heat release from the appliance.
Open solid-fuel fire - inset	Gross efficiency 37%	-
Open solid fuel fire – freestanding convector	Gross efficiency 47%	-
Open solid fuel fire - inset convector	Gross efficiency 45% (mineral fuels) or 43% (wood fuels)	-

System or Appliance Type	Minimum Efficiency	Circulation Standards and Minimum Controls
Open solid fuel fire with boiler – inset or freestanding	Gross efficiency 50%	Where boiler interlock is available, fully pumped circulation should be provided. The manufacturer's instructions on the sizing and positioning of heat leak radiators should be followed. Solid fuel appliances should not be fitted to sealed heating systems with expansion vessels, except where specifically permitted by the manufacturer or where a thermal storage interface device is used. All appliances should have thermostatic control of the burning rate. **Where automatic-feed appliances are used,** when only the boiler is replaced the existing heating zone(s) may be retained. Otherwise, dwellings with floor area up to 150 m^2 should be divided into two heating zones with independent temperature control, one of which is assigned to the living area; and dwellings with floor area greater than 150 m^2 should be provided with at least two heating zones, each having separate timing and temperature controls. For single-storey open-plan dwellings in which the living area is greater than 70% of the total floor area, a single heating zone is acceptable. For dwellings with a floor area greater than 150 m^2, separate timing of heating zones can be achieved by: multiple heating zone programmers; or a single multi-channel programmer; or programmable room thermostats; or separate timers to each zone (including the hot water circuit). Separate temperature control of heating zones should be provided using room thermostats or programmable room thermostats; and individual radiator controls such as thermostatic radiator valves (TRVs) on all radiators other than in rooms with a thermostat. Hot water systems should have a cylinder thermostat to control the stored water temperature. In dwellings with floor area greater than 150 m^2 more than one hot water circuit should be provided, each with separate timing and temperature controls. This can be achieved by: a single multi-channel programmer; or separate timers to each circuit.
Open solid fuel fire with high output boiler	Gross efficiency 63%	
Dry solid fuel room heater ('dry stove') – logs or multi-fuel	Gross efficiency 65%	
Dry solid fuel room heater – wood pellet stove	Gross efficiency 65% at part load, 70% at nominal load	
Solid fuel room heater with boiler – mineral fuel or logs	Gross efficiency 67%	
Solid fuel heater with boiler - wood pellets	Gross efficiency 70% at part load, 75% at nominal load	
Solid fuel cooker with boiler - not exceeding 3.5 kW output	Gross efficiency 65% (mineral fuel) or 55% (wood fuel)	
Solid fuel cooker with boiler - exceeding 3.5 kW output	Gross efficiency 65% (mineral fuel) or 55% (wood fuels)	
Independent solid fuel boiler - wood logs	Gross efficiency 75%	
Independent solid fuel boiler - multi fuel	Gross efficiency 65% (mineral fuels) or 75% (wood logs)	
Independent solid fuel boiler - anthracite	Gross efficiency 70% up to 20.5 kW, or 75% over 20.5 kW output	
Independent solid fuel boiler - wood pellets or chips	Gross efficiency 75% at nominal load, 70% at part load	
Slow release solid fuel appliance	Gross efficiency 65%	-
One-off solid fuel tiled or mortared stoves	Gross efficiency 70%	-

Appendix E: Cost-effective Insulation Improvements

1 Where work involves the renovation of a thermal element, an opportunity exists for cost-effective insulation improvements to be undertaken at marginal additional cost. This appendix provides guidance on the cost-effectiveness of insulation measures when undertaking various types of work on a thermal element.

2 Table E1 sets out the circumstances and the level of performance that would be considered reasonable provision in ordinary circumstances. When dealing with existing dwellings some flexibility in the application of standards is necessary to ensure that the context of each scheme can be taken into account while securing, as far as possible, the reasonable improvement. The final column in Table E1 provides guidance on a number of specific issues that may need to be considered in determining an appropriate course of action. As part of this flexible approach, it will be necessary to take into account technical risk and practicality in relation to the dwelling under consideration and the possible impacts on any adjoining building. In general the proposed works should take account of:

a. the requirements of any other relevant parts of Schedule 1 to the Building Regulations;

b. the general guidance on technical risk relating to insulation improvements contained in BRE Report *BR 262 Thermal insulation: Avoiding risks*, 2002;

c. for dwellings of architectural and historic interest, the guidance produced by English Heritage.

Where it is not reasonable in the context of the works project to achieve the performance set out in Table E1 the level of performance achieved should be as close to this as practically possible.

3 Table E1 incorporates, in outline form, examples of construction that would achieve the proposed performance, but designers are free to use any appropriate construction that satisfies the energy performance standard, so long as they do not compromise performance with respect to any other part of the Building Regulations.

4 General guidance is available from such sources as the Energy Saving Trust and relevant British Standards.

Table E1: Cost-effective U-value targets when undertaking renovation works to thermal elements			
Proposed works	**Target U-value ($W/m^2.K$)**	**Typical construction**	**Comments (reasonableness, practicability and cost- effectiveness)**
Pitched roof constructions[64]			
Renewal of roof covering – No living accommodation in the roof void – existing insulation (if any) at ceiling level. No existing insulation, existing insulation less than 50 mm, in poor condition, and/ or likely to be significantly disturbed or removed as part of the planned work	0.16	Provide loft insulation – 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent	Assess condensation risk in roof space and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide access to and insulation of services in the roof void
Renewal of roof covering – Existing insulation in good condition and will not be significantly disturbed by proposed works. Existing insulation thickness 50 mm or more but less than 100 mm	0.16	Top up loft insulation to at least 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent. This may be boarded out	Assess condensation risk in roof space and make appropriate provision in line with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide insulation and access to services in the roof void Where the loft is already boarded out and the boarding is not to be removed as part of the work, the practicality of insulation works would need to be considered
Renewal of the ceiling to cold loft space. Existing insulation at ceiling level removed as part of the works	0.16	Provide loft insulation – 250 mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent. This may be boarded out	Assess condensation risk in roof space and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation. Additional provision may be required to provide insulation and access to services in the roof void Where the loft is already boarded out and the boarding is not to be removed as part of the work, insulation can be installed from the underside but the target U-value may not be achievable
Renewal of roof covering – Living accommodation in roof space (room-in-the-roof type arrangement), with or without dormer windows	0.18	Cold structure – Insulation (thickness dependent on material) placed between and below rafters Warm structure – Insulation placed between and above rafters	Assess condensation risk (particularly interstitial condensation), and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation (Clause 8.4 of BS 5250:2002 and BS EN ISO 13788:2002 Practical considerations with respect to an increase in structural thickness (particularly in terraced dwellings) may necessitate a lower performance target

[64] Specification of thickness of insulation is based on lambda values (conductivity) of 0.04 W/m.K

Dormer window constructions			
Renewal of cladding to side walls	0.30	Insulation (thickness dependent on material) placed between and/or fixed to outside of wall studs. Or fully external to existing structure depending on construction	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C
Renewal of roof covering	–	Follow guidance on improvement to pitched or flat roofs as appropriate	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C
Flat roof constructions			
Renewal of roof covering – Existing insulation, if any, less than 100 mm, mineral fibre (or equivalent resistance) or in poor condition and likely to be significantly disturbed or removed as part of the planned work	0.18	Insulation placed between and over joists as required to achieve the target U-value – Warm structure	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C. Also see BS 6229:2003 for design guidance
Renewal of the ceiling to flat roof area. Existing insulation removed as part of the works	0.18	Insulation placed between and to underside of joists to achieve target U-value	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C. Also see BS 6229:2003 for design guidance. Where ceiling height would be adversely affected, a lower performance target may be appropriate
Solid wall constructions			
Renewal of internal finish to external wall or applying a finish for the first time	0.30	Dry-lining to inner face of wall – insulation between studs fixed to wall to achieve target U-value – thickness dependent on insulation and stud material used Insulated wall board fixed to internal wall surface to achieve the required U-value – thickness dependent on material used	Assess the impact on internal floor area. In general it would be reasonable to accept a reduction of no more than 5% in the area of a room. However, the use of the room and the space requirements for movement and arrangements of fixtures, fittings and furniture should be assessed In situations where acoustic attenuation issues are particularly important (e.g. where insulation is returned at party walls) a less demanding U-value may be more appropriate. In such cases, the U-value target may have to be increased to 0.35 or above depending on the circumstances Assess condensation and other moisture risks and make appropriate provision in accordance with the requirements of Part C. This will usually require the provision of a vapour control and damp protection to components. Guidance on the risks involved is provided in BR 262 and, on the technical options, in Energy Saving Trust publications

Renewal of finish or cladding to external wall area or elevation (render or other cladding) or applying a finish or cladding for the first time	0.30	External insulation system with rendered finish or cladding to give required U-value	Assess technical risk and impact of increased wall thickness on adjoining buildings
Ground floor constructions			
Renovation of a solid or suspended floor involving the replacement of screed or a timber floor deck	See comment	Solid floor – replace screed with an insulated floor deck to maintain existing floor level Suspended timber floor – fit insulation between floor joists prior to replacement of floor deck	The cost-effectiveness of floor insulation is complicated by the impact of the size and shape of the floor (perimeter/area ratio). In many cases existing un-insulated floor U-values are already relatively low when compared with wall and roof U-values. Where the existing floor U-value is greater than 0.70 W/m².K, then the addition of insulation is likely to be cost-effective. Analysis shows that the cost–benefit curve for the thickness of added insulation is very flat, and so a target U-value of 0.25 W/m².K is appropriate subject to other technical constraints (adjoining floor levels, etc.)

Appendix F: Materials and Workmanship

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.

3 When an Approved Document makes reference to a named standard, the relevant version of the standard to which it refers is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version may be used as a source of guidance provided it continues to address the relevant requirements of the Regulations.

Appendix G: 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, 1996.

2 Where the requirements of the Building Regulations that are covered by this Approved Document do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

Appendix H: Approved Documents

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.

Appendix I: List of References

Documents Referred To

BRE
www.bre.co.uk

BR 262 *Thermal insulation: avoiding risks*, 2002. ISBN 1860815154

BRE Report BR 443 *Conventions for U-value calculations*, 2006. (Available at www.bre.co.uk/uvalues)

Department for Business, Innovation and Skills
www.bis.gov.uk

Technical Standards and Regulations Directive 98/34/EC (As amended by Directive 98/48/EC).
(Available at
www.bis.gov.uk/policies/innovation/infrastructure/Standardisation/techstandards-directive)

Department of Energy and Climate Change (DECC)
www.decc.gov.uk

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2009. (Available at www.bre.co.uk/sap2009)

Current Energy Prices
(www.decc.gov.uk/en/content/cms/statistics/publications/prices/prices.aspx)

Department for Communities and Local Government (DCLG)
www.communities.gov.uk

Accredited Construction Details for Part L
(Available to download from
www.planningportal.gov.uk/england/professionals/en/1115314255826.html)

Energy Saving Trust (EST)
www.est.org.uk

Energy Efficient Glazing – guidance (Available at www.energysavingtrust.org.uk/Home-improvements-and-products/Home-insulation-glazing/Glazing)

(2006) *Energy Efficient Ventilation in Dwellings – a guide for specifiers* Good Practice Guide 268 (CE124), Energy Saving Trust, London.

English Heritage
www.english-heritage.org.uk

Building Regulations and Historic Buildings, 2002 (revised 2004) and other guidance

Health and Safety Executive (HSE)
www.hse.gov.uk

L24 Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations1992, Approved Code of Practice and Guidance, The Health and Safety Commission 1992. ISBN 978 0 71760 413 5

NBS (on behalf of Department for Communities and Local Government)
www.thebuildingregs.com

Domestic Building Services Compliance Guide, CLG 2013.

Non-Domestic Building Services Compliance Guide (2013 edition) NBS (RIBA Enterprises Ltd), London, ISBN 978 1 85946 3765, available from www.thenbs.com/buildingregs.

Domestic Ventilation Compliance Guide, CLG 2010.

(Both available to download from www. planningportal.gov.uk)

Legislation

Ancient Monuments and Archaeological Areas Act 1979

Planning (Listed Buildings and Conservation Areas) Act 1990

Construction Products Regulation (305/2011/EU-CPR)

UK Construction Products Regulations 2013 (TBC)

SI 1994/3260 Electrical Equipment (Safety) Regulations 1994

SI 2010/2214 The Building Regulations 2010

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

SI 2006/3418 Electromagnetic Compatibility Regulations 2006

Decision No 1/95 of the EC-Turkey Association Council of 22 December 1995

Standards Referred To

BS EN ISO 13370:2007 Thermal performance of buildings. Heat transfer via the ground. Calculation methods.

BS EN 14351-1:2006 Windows and doors. Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics.

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

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

BS 6375-1:2009 Performance of windows and doors. Classification for weathertightness and guidance on selection and specification (incorporating corrigendum No. 1).

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

BS EN ISO 13788:2002 Hygrothermal performance of building components and building elements.

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

Chapter 4: Proposed changes to Wales Approved Document L2A: New buildings other than dwellings

This chapter summarises the proposed changes to Approved Document L2A (Conservation of fuel and power in new buildings other than dwellings) and has been produced for consultation purposes. This document should be read alongside the 2010 edition of Approved Document L2A which can be seen at: http://www.planningportal.gov.uk/uploads/br/BR_PDF_ADL2A_2010.pdf

Final Approved Document statutory guidance will be produced to accompany the final regulatory changes. Where text from the Building Regulations 2010 is reproduced in this document, the only change which has been made is to update the numbering of the regulations in accord with Statutory Instrument 2010:2214. Further changes to the Regulations themselves are likely to be required to reflect decisions on final policy following consultation.

Text from the 2010 version is shown in black.

Deletions from the 2010 version are shown in ~~black strikethrough.~~

Text which is new to this version is shown in blue for new statutory guidance and *italic blue for new supplementary (non-statutory) advice*.

Explanatory text (which is provided to assist the consultation process and will not feature in the final Approved Document) is shown in *purple italic*.

Para	Revised text	Comment
1.1		Will include a reference to the Welsh Ministers
1.4	For example, the requirement that the target primary energy consumption (***TPEC***) and the target CO_2 emission rate (***TER***) for the building shall not be exceeded (regulation 26) is a regulatory requirement.	Reference to new primary energy target.
1.10		References to sources of assistance will be Welsh specific
2.1	Where a building is erected, it shall not exceed the target primary energy consumption and the target CO_2 emission rate for the building that has been approved pursuant to regulation 25	Welsh Regulations to include reference to new primary energy target.

3.1	*Additional terms to be defined as follows:* ***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. ***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 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. ***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. **High Efficiency Alternative Systems** means heat pumps, decentralised energy supply systems based on renewable energy, CHP, and district heating or cooling (if available). ***TPEC*** is the Target Primary Energy Consumption expressed as kWh/(m2.year). ***BPEC*** is the Building Primary Energy Consumption expressed as kWh/(m2.year).	To define terms related to the new Primary Energy target. The reference to High Efficiency Alternative Systems comes from the EPBD recast which requires the technical, environmental and economic feasibility of these systems to be examined when a new building is constructed.
3.7	Special considerations apply to certain classes of non-exempt building. These building types are: a. non-exempt buildings with low energy demand; the guidance specific to such buildings is given in paragraphs 3.8 to 3.11; b. modular and portable buildings with a planned service life ~~time of use~~ of more than two years (at one or more sites); the guidance specific to such buildings is given in the section beginning with paragraph 4.20; c. shell and core developments; the guidance specific to such buildings is given in the section beginning with paragraph 4.25.	Change suggested by the Modular and Portable Building Association

3.10	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 ~~a~~ ***TPEC/BPEC*** and ***TER/BER*** calculations) should be followed in respect of the enclosure.	Reference to new primary energy target.
3.11	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*** submissions would then be required (see paragraph 3.2b).	Reference to new primary energy target.
3.27		DCLG reference will be changed to Welsh Government
3.30		Reference will be changed from Secretary of State to Welsh Ministers
3.31	Criterion 1: in accordance with regulation 26, the calculated **primary energy consumption (the Building Primary Energy Consumption, *BPEC*)** and the CO2 emission rate for the building (the Building Emission Rate, ***BER***) must not be greater than **the Target Primary Energy Consumption (TPEC)** and the Target CO_2 Emission Rate (TER), which **are** ~~is~~ determined by following the procedures set out in paragraphs 4.7 to 4.27. *Criterion 1 is a regulation and is therefore mandatory, whereas Criteria 2 to 5 are only guidance. The calculations required as part of the procedure used to show compliance with this criterion can also provide information needed to prepare the Energy Performance Certificate required by regulation 29 of the Building Regulations and by the Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007 (SI 2007/991) as amended.*	Reference to new primary energy target. Reference to be updated when there is a Wales specific regulation
3.34	Criterion 4: the performance of the building, as built, should be consistent with the ***BPEC*** and ***BER***. The guidance in Section 5 can be used to show that this criterion has been met. ~~Extra credits will be given in the TER calculation where builders provide robust evidence of quality assured procedures in the design and construction phases; and~~	Reference to new primary energy target. Deletion of reference to quality assured procedures. See paragraph 5.7.
3.38 footnote	BS EN ISO 13370:2007 Thermal performance of buildings - Heat transfer via the ground - Calculation methods (incorporating corrigendum March 2009)	Updated reference
4.1		Reference to be updated when there is a Wales specific regulation

4.2	Target Primary Energy Consumption (TPEC) and Target carbon dioxide Emission Rate (TER) The Target Primary Energy Consumption (TPEC) and the Target CO_2 Emission Rate (***TER***) are ~~is~~ the minimum energy performance requirements for a new building based on the methodology approved by the ~~Secretary of State~~ Welsh Ministers in accordance with regulation 25. ~~It is~~ They are expressed in terms of the amount of primary energy consumed and the mass of CO_2 emitted per year per square metre of the ***total useful floor area*** of the building (kWh/m^2/year and kg/m^2/year).	Reference to new primary energy target.
4.3	The ***TPEC*** and the ***TER*** must be calculated using one of the calculation tools included in the methodology approved by the ~~Secretary of State~~ Welsh Ministers for calculating the energy performance of buildings pursuant to regulation 24.	Reference to new primary energy target.
4.4		Reference to software list will be checked and changed if necessary.
4.6	The TPEC and the ***TER*** ~~is~~ are established by using approved software to calculate the primary energy consumption and the CO_2 emission rate from a notional building of the same size and shape as the actual building, but with specified properties. These specified properties shall be as set out in the ~~2010~~ 2013 Wales NCM Modelling Guide[FN1], in the section headed 'Detailed definition of Notional Building for buildings other than ***dwellings'***. The key components of the notional building specification can also be seen at Table 6 ~~in the impact assessment~~. The TPEC and the ***TER*** ~~is~~ are set equal to the primary energy consumption and the CO_2 emissions from this notional building, with no further adjustment being made. *Non statutory advice below 4.6 deleted and replaced as follows:* *The **BPEC and TER** are based on a building of the same size and shape as the actual building, constructed to a concurrent specification. This concurrent specification for Part L 2013 is given in the 2013 Wales NCM modelling guide.* *The specification delivers an overall [7 or 10] per cent reduction in primary energy consumption and an overall [10, 11 or 20] per cent reduction in CO_2 emissions across the new-build mix for the non-dwellings sector (the so-called 'aggregate approach').* *FN1* www.2013ncm.bre.co.uk	See Impact Assessment for modelling to inform notional buildings in 2013.
4.7 to 4.10		Reference to be updated when there is a Wales specific regulation.

4.11	As required by regulations 26 ~~17C~~ and 27 ~~20D~~, before the work starts, the builder shall carry out a calculation that demonstrates that the ***BPEC*** and the ***BER*** of the building as designed ~~is~~ are not greater than the ***TPEC*** and the ***TER***. This design based calculation shall be provided to the ***BCB***, along with a list of specifications of the building envelope and the ***fixed building services*** used in calculating the ***BPEC*** and the ***BER***. Before the work starts, the builder shall also take into account the technical, environmental and economic feasibility of ***high efficiency alternative systems***. This analysis is to be documented and made available for verification purposes. *This design stage calculation and provision of a list of specifications will assist the **BCB** to confirm that what is being built aligns with the claimed performance. As set out at Appendix A it is expected that compliance software will be used to produce the list of specifications and highlight where these deviate significantly from the concurrent specification that defines the notional building. ~~and highlight those features of the design that are critical to achieving compliance. These 'key features'~~ This list of specifications can be used to prioritise the risk-based inspection of the building as part of confirming compliance with Regulation 26 ~~17C~~. If a provisional energy rating is calculated at this stage and an interim recommendations report is therefore available, the recommendations should be reviewed by the developer to see if further carbon mitigation measures might be incorporated in a cost-effective manner.*	The recast Energy Performance of Buildings Directive (EPBD) requires that high efficiency alternative systems e.g. renewable energy systems, heat pumps are taken into account before work starts. The NCM Compliance Report to be updated with a facility for the builder to declare that an analysis has been completed and documented and where it can be obtained for verification purposes. 'Key features' is no longer thought appropriate. See commentary at Appendix A.
4.13	In order to determine the ***BPEC*** and the ***BER***, the CO_2 emission factors shall be as specified in the paper published by DECC[FN]. [FN] The proposed primary energy and CO_2 emission factors and methodology for generating these can be seen at www.bre.co.uk/SAP2012.	Updated footnote. DECC are consulting on updated primary energy and CO_2 factors. Part L 2013 compliance calculations will be based upon these once finalised and published.

4.15	If thermal energy is supplied from a district or community heating or cooling system, primary energy and emission factors should be determined by considering the particular details of the scheme. 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 predicted effect of all buildings proposed to be newly connected to the system in the year of application to be included in the calculation of the primary energy and emission factors so that the increased operation of any marginal plant (e.g. gas boilers) is properly accounted for. The electricity generated by any CHP scheme or trigeneration is always credited at a primary energy and ~~an~~ emission factor equal to the grid average. CO_2 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*** submissions should be accompanied by a report, signed by a suitably qualified person, detailing how the emission factors have been derived. *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) ~~and C kWh of useful cooling~~, the emission factor for the heat output should both be taken as 1/H ~~1(H+C)~~*(F*CO_{2F} - E*CO_{2E}) where CO_{2F} is the emission factor for the input fuel, and CO_{2E} the factor for grid electricity.* See NCM Modelling Guide at: http://wales.gov.uk/xxx (area of website to be linked following consultation)	The primary energy and CO_2 emission factors for heat delivered by a district heating system is likely to change when a new building is connected to it. This change in emission factor must be accounted for to reflect any "dilution" of existing low carbon energy (e.g. from CHP) across a greater number of buildings.
4.16	Certain management features offer improved energy efficiency in practice. Where these management features are provided in the actual building, the ***BPEC*** and the ***BER*** can be reduced by an amount equal to the product of the factor given in Table 2 and the primary energy and the CO_2 emissions for the system(s) to which the feature is applied. *For example, if the CO_2 emissions due to electrical energy consumption were 70 $kgCO_2/(m^2.year)$ 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 x 0.025 = 1.75 $kgCO_2/(m^2.year)$.*	Reference to new primary energy target.

4.17	~~Provided the building satisfies the limits on design flexibility as set out in Criterion 2, the compliance procedure allows the designer full flexibility to achieve the ***TER*** utilising fabric and system measures and the integration of low and zero carbon (LZC) technologies in whatever mix is appropriate to the scheme. The approved compliance tools include appropriate algorithms that enable the designer to assess the role LZC technologies (including local renewable and low-carbon schemes driven by planning requirements) can play in achieving the ***TER***.~~ Provided the building satisfies the limits on design flexibility as set out in Criterion 2, the compliance procedure allows the designer flexibility to achieve the ***BPEC*** and the ***BER*** utilising fabric and system measures in whatever mix is appropriate to the scheme. However, on-site energy generation from renewable energy technologies may only be used towards calculation of the ***BER***. The approved compliance tools include appropriate algorithms that enable the designer to assess the role LZC technologies (including local renewable and low-carbon schemes driven by planning requirements) can play in achieving the ***TER***.	Reference to new primary energy target. The main purpose of the primary energy target is to promote building energy efficiency rather than low carbon energy supply and therefore renewable energy generation is excluded from its calculation. Low carbon heating technologies such as heat pumps and biomass are included in the primary energy calculation, however biomass heating will not contribute significantly to achievement of the TPEC since the primary energy factor for biomass is similar to that for other heating fuels. Heat pumps are considered to be an energy efficient form of heating or cooling rather than a low and zero carbon technology for the purposes of the primary energy calculation.
Title before 4.20	**Special considerations: Modular and portable buildings with a planned service life ~~time of use~~ of more than two years**	Change suggested by the Modular and Portable Building Association
Sub title before 4.21	New-build and Resale Buildings ~~At a given location~~:	Change suggested by the Modular and Portable Building Association

4.21	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 ***TPEC*** and ***TER*** should be adjusted by the relevant factor from Table 3. 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 ~~units~~ 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.	Change suggested by the Modular and Portable Building Association. Reference to new primary energy target added by WG.
4.23	In the case of a modular or portable building intended to be sited in a given location for less than 2 years, 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.	Reference to new primary energy target.
4.24	It is recognised that in situations where the planned time of use in a given location is less than 2 years, the only practical heating technology is electric resistance heating. In such cases, reasonable provision would be to provide energy efficiency measures 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 the ***TER/BER*** calculation is provided by a gas boiler with an efficiency of 77 per cent. Post initial construction, any work on the module should meet the standards set out in ADL2B. If a ***TPEC/BPEC*** and a ***TER/BER*** calculation is not available for a module constructed prior to June 2014 ~~2010~~, reasonable provision would be to demonstrate that the ***BPEC*** and the BER is not greater than the 2014 ~~2010~~ ***BPEC*** and ***TER*** adjusted by the relevant factor from Table 3.	To be updated if boiler efficiency in notional building changes.

<table>
<tr>
<td>Table 3</td>
<td>
Table 3 TER multiplying factor for modular and portable buildings
<table>
<tr><td>Date of manufacture of 70% of modules making up the external envelope</td><td>TER multiplying factor
For 10% aggregate</td><td>TER multiplying factor
For 11% aggregate</td><td>TER multiplying factor
For 20% aggregate</td></tr>
<tr><td>After June 2014</td><td>1.00</td><td>1.00</td><td>1.00</td></tr>
<tr><td>1 Oct 2010 – June 2014</td><td>1.11</td><td>1.12</td><td>1.25</td></tr>
<tr><td>6 April 2006 – 1 Oct 2010</td><td>1.48</td><td>1.50</td><td>1.67</td></tr>
<tr><td>1 April 2002 – 5 April 2006</td><td>1.96</td><td>2.00</td><td>2.20</td></tr>
<tr><td>Pre 1 April 2002</td><td>1.96 [2.62[1]]</td><td>2.00 [2.65[1]]</td><td>2.20 [2.95[1]]</td></tr>
</table>
Notes:
[1] For buildings with a planned time of use in a given location of less than 2 years, the figure in brackets is applicable.
</td>
<td>Reference to new primary energy target.

Multiplying factors specific to Wales Building Regulations</td>
</tr>
<tr>
<td>4.25</td>
<td>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 submissions 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 will have to assume efficiencies for those services that will be installed as part of the first fit-out work. The specification provided to the BCB (see paragraph 4.11) 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 calculations 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.</td>
<td>Reference to new primary energy target.</td>
</tr>
<tr>
<td>4.26</td>
<td>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 submissions should be made to the BCB after completion to demonstrate compliance for the part of the building covered by the fit-out work.</td>
<td>Reference to new primary energy target.</td>
</tr>
</table>

4.29	One way of showing that the requirement has been satisfied is to demonstrate that the fabric elements and the ***fixed building services*** all satisfy minimum energy efficiency standards as specified in the following paragraphs. *Note that in order to satisfy the **TPEC** and the **TER**, the building specification will need to be considerably better than the stated values in many aspects of the design. Table 6 provides the concurrent specification of the notional building and is a better indication of the standards required to meet the **TPEC** and the **TER**.*	Reference to new primary energy target.
4.30	Table 4 sets out the worst acceptable standards for fabric properties. The stated value represents the area-weighted average value for all elements of that type. In general, achievement of the ***TPEC** and the **TER*** is likely to require better fabric performance than set out in Table 4.	Reference to new primary energy target.
Table 4 Note 3	The relevant rooflight U-value for checking against these limits is that based on the developed area of the rooflight, not the area of the roof aperture. Further guidance on evaluating the U-value of out-of-plane rooflights is given in *Assessment of thermal performance of out-of-plane rooflights*, NARM Technical Document NTD 2 (2010), see http://www.narm.org.uk/home/pdfs/Guidance-notes-and-new-docs/NARM-TAOOPR-030311.pdf	
4.31 footnote	BS EN 14351-1:2006 Windows and doors - Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics (+A1:2010)	Updated reference
4.38 footnote	CIBSE: TM 39 Building energy metering, 2009. ISBN 978 1 90684 611 4	Corrects an error in the 2010 edition which referred to a non-existent 2010 version of TM39.
4.43	DfES: Building Bulletin 101 Ventilation of School Buildings. Version 1.4 - 5th July 2006. ISBN 011-2711642.	Updated reference. Potentially subject to further review and revision.
4.44 footnote	BS EN 410:2011 Glass in building - Determination of luminous and solar characteristics of glazing	Updated reference
5.1	Buildings should be constructed and equipped so that performance is consistent with the calculated ***BPEC** and **BER***. As indicated in paragraph 4.12, a calculation of the ***BPEC** and **BER*** is required to be submitted to the ***BCB*** after completion to take account of: a. any changes in performance between design and construction; and b. the achieved air permeability, ductwork leakage and commissioned fan performance. *The following paragraphs in this section set out what in normal circumstances would be reasonable provision to ensure that the actual performance of the building is consistent with the **BPEC** and **BER**. The results referred to in paragraph 4.11 would assist **BCBs** in checking that the ~~key features of the design are included~~ performance values of individual elements are as specified during the construction process.*	'Key features' is no longer thought appropriate. See commentary at Appendix A.

5.5	Where calculated in support of the approach set out in paragraph 5.7a ~~and 5.7b~~, linear thermal transmittances and temperature factors should be calculated following the guidance set out in BR 497[FN1]. Reasonable provision would be to demonstrate that the specified details achieve a temperature factor that is no worse than the performance set out in BRE IP 1/06[FN2]. [FN1] BR 497 *Conventions for calculating linear thermal transmittance and temperature factors*, BRE 2007. [FN2] IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, BRE, 2006.	See new paragraph 5.7
5.5 footnote	BRE: BRE Report BR 497 Conventions for Calculating Linear Thermal Transmittance and Temperature Factors 2007. ISBN 978 1 86081 986 5. Also see updates: 'Amendments to BR497 to clarify certain text and make corrections. - Amendment No. 1' (2010) AND 'New conventions on separating wall/ground floor junctions, where the separating wall penetrates the insulation layer of the ground floor.' (2010). Available at: http://www.bre.co.uk/page.jsp?id=1051	Updated reference
5.6	Similarly, in support of the approach set out in paragraphs 5.7a ~~and 5.7b~~, the builder would have to demonstrate that an appropriate system of site inspection is in place to give confidence that the construction procedures achieve the required standards of consistency.	See new paragraph 5.7
5.7	*Paragraph 5.7 is deleted and replaced with the revised text below* Ways of demonstrating that reasonable provision has been made are: a. To use construction joint details that have been calculated by a person with suitable expertise and experience following the guidance set out in BR 497 and following a process flow sequence that has been provided to the ***BCB*** indicating the way in which the detail should be constructed. The calculated value can then be used in the ***BPEC*** and ***BER*** calculations. *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.	No quality assured accredited construction details schemes have been approved by the Welsh Ministers. The confidence factor of 0.02 W/mK or 25 per cent is disapplied from Part L 2010. The option for such quality assured schemes is not included in this consultation however views and suggestions for alternative approaches are welcomed. See also Section 5 of the Part L consultation document.
5.8	Delete paragraph	

5.13	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 time of use of more than 2 years at more than one location, and where no site assembly work is needed other than making linkages between standard modules using standard link details. Compliance with regulation 43 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 m3/(h.m2) at 50 Pa.	Reference to new primary energy target.
5.14	The ***BPEC*** and ***BER*** calculated using the measured ***air permeability*** is not worse than the ***TPEC*** and ***TER***.	Reference to new primary energy target.
5.15	If the measured ***air permeability*** on retest is greater than the design ***air permeability*** but less than the limiting value of 10 m3/(h.m2) then other improvements may be required to achieve the ***TPEC*** and ***TER***.	Reference to new primary energy target.
5.17	It would be useful to prepare a ***commissioning*** plan, identifying the systems that need to be tested and the tests that will be carried out and provide this with the design-stage ***TPEC/BPEC*** and ***TER/BER*** calculations so that the ***BCB*** can check that the ***commissioning*** is being done as the work proceeds.	Reference to new primary energy target
5.26	Until the ***BCB*** receives the ***commissioning*** notice it may not be able to be reasonably satisfied that Part L has been complied with and consequently is unlikely to be able to give a completion / final certificate. *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/).*	

5.27	The ***BPEC*** and ***BER*** calculations assume~~s~~ a leakage rate for a given section of ductwork that is better than the standard for its particular pressure class. In such cases, any low-pressure ductwork should be tested using the DW/143 testing provisions for medium-pressure ductwork. The pressure classes are set out in Table 5. *DW/143 does not call for any testing of low-pressure ductwork. However, where the builder is claiming that the low-pressure ductwork will be less leaky than the normal low-pressure class allowance to achieve an improved* ***BPEC*** *and* ***BER****, this better standard should be demonstrated by testing using the procedures set out for medium-pressure ductwork.*	Reference to new primary energy target
6.2	A way of showing compliance with Regulation 40 ~~the requirement~~ would be to produce information following the guidance in CIBSE TM 31 Building log book toolkit[FN1]. The information should be presented in templates as or similar to those in the TM. The information 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 Guides [FN2].* [FN1] TM 31 Building log book toolkit, CIBSE, 2006 [FN2] Building Manuals and User Guides, BG 26/2011, BSRIA 2011	To signpost additional information on Building Manuals and User Guides
6.3	The data used to calculate the ***TPEC, BPEC, TER*** and the ***BER*** 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. This will inform the occupier how the energy performance of the building might be further improved. It would also be sensible to retain an electronic copy of the ***TPEC/BPEC*** **and** ***TER/BER*** input files for the energy calculation to facilitate any future analysis that may be required by the owner when altering or improving the building.	Reference to new primary energy target
Section 7	Title: **Concurrent Specification and Model Designs**	

7.1	*Paragraph 7.1 is deleted and replaced with the revised text below* This update to the approved document maintains the approach to setting the ***TER*** adopted in 2010 whereby the ***TER*** is based on a building of the same size and shape as the actual building, constructed to a concurrent specification and no improvement factor. The concurrent specification now includes a small area of roof mounted photovoltaic panels. The newly introduced ***TPEC*** is based on the same concurrent specification but does not include any energy generation from renewable energy technologies. If the actual building is constructed entirely to this concurrent speciation it will meet the ***TPEC*** and the ***TER*** and therefore pass Criterion 1. *Note that submittal of the actual building specification will not be sufficient to demonstrate compliance with the **TPEC** or the **TER**. In all cases the **TPEC** and the **TER** must be calculated using an approved calculation tool. The same tool must be used to calculate the **TPEC** and the **TER**.* *For information, Table 6 provides a summary of the concurrent notional building specifications for each category of building. More detailed information can be found in the Wales NCM Modelling Guide 2013.*	Summary of the notional building specifications set out for 10%, 11% and 20% consultation options.
Appendix A Para 1	To facilitate effective communication between the builder and ***BCB***, it would be beneficial to adopt a standard format for presenting the evidence that demonstrates compliance with the energy efficiency requirements. (Other than the primary energy and CO_2 targets which ~~is~~ are mandatory, the compliance criteria represent reasonable provision in normal circumstances. In unusual circumstances, alternative limits may represent reasonable provision, but this would have to be demonstrated in the particular case.)	Reference to new primary energy target
Appendix A Para 3	It is anticipated that two versions of the standard report would be produced by the compliance software: the first before commencement of works to include the ***TPEC/BPEC*** **and** ***TER/BER*** calculations plus supporting list of specifications and the second after completion to include the as built ***TPEC/BPEC*** **and** ***TER/BER*** calculations plus any changes to the list of specifications.	Reference to new primary energy target

Appendix A Para 5	The report should indicate the percentage by which the average performance of elements in the actual building deviates from the concurrent specification ~~highlight any items whose specification is better than typically expected values~~. The ***BCB*** is advised to ~~can then~~ give particular attention to elements that are more than 10% better than the concurrent specification ~~such 'key features'~~ as their appropriate installation will be critical in achieving the ***TPEC*** and the ***TER***. It is expected that low and zero carbon technologies will increasingly be employed for compliance with the ***TER***, particularly where the average performance of elements in the actual building is worse than the concurrent 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. ~~The ***BCB*** is advised to give particular attention to those aspects where the claimed specification delivers an energy efficiency standard in advance of that defined in the following schedule.~~ ~~Wall U-value 0.23 W/m^2.K~~ ~~Roof U-value 0.15 W/m^2.K~~ ~~Floor U-value 0.20 W/m^2.K~~ ~~Window/door U-value 1.5 W/m^2.K~~ ~~Design air permeability 5.0 m^3/h.m^2 at 50 Pa~~ ~~Fixed Building Service efficiency more than 15% better than that recommended for its type in the *Non-Domestic Building Services Compliance Guide*.~~ ~~Use of any low-carbon or renewable energy technology.~~	The concurrent specifications proposed for the 7% and 10% aggregate improvement in primary energy contain demanding performance values for individual elements (e.g. air tightness < 3 m^3/m^2/hour) that would be considered better than typically expected today. The Welsh Government expects industry to prepare itself to meet these more demanding performance values in the period between consultation and coming into force. It is therefore no longer appropriate to identify individual key features that would be considered better than is typically expected.

Appendix C	Department for Business, Innovation and Skills: Technical Standards and Regulations Directive 98/34/EC (As Amended by Directive 98/48/EC) Building Regulations 2010 (SI 2010/2214) Building (Approved Inspectors etc.) Regulations 2010 (SI 2010/2215) EU Construction Products Regulation (305/2011) UK Construction Products Regulations 2013 (TBC)	Updated references to legislation

Table 5– Concurrent notional building specification – 7% aggregate saving in primary energy

Element	Side lit or unlit (where HVAC specification is heating only)	Sidelit 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 ($W/m^2.K$)	1.8 (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	55%
Light Transmittance (%)	N/A	N/A	60%
Air-permeability (m^3/m^2/hour) Gross Internal Area greater than $250m^2$	3	5	5
Air-permeability (m^3/m^2/hour) Gross Internal Area less than or equal to $250m^2$	5	5	5
Lighting Luminaire (lm / circuit watt)	55	65	65
Occupancy control (Yes/No)	Yes	Yes	Yes
Daylight control (Yes/No)	Yes	Yes	Yes
Heating efficiency (Heating and hot water)	88%	91%	91%
Central Ventilation SFP (W/l/s)	1.8	1.8	1.8
Terminal Unit SFP (W/l/s)	0.5	0.4	0.4
Cooling (SEER / SSEER)	4.5 / 3.6	4.5 / 3.6	4.5 / 3.6
Cooling (SSEER)[65]	2.7	2.7	2.7
Heat recovery efficiency (%)	70%	70%	70%
Variable speed control of fans and pumps, controlled via multiple sensors (Yes/No)	Yes	Yes	Yes
Demand control (mechanical ventilation only). Variable speed control of fans via CO_2 sensors (Yes/No)	No	Yes	Yes

[65] Mixed mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses

Renewable Energy Contribution Monocrystalline PV with an efficiency of 15%. 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.	For 10% aggregate reduction in ***TER***: 1% of gross internal area

Table 6 – Concurrent notional building specification – 10% aggregate saving in primary energy (Welsh Government's preferred option)

Element	Side lit or unlit (where HVAC specification is heating only)	Sidelit 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 ($W/m^2.K$)	1.8 (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	55%
Light Transmittance (%)	N/A	N/A	60%
Air-permeability (m^3/m^2/hour) Gross Internal Area greater than $250m^2$	3	5	5
Air-permeability (m^3/m^2/hour) Gross Internal Area less than or equal to $250m^2$	5	5	5
Lighting Luminaire (lm / circuit watt)	65	65	65
Occupancy control (Yes/No)	Yes	Yes	Yes
Daylight control (Yes/No)	Yes	Yes	Yes
Heating efficiency (Heating and hot water)	91%	91%	91%
Central Ventilation SFP (W/l/s)	1.8	1.8	1.8
Terminal Unit SFP (W/l/s)	0.4	0.3	0.4
Cooling (air-conditioned) (SEER / SSEER)	4.5 / 3.6	4.5 / 3.6	4.5 / 3.6
Cooling (mixed mode) (SSEER)[66]	2.7	2.7	2.7
Heat recovery efficiency (%)	70%	70%	70%
Variable speed control of fans and pumps, controlled via multiple sensors	Yes	Yes	Yes
Demand control (mechanical ventilation only). Variable speed control of fans via CO_2 sensors	Yes	Yes	Yes
Renewable Energy Contribution	For 11% aggregate reduction in ***TER***: None		
Monocrystalline PV with an efficiency of 15%. 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.	For 20% aggregate reduction in ***TER***: 5% of gross internal area Welsh Government's preferred option		

[66] Mixed mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses

Chapter 5: Proposed changes to Wales Approved Document L2B: Existing buildings other than dwellings

This chapter summarises the proposed changes to Wales Approved Document L2B (Conservation of fuel and power in existing buildings other than dwellings) and has been produced for consultation purposes. This document should be read alongside the 2010 edition of Approved Document L2B which can be seen at:
http://www.planningportal.gov.uk/uploads/br/BR_PDF_ADL2B_2010.pdf

Final Approved Document statutory guidance will be produced to accompany the final regulatory changes. Where text from the Building Regulations 2010 is reproduced in this document, the only change which has been made is to update the numbering of the regulations in accord with Statutory Instrument 2010:2214. Further changes to the Regulations themselves are likely to be required to reflect decisions on final policy following consultation.

Text from the 2010 version is shown in black.

Deletions from the 2010 version are shown in ~~black strikethrough.~~

Text which is new to this version is shown in blue for new statutory guidance and *italic blue for new supplementary (non-statutory) advice*.

Explanatory text (which is provided to assist the consultation process and will not feature in the final Approved Document) is shown in *purple italic*.

Para	Revised text	Comment
2.1	*Regulation 28 'Consequential improvements to energy performance' to be updated to:* • *apply upon extension or increase in habitable area to all existing dwellings (1000m^2 area threshold removed);* • *apply upon extension or increase in habitable area to all existing non domestic buildings (1000m^2 area threshold removed);* • *continue to apply upon initial provision of or increase to installed capacity of fixed building services in existing non domestic buildings with a total useful floor area of over 1000m^2 (area threshold retained).*	See also Chapter 4, of the Part L consultation document. Increases in habitable area include such activities as loft and integral-garage conversions, or converting an unheated warehouse space to office or retail use.
3.6	Special considerations apply to certain classes of non-exempt building. These building types are: a) historic buildings and buildings used primarily or solely as places of worship; the considerations that apply to such existing buildings are given in paragraphs 3.9 to 3.14; b) buildings with low energy demand; the guidance specific to such buildings is given in paragraphs 3.15 to 3.20; c) modular and portable buildings; for the construction of such buildings with a planned service life ~~time of use~~ of more than 2 years at one or more locations, the guidance in Approved Document L2A should be followed. Any changes to the building fabric or ***fixed building services*** should comply with this Approved Document.	
3.10	The guidance given by English Heritage[FN] should be taken into account in determining appropriate energy performance standards for building work in historic buildings. *In addition English Heritage has produced detailed technical guidance on how to implement specific energy efficiency measures. (See list of available guidance documents at http://www.english-heritage.org.uk/professional/advice/advice-by-topic/climate-change/energy-efficiency/).* [FN] English Heritage: Energy Efficiency and Historic Buildings Application of Part L of the Building Regulations to historic and traditionally constructed buildings, 2011: http://www.english-heritage.org.uk/content/publications/docs/eehb-partl.pdf	References to be updated to reflect newer English Heritage guidance.
3.21	Regulation 9 of the Building Regulations exempts some conservatory and porch extensions from the ***energy efficiency requirements.*** The exemption applies only to conservatories or porches: • which are at ground level; • where the floor area is less than 30m^2; • where 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 • ~~where the heating system of the building is not extended into the conservatory or porch~~ • which are not heated or cooled.	

3.22	Where any conservatory or porch does not meet all the requirements in the preceding paragraph, it is not exempt and must comply with the relevant ***energy efficiency requirements*** including ***Consequential Improvements*** (see paragraphs 4.12 and 4.13 and Section 6 below).	Non-exempt conservatories are classed as extensions and must meet the energy efficiency requirements including Consequential Improvements as appropriate.
3.31 to 3.33	*To be amended to reflect the proposed changes to the Regulation 7 Approved Document.*	See consultation document (Chapter 7)
4.1	Under Regulation 28 of the Building Regulations, the construction of an extension or an increase in habitable area triggers the requirement for ***consequential improvements*** in the building ~~in buildings with a ***total useful floor area*** greater than 1000m^2~~. The guidance in Section 6 should be followed in respect of the ***consequential improvement*** in addition to following the specific guidance.	Area threshold to be removed
4.12	Where the extension is a conservatory or porch that is not exempt from the ***energy efficiency requirements*** (see paragraphs 3.21 to 3.22 above), the conservatory or porch is an extension, and the guidance set out in paragraphs 4.1 to 4.11 and Section 6 applies. In addition, ~~then~~ reasonable provision would be to provide: a. Effective thermal separation between the heated area in the existing building i.e. the walls, doors, and windows between the building and the extension, should be insulated and draught proofed to at least the same extent as in the existing building; b. Independent temperature and on/off controls to any heating system installed within the extension. Any ***fixed building service*** installed within the extension should also conform to the standards set out in paragraphs 4.29 to 4.48; c. Glazed elements should meet the standards set out in Table 3 and opaque elements should meet the standards set out in Table 4 however the limitations on total area of windows, roof windows and doors as set out at paragraph 4.4 above do not apply.	Non-exempt conservatories are classed as extensions and must meet the energy efficiency requirements including Consequential Improvements as appropriate.
4.13	Removing, and not replacing, any or all of the thermal separation between the building and an existing exempt extension, or extending the building's heating system into the extension, means the extension ceases to be exempt (see paragraphs 3.21 to 3.22 above). This constitutes a change to the building's energy status (Regulation 22). In such situations, the extension should be treated as a conventional extension and reasonable provision would be to demonstrate that the extension meets the guidance set out in paragraphs 4.1 to 4.11 and Section 6.	Non-exempt conservatories are classed as extensions and must meet the energy efficiency requirements including Consequential Improvements as appropriate.

4.14	Where a swimming pool is being provided in a building, the U-value of the basin (walls and floor) should be not worse than 0.25 W/m^2.K as calculated according to BS EN ISO 13370[FN]. *Design consideration should be taken with regards to compressive creep, insulation boards not being fully supported and the effects of point loading. Care should be taken to avoid thermal bridging particularly around basin wall and floor junctions with foundations.* [FN] BS EN ISO 13370:2007 Thermal performance of buildings - Heat transfer via the ground - Calculation methods (incorporating corrigendum March 2009)	Updated reference
4.18	In this regulation 'building' means the building as a whole or parts of the building that have been designed or altered to be used separately. *For example, this could occur where a previously unheated building, or parts of the building that have been designed or altered to be used separately, were to be heated in future, or where a previously exempt building were no longer within the exempted categories. Where this also results in an increase in habitable area e.g. a loft or integral garage conversion, or converting an unheated warehouse space to office or retail use, the requirements for **consequential improvements** are triggered. A material alteration (regulation 3(2) and (3)) may result in a change to a building's energy status.*	
	Increase in habitable area	New heading after paragraph 4.21
4.21a	Where the habitable area of a building is increased by, for example, converting a loft, integral garage or an unheated warehouse space to office or retail use, the building work triggers a requirement for a ***consequential improvement*** under Regulation 28. The guidance in Section 6 should be followed in respect of the ***consequential improvement.*** The increased area of habitable space created by the work should follow the guidance relating to a change in a building's energy status.	New paragraph below new heading **Increase in habitable area** To apply to existing non domestic buildings below the 1000m^2 area threshold
4.24	Where windows, roof windows, rooflights or doors are to be provided or replaced, reasonable provision in normal cases would be the installation of draught-proofed units whose performance is no worse than given in Table 3. In addition, insulated cavity closers should be installed where appropriate. If a window, pedestrian door or rooflight is enlarged or a new one created, then the area of the windows and pedestrian doors and of rooflights expressed as a percentage of the total floor area of the building should not exceed the relevant value from Table 2, or should be compensated for in some other a way. Where the replacement windows are unable to meet the requirements of Table 3 because of the need to maintain the external appearance of the façade or the character of the building, replacement windows should meet a centre pane U-value of 1.2W/m^{2}K, where the centre-pane U-value is defined as the U-value determined in the central area of the glazing unit, making no allowance for edge spacers or window frame. As an alternative ~~or~~ single glazing should be supplemented with low-e secondary glazing. In this latter case, the weather stripping should be on the secondary glazing to minimise condensation risk between the primary and secondary glazing. *"Replaced" has been added for clarification.*	
4.25	U-values shall be calculated using the methods and conventions set out in BR 443[FN1] and should be based on the whole unit (i.e. in the case of a window, the combined performance of the glazing and	

	frame). The U-value of the window can be calculated for: a. the smaller of the two standard windows defined in BS EN 14351-1[FN2]; or b. the standard window configuration set out in BR 443; or c. the specific size and configuration of the actual window. The U-value of the door can be calculated for the standard size as laid out in BS EN 14351-1, or the specific size and configuration of the actual door. *SAP 2012 ~~2009~~ Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.* [FN1] BR 443 *Conventions for U-value calculations*, BRE, 2006. [FN2] EN 14351-1 Windows and doors – Product standard, performance characteristics, 2006.	
4.25 footnote	BS EN 14351-1:2006 Windows and doors - Product standard, performance characteristics. Windows and external pedestrian doorsets without resistance to fire and/or smoke leakage characteristics (+A1:2010)	Updated reference

Table 3

Table 3 **Standards for controlled fittings**	
Windows in buildings that are essentially domestic in character[2]	A Window Energy Rating[3] of Band C or 1.6 W/m^{2}K
All other windows, roof windows and glazed rooflights [1,4]	1.8 W/m^{2}K for the whole unit
Plastic rooflight	1.8 W/m^{2}K
Curtain walling	See paragraph 4.28
Pedestrian doors where the door has more than 50% of its internal face area glazed	1.8 W/m^{2}K for the whole unit
High-usage entrance doors for people	3.5 W/m^{2}K
Vehicle access and similar large doors	1.5 W/m^{2}K
Other doors	1.8 W/m^{2}K
Roof ventilators (including smoke extract ventilators)	3.5 W/m^{2}K

Notes:

[1] Display windows are not required to meet the standard given in this table.

[2] For example, student accommodation, care homes and similar uses where the occupancy levels and internal gains are essentially domestic in character.

[3] See Approved Document L1B for more detail on WER

[4] The relevant rooflight U-value for checking against these limits is that based on the developed area of the rooflight, not the area of the roof aperture. Further guidance on evaluating the U-value of out-of-plane rooflights is given in *Assessment of thermal performance of out-of-plane rooflights*, NARM Technical Document NTD 2 (2010), see http://www.narm.org.uk/home/pdfs/Guidance-notes-and-new-docs/NARM-TAOOPR-030311.pdf.

4.29	Where the work involves the provision, extension or replacement of **controlled services**, reasonable provision would be demonstrated by following the guidance set out in the *Non-Domestic Building Services Compliance Guide*. The Guide covers the following services: a) heating and hot water systems (including insulation of pipes, ducts and vessels; b) mechanical ventilation; c) mechanical cooling/ air conditioning; d) fixed internal lighting; note that as detailed in Schedule 4 ~~2B~~, the work is not notifiable if the floor area that is to be provided with new fixed lighting is not greater than 100m^2. Although not notifiable, the work should still meet the standards set out in the compliance guide. ~~e) renewable energy systems~~. *"Replacement" has been added for clarification.* *Standards defining the energy efficiency of lifts have not yet been published, and so it has not been possible to include minimum Part L standards for vertical transport systems.*	Non Domestic Building Services Guide excludes renewable energy systems.
4.32	When replacing a heating appliance, consideration should be given to connecting to any existing local heat networks. If the work involves pipework changes, consideration should be given to providing capped off connections to facilitate subsequent connection to a planned local heat network. The heat network should have sufficient capacity to meet the needs of the building without increasing the carbon intensity of delivered heat, through the increased operation of less efficient marginal plant.	
4.34 footnote	CIBSE: TM 39 Building energy metering, 2009. ISBN 978 1 90684 611 4	Corrects an error in the 2010 edition which referred to a non-existent 2010 version of TM39.
4.40	In existing buildings other than dwellings ***commissioning*** is most often carried out by the person who installs the system. Sometimes it may be carried out by a subcontractor or by a specialist firm. It is important that whoever carries it out follows the relevant approved procedure. *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/.*	

<table>
<tr><td>Table 4</td><td>

<table>
<tr><td colspan="3">Table 4 Standards for new thermal elements (W/m²K)</td></tr>
<tr><td>Element[1]</td><td>Buildings that are essentially domestic in character[6]</td><td>All other buildings
~~Standard (W/m².K)~~</td></tr>
<tr><td>Wall[2]</td><td>0.2</td><td>0.26 ~~0.28~~[2]</td></tr>
<tr><td>Pitched roof – insulation at ceiling level</td><td colspan="2">0.15 ~~0.16~~</td></tr>
<tr><td>Pitched roof – insulation at rafter level</td><td>0.15</td><td>0.18</td></tr>
<tr><td>Flat roof or roof with integral insulation</td><td>0.15</td><td>0.18</td></tr>
<tr><td>Floors[3,4]</td><td>0.17</td><td>0.22[4]</td></tr>
<tr><td>Swimming pool basin</td><td colspan="2">0.25[5]</td></tr>
</table>

Notes:

[1] 'Roof' includes the roof parts of dormer windows, and 'wall' includes the wall parts (cheeks) of dormer windows.

[2] A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.

[3] The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged building.

[4] A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.

[5] See paragraph 4.14.

6 For example, student accommodation, care homes and similar uses where the occupancy levels and internal gains are essentially domestic in character.

</td></tr>
<tr><td>5.7 footnote</td><td>BRE: BRE Report BR 497 Conventions for Calculating Linear Thermal Transmittance and Temperature Factors 2007. ISBN 978 1 86081 986 5. Also see updates: 'Amendments to BR497 to clarify certain text and make corrections. - Amendment No. 1' (2010) AND 'New conventions on separating wall/ground floor junctions, where the separating wall penetrates the insulation layer of the ground floor.' (2010). Available at: http://www.bre.co.uk/page.jsp?id=1051</td><td>Updated reference</td></tr>
<tr><td>5.10</td><td>If achievement of the relevant U-value set out in column (b) of Table 5 is not technically or functionally feasible or would not achieve a ***simple payback*** of 15 years or less, the element should be upgraded to the best standard that is technically and functionally feasible and which can be achieved within a ***simple payback*** of no greater than 15 years. Guidance on this approach is given in Appendix A to Approved Document L1B. Generally, this lesser standard should not be worse than column (a) of Table 5 to minimise the risk of surface condensation and mould growth.</td><td></td></tr>
<tr><td>5.13</td><td>Reasonable provision would be to upgrade those ***thermal elements*** ~~whose U-value is worse than the threshold value in column (a) of Table 5~~ to achieve the U-value given in column (b) of Table 5, provided this is technically, functionally and economically feasible. A reasonable test of economic feasibility is to achieve a ***simple payback*** of 15 years or less. Where the standard given in column (b) is not technically, functionally or economically feasible, then the element should be upgraded to the best standard that is technically and functionally feasible and which meets a ***simple payback*** of 15 years or less. Guidance on this approach is given in Appendix A to Approved Document L1B. Generally, this lesser standard should not be worse than column (a) of Table 5 to minimise the risk of surface condensation and mould growth.</td><td></td></tr>
</table>

6.1	Regulation 28 ~~17D~~ of the Building Regulations may require additional work to be undertaken to make an existing building more energy efficient when certain types of building work are proposed. This additional work is termed the ***Consequential Improvement***.	
6.2	This requirement arises in existing buildings with a total useful floor area of over 1,000 m^2 where the proposed work consists of or includes: a. an extension (including a non-exempt conservatory) or an increase in habitable area; b. the initial provision of any ***fixed building service*** (other than a renewable energy generator); c. an increase to the installed capacity of any ***fixed building service*** (other than a renewable energy generator); *Increases in habitable area include such activities as loft and integral-garage conversions.* *To be updated to:* • *apply upon extension or increase in habitable area to all existing non domestic buildings (1000m^2 area threshold removed);* • *continue to apply upon initial provision of or increase to installed capacity of fixed building services in existing non domestic buildings with a total useful floor area of over 1000m^2 (area threshold retained).*	See Chapter 4 of the Part L consultation document.
6.4	Where improvement works other than the 'trigger activities' listed in regulation 28 ~~17D (1)~~ are planned as part of the building work, owners can use these as contributing to the consequential improvements. The exception to this is if additional work is being done to the existing building to compensate for a poorer standard of an extension (see paragraphs 4.9 to 4.11). For example, if, as well as extending the building, the proposals included total window replacement, then the window replacement work would satisfy the requirement for consequential improvements, provided the cost was at least 10 per cent of the cost of the extension.	
6.5	Reasonable provision for ***consequential improvements*** would be to implement improvement measures from one of the following sources: a) An assessment provided by an accredited Green Deal Assessor; or b) A recommendations report associated with a valid Energy Performance Certificate; or c) Measures such as those listed in Table 6. The measures listed in Table 6 are assessed on the basis of a simple 15 year payback and would be economically feasible unless there are unusual circumstances. *For example, where measures are selected from Table 6, and ~~if~~ the remaining design life of the building is less than 15 years it would only be economic to carry out improvements with payback periods within that life.*	In reaching a view on which of these measures would be appropriate to install, a building owner not wishing to use a Green Deal assessment or possessing a valid EPC would be able to draw on information available from the Planning Portal, Direct Gov and the new Green Deal Advice Service.

Table 6

Table 6: Improvements that in ordinary circumstances are practical and economically feasible

Items 3 ~~1~~ to 9 ~~7~~ will usually meet the economic feasibility criterion set out in paragraph 6.5. A shorter payback period is given in item 10 ~~8~~ because such measures are likely to be more capital intensive or more risky than the others.

No.	Improvement measure
1	Measures specified in an assessment provided by an accredited Green Deal Assessor
2	Measures specified in the Recommendations Report produced in parallel with a valid Energy Performance Certificate.
3	Upgrading heating systems more than 15 years old by the provision of new plant and/or improved controls.
4	Upgrading cooling systems more than 15 years old by the provision of new plant and/or improved controls.
5	Upgrading air-handling systems more than 15 years old by the provision of new plant and/or improved controls.
6	Upgrading general lighting systems that have an average lamp efficacy of less than 40 lamp-lumens per circuit-watt and that serve areas greater than 100 m^2 by the provision of new luminaires and/or improved controls.
7	Installing energy metering following the guidance given in CIBSE TM 39.
8	Upgrading ***thermal elements*** which have U-values worse than those set out in column (a) of Table 5 following the guidance in paragraphs 5.12 and 5.13.
9	Replacing existing windows, roof windows or rooflights (but excluding display windows) or doors (but excluding high usage entrance doors) which have a U-value worse than 3.3 $W/m^2.K$ following the guidance in paragraphs 4.23 to 4.28.
10	Increasing the on-site low and zero carbon (LZC) energy-generating systems if the existing on-site systems provide less than 10% of on-site energy demand, provided the increase would achieve a simple payback of seven years or less.

6.6

Where a building is extended, or the habitable area is increased, a way of complying with regulation 28 ~~17D~~ would be to adopt measures such as those in Table 6 to the extent that their value is not less than 10% of the value of the ***principal works***. The value of the ***principal works*** and the value of the ***consequential improvements*** should be established using prices current at the date the proposals are made known to the ***BCB***. They should be made known by way of a report signed by a suitably qualified person as part of the initial notice or deposit of plans.

An example of a suitably qualified person would be an accredited Green Deal Assessor, Accredited Energy Assessor or chartered quantity surveyor.

7.3	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 Guides*[FN] [FN] Building Manuals and User Guides, BG 26/2011, BSRIA 2011	To signpost additional information on Building Manuals and User Guides.
Appendix A	BRE: BRE Report BR 497 Conventions for Calculating Linear Thermal Transmittance and Temperature Factors 2007. ISBN 978 1 86081 986 5. Also see updates: 'Amendments to BR497 to clarify certain text and make corrections. - Amendment No. 1' (2010) AND 'New conventions on separating wall/ground floor junctions, where the separating wall penetrates the insulation layer of the ground floor.' (2010). Available at: http://www.bre.co.uk/page.jsp?id=1051 CIBSE: TM 39 Building energy metering, 2009. ISBN 978 1 90684 611 4 Department for Business, Innovation and Skills: Technical Standards and Regulations Directive 98/34/EC (As Amended by Directive 98/48/EC) Building Regulations 2010 (SI 2010/2214) Building (Approved Inspectors etc.) Regulations 2010 (SI 2010/2215) EU Construction Products Regulation (305/2011) UK Construction Products Regulations 2013 (TBC)	Updated references to legislation and standards

Chapter 6: Proposed changes to the National Calculation Methodology for Wales

1. This chapter summarises the key changes proposed for the National Calculation Methodology for Wales (NCMW).

Overview of changes

Homes

2. For new homes a change to the target setting mechanism is proposed. In Part L 2010, the target was defined as a 25% improvement on a 2006 compliant building. However as we move towards zero carbon and standards are strengthened, there is benefit in recognising that the abilities of different home types to improve energy and carbon performance varies.

3. So for Part L 2013, it is proposed that this 'flat' uplift will be replaced by a 'aggregated' approach to target setting. Furthermore, the proposal is to use a set of concurrent elemental recipe buildings, in a similar (but not identical) approach to non-domestic buildings, to help deliver a similar challenge across building types as well as providing a potentially compliant specification. The NCMw therefore needs to accommodate this new approach to target setting.

4. In addition, it is also proposed that compliance will be based on fabric elemental standards achieving better than mandatory worse acceptable values. This ensures a good standard of fabric performance. Reducing energy demand from our homes helps wider policy issues of security of energy supply and fuel poverty. Focusing efforts on the comparatively long-lived building fabric helps to 'future proof' the homes. Increased fabric energy efficiency means homes will be less likely to require difficult and expensive refurbishment upgrades at a later date.

5. These changes will have implications for those who develop SAP software compliance tools, as the tools will need to be adjusted to deliver the new carbon and energy targets. Designers and builders will need to adapt to using the new targets, but the intention is that they should not see significant change in the way the SAP software actually operates.

Non-domestic buildings

6. For new non-domestic buildings, the underlying principle of an 'aggregate' approach, using a set of concurrent notional building definitions, remains unchanged from 2010. The changes, apart from those to the parameter values, are the introduction of a Target for Primary Energy Consumption (TPEC) and an additional notional building type and the specification. These changes, together with refinements to the calculation itself, are described below.

Homes

7. As in previous reviews of Part L, the basic calculation methodology for new dwellings from 2013 will be SAP – in this case the version to be published in 2012 following consultation by DECC. Details can be found at www.bre.co.uk/SAP2012. A consultation version of SAP (cSAPw) which implements the proposals for Part L 2013, can be downloaded from www.2013walesncm.bre.co.uk

8. The consultation proposes that the modified worse acceptable fabric standards are made mandatory.

9. The consultation considers two main options for the CO_2 emissions target in Part L 2013:

    a. 25% CO_2 emissions reduction;

    b. 40% CO_2 emissions reduction.

Worse Acceptable Fabric Standards

10. The proposed mandatory worse acceptable fabric standards are shown in Table 1.

Table 1: Worse acceptable fabric standards for 2013

	Wales Part L 2013
Roof	0.15 W/m²K
Wall	0.21 W/m²K
Floor	0.18 W/m²K
Party Wall	0.20 W/m²K
Windows, roof windows, glazed roof lights, curtain walling and pedestrian doors	1.6 W/m²K (whole window value)
Air tightness (m³/hr.m²)	10 m³/hr.m² at 50 Pa
Linear thermal transmittance	0.15 x total exposed surface area (W/k)

11. It should be noted that the U-values for roof windows and roof lights are based on the U-value having been assessed with the roof window or roof light in the vertical position. If a particular unit has been assessed in a plan other than vertical, the standards should be modified by making an adjustment that is dependent on the slope of the unit following the guidance given in BR 443.

CO_2 emissions target for 2013

12. Part L 2006 and Part L 2010 apply an improvement factor to the emissions from an historic (2002) elemental recipe dwelling. The same improvement factor is equally applied to all building types, and there is only one elemental recipe

dwelling. However, this does not account for some dwelling types finding it more challenging (and costly) to achieve the CO_2 target than others.

13. For both the 2013 options presented here, different levels of emissions reduction would be achieved on different house types. This provides a more equitable challenge across the building types.

14. This is achieved by basing both options on a 2013 elemental recipe building (or 'recipe') with no improvement factor. Hence, the elemental recipe building is itself a compliant solution. However, the elemental recipe building also defines the carbon performance target for the dwelling, allowing flexibility in how these targets are achieved.

15. Furthermore, a separate elemental recipe building is proposed for each fuel type. As a result there is now no separate fuel factor – allowances for more carbon intensive off-gas fuels is now integrated within the set of elemental recipe buildings.

16. The way users interface with compliance tools will be as before. The only difference being that users should not now have the option of input fabric efficiencies poorer than the worse acceptable values in Table 1 (noting the comment on roof lights and roof windows).

17. Proposed changes to the parameters used to define the 2013 elemental recipe building for a 40% carbon reduction target are contained in Table 2.For a 25% carbon reduction target the elemental values would be identical to Table 2 with the exception of the factor to determine the kWp of photovoltaics required which would change from 0.036 to 0.020 kWp/m^2. Other than the changes detailed below, the specification is as per SAP 2012.

18. The Dwelling ***TER*** is then calculated from the specification described in Table 2 applied to the dwelling form as designed. A designer can then chose to achieve the ***TER*** by building to the elemental specification or can vary their design so long as the resultant carbon emissions as calculated in SAP 2012 are no greater than the dwelling if built to the elemental specification.

Table 2a - SAP 2012 elemental recipe dwelling definition for 40% improvement

Element or System	Elemental Values
Size and shape	Same as actual dwelling
Number of sheltered sides	Same as actual dwelling
Living area (zone 1)	Same as actual dwelling
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area. When calculating percentage all glazing treated as windows (i.e. no roof windows) If glazing is greater than 25% of TFA compliance with TER must be demonstrated in SAP. Where glazing is greater than 25% the following hierarchy should be taken to include doors and windows if specified[1], 1. Include all opaque and semi glazed doors (areas same as actual dwelling), 2. Reduce area of windows to 25% of TFA by scaling down consistently.
Shading and orientation	Same as actual dwelling
Over shading	Same as actual dwelling
Thermal Mass parameter	Same as actual dwelling
External Walls (and curtain walls)	0.15 W/m²K
Party Walls	0.0 W/m²K
Floor	0.15 W/m²K
Roof	0.11 W/m²K
Windows, roof windows, glazed roof lights, and glazed doors	1.4 W/m²K (whole window u-value)
	Emissivity = 0.1
	Frame Factor – as windows specified
	Solar energy transmittance -as windows specified
	Light transmittance – as windows specified
Opaque doors	1.0 W/m²K
Semi- glazed doors	1.2 W/m^{2}K
Air tightness	6.0 m^3/h.m² at 50Pa [2]
Linear thermal transmittance	0.09 x total exposed surface area (W/K)
Ventilation type	Natural (with extract fans) [6]

	As defined by SAP section 11: 2 for TFA up to 70m²; 3 for 70 < TFA < 100; 4 for TFA > 100 -If chimney or open flue specified additional measures beyond the recipe will be required to be implemented. Compliance with recipe TER to be demonstrated in SAP				
Low energy lighting	100% of fixed outlets				
Water use	limited to 125 litres per person per day				
Air conditioning	None - if air conditioning specified additional measures beyond the recipe will be required to be implemented. Compliance with recipe TER to be demonstrated in SAP				
Fuel Type	**Gas**	**LPG**	**Oil**	**Electric**	**Biomass [4]**
Heating System[5]	Boiler Assume same type as actual dwelling (regular, instantaneous combi or storage combi) If no boiler specified in actual dwelling assume regular boiler + HWC			Heat Pump + HWC	Regular Boiler + HWC
	Radiators	Radiators	Radiators	Radiators	Radiators
	Room sealed	Room sealed	Room sealed		Room sealed
	Fan flue	Fan flue	Fan flue		Fan flue
	SEDBUK 2009 89% efficient	SEDBUK 2009 89.9% efficient	SEDBUK 2009 90.9% efficient	COP 3.2 [3]	SEDBUK 2009 86% efficient HECTAS approved
	Pump in heated space	Pump in heated space	Pump in heated space		Pump in heated space
Controls	Time and temperature zone control				
	Boiler - Modulating burner control; interlock				Boiler - Modulating burner control; interlock
	Weather Compensation	Weather Compensation	Weather Compensation	Weather Compensation	
Hot water storage system	Stored hot water from boiler (unless combination boiler specified)			Stored hot water from heat pump and electric immersion (50%)	Stored hot water from boiler
	Thermostat controlled Separate time control for space and water heating				
Hot water cylinder volume [7]	If cylinder specified in actual dwelling – volume of cylinder specified If cylinder not specified in actual dwelling cylinder volume 150l				

Hot water cylinder loss factor [7]	HWC loss factor of 0.024(10+0.25V)kWh/day				
Primary Pipework	Fully insulated				
Secondary Space Heating	None	None	None	10% Electric	None
Photovoltaic System (kWp) (SE/SW orientation , 45° inclination, no over shading)	Yes - Building Foundation Area(m^2) * **0.036** (kWp/m^2)				No

Notes

[1]. An example where they may be no door specified could be where an apartment has an entrance door to a heated corridor which would not be on an exposed element to the dwelling.

[2] Air tightness is ‘as built’, pressure tested value.

[3]COP for heat pump is designed to provide a carbon target comparable to a gas condensing boiler. As such the COP in the elemental recipe elemental recipe building may not be subject to the same in use factors as for a default heat pump implemented in SAP

[4] Biomass recipe used for any fuel with a CEF of less than or equal to 0.10 $KgCO_{2eq}$/kWh

[5] For individual dwellings if there are if the dwelling has 2 main heating systems the system supplying the greater proportion of the space heating is chosen for the notional building.

[6] The elemental recipe does not include chimneys or open flues. For dwellings with chimneys, or open flues following the elemental recipe specification will not ensure compliance is achieved. Compliance calculations will be required in SAP to identify further measures to achieve compliance. In the actual dwelling fans can be replaced with the same number of passive vents whilst still complying with the elemental recipe.

[7] For dwellings with regular boilers not for dwellings with combination boilers.

19. The 2013 Elemental recipe dwelling includes the requirement for a user to input the Building Foundation Area (BFA). This is an additional user input required for the Wales NCM. BFA was chosen as the metric to calculate the area(kWp) of PV from as this metric takes account of:

    i. communal space provided to the bottom of apartment blocks and;

    ii. Roofs over garages that may be outside the heated envelope but where there is accommodation above and;

    iii. Roofs over garages where heating is provided within the garage from the main central heating system.

    Where garages are outside the insulated envelope and do not feature accommodation above, the foundation of this garage is to be excluded from the BFA calculation. The calculation of BFA does not include outbuildings and ancillary buildings when not located below residential and associated uses (e.g. communal corridors servicing residential would be included, stand alone bin stores adjacent to an apartment block would not).

20. Where a HWC is specified the 2013 elemental recipe requires the input of the HWC volume whether or not the manufacturer's declared loss factor is input.

Buildings containing Multiple Dwellings

21. Where a building contains more than one dwelling (such as in a terrace of houses or in a block of flats), an average CO_2 target may be calculated for all the connected dwellings in the building. In such cases, the average energy or CO_2 target is the floor-area-weighted average of all the individual CO_2 targets. For more detail see paragraph 4.6 in the 2013 draft Approved Document L1A.

22. For apartment buildings following a recipe approach it is expected that apartment blocks will feature a single rooftop PV array. Individual kWp PV required on a unit by unit basis will use the following calculation to allocate PV to individual dwellings:

$$\frac{TFA\ Flat(m^2)\ x\ Building\ Foundation\ Area\ (m^2)}{\sum TFA\ all\ flats\ in\ block}\ x\ 0.036[1]\left(\frac{kWp}{m^2}\right)$$

$[1](0.020\ for\ 25\%\ target)$

The SAP assessment tool will require the assessor to measure and input the TFA for all apartments in a block to determine the area of PV used in the elemental recipe specification on an apartment by apartment basis.

National Weather

23. Since demand for heating and cooling is affected by the weather, Building Regulations use weather data in calculating the carbon performance of a new home. At present, for all aspects of this calculation (apart from when active cooling is included) UK average data is used for all new dwellings, wherever they are located. We propose to alter this approach for Wales in Part L 2013, such that all heating and cooling aspects of the calculation are based on UK average weather data. For the purposes of the compliance calculation UK

average weather data will be used. For input the assessor will be provided with a full list of degree day regions for Wales (which could automatically populate form postcode data if provided). Overheating calculations are then based on the actual degree day region.

Treatment of different fuel types

24. The fuel to be used in the 2013 recipe is the one used to provide space heating to the actual dwelling as follows:

    a. Where all the space heating appliances are served by the same fuel, the fuel used in those appliances, as described in Table 1 '2013 Elemental Recipe Specification' in ADPL1A 2013, except the cases described below.

    b. Where the main space heating system can only use a liquid biofuel, the TER is calculated for biomass (and the DER is calculated using the actual fuel).

25. Multiple fuels (individual heating systems)

    a. Where the dwelling is served by more than one appliance, a multi fuel appliance or an appliance powered by a blended fuel mix, the TER (and DER) should use the 2013 recipe for the fuel with the highest CO_2 emission factor. (This ensures that the building will comply regardless of the extent either fuel is actually used.) For the TER select the package for the identified fuel and for the DER set the space heating fraction for the system using the identified fuel to 1.0. This applies to:

        i. blends of liquid fuels (including B30K and B30D) or multi-fuel oil appliance (use oil for both TER and DER).

        ii. two main systems (use system with highest emission factor for both TER and DER).

    with the following exception:

        iii. Where the main space heating system uses solid multifuel or mineral fuel e.g. coal, the TER should use the 2013 recipe for oil (whereas the DER is calculated using the actual fuel).

        iv. Where the main space heating system uses biodiesel or bioethanol the TER should use the 2013 recipe for oil (whereas the DER is calculated using the actual fuel).(this ensures that a dwelling heated by these fuels does not have higher carbon emissions than the oil recipe).

    Note that:

        v. for two main systems each of whose fuel has the same emission factor the DER is calculated retaining the two systems with space heating fractions as they have been specified;

        vi. except for the fuel used, the water heating system is not altered.

26. See the notes below Table 1 ‘2013 Elemental Recipe Specification’ in ADL1A 2013 and the Table 3 below ‘fuel package for TER (Wales) for the specific fuels to be used.

27. The implementation of this is similar to the approach proposed for Scotland in that the software will have embedded a set of reference values for each fuel type, rather than using the data in SAP Appendix R.

Community heating systems

28. For dwellings connected to a community heating system the fuel to be used in the 2013 recipe is the one used to provide heating and hot water to the actual dwelling, assuming it has an individual source of heat, as follows:

    a. Where all the space heating and domestic hot water heat supplied by the communal heat network are served by the same fuel, the fuel used to serve the network e.g. an actual dwelling supplied by heat from a community network, powered by gas combined heat and power and gas boilers, would be compared to a TER calculated from an individual gas heated dwelling as described in Table 1.

    b. Where the community heating system has more than one heat source feeding into a circuit providing both space heating and/or domestic hot water and these are served by different fuels the TER is calculated using the appropriate recipe package for each fuel and the overall TER is obtained by weighting the TER value for each fuel by the fraction of community heat supplied by each fuel. The heat fractions being as shown in lines (303a) to (303e) of the DER worksheet. The DER is calculated for the actual configuration.

    c. The TER for each community fuel is rounded to 2 decimal places before obtaining the weighted sum.

Table 3 - Fuel package for TER (Wales)

Fuel code	Fuel	Fuel for DER	CEF for DER $kgCO_2/kWh$	Package for TER	CEF for TER $kgCO_2/kWh$
	Gas:				
1	mains gas	as actual	0.212	1, Gas	0.212
2	bulk LPG	as actual	0.242	2, LPG	0.242
3	bottled LPG	as actual	0.242	2, LPG	0.242
9	LPG subject to Special Condition 18	as actual	0.242	2, LPG	0.242
	(appliances that specifically use) Biogas (including anaerobic digestion)	as actual	0.098	5, Biomass	0.098
	Oil:				
4	heating oil	as actual	0.292	3, Oil	0.292
71	(appliances that specifically use) biodiesel from any biomass source	as actual	0.149	3, Oil	0.292
72	(appliances that specifically use) biodiesel from vegetable oil only	as actual	0.091	5, Biomass	0.091
74	appliances able to use mineral oil or liquid biofuel	heating oil	0.292	3, Oil	0.292
75	(appliances that specifically use) B30K	as actual	0.249	3, Oil	0.292
76	(appliances that specifically use) bioethanol from any biomass source	as actual	0.138	3, Oil	0.292
	Solid fuel: (†)				
11	house coal	as actual	0.400	3, Oil	0.292
15	Anthracite	as actual	0.375	3, Oil	0.292
12	manufactured smokeless fuel	as actual	0.434	3, Oil	0.292
20	(appliances that can only burn) wood logs	as actual	0.019	5, Biomass	0.019
22	wood pellets (in bags for secondary heating)	as actual	0.039	5, Biomass	0.039
23	wood pellets (bulk supply for main heating)	as actual	0.039	5, Biomass	0.039
21	wood chips	as actual	0.016	5, Biomass	0.016
10	dual fuel appliance (solid mineral and wood)	house coal	0.400	3, Oil	0.292
	Electricity:				
39	electricity	as actual	0.522	4, Electricity	0.522
	Community heating schemes:				
51	heat from boilers – mains gas	as actual	0.212	1, Gas	0.212
52	heat from boilers – LPG	as actual	0.242	2, LPG	0.242
53	heat from boilers – heating oil	Oil	0.292	3, Oil	0.292
	Heat from boilers that can use mineral oil or liquid biofuel	Oil	0.327	3, Oil	0.292
	Heat from boilers using biodiesel from any biomass source	as actual	0.149	3, Oil	0.292
	Heat from boilers using biodiesel from vegetable oil only	as actual	0.091	5, Biomass	0.091
55	heat from boilers – B30D	oil	0.292	3, Oil	0.292
54	heat from boilers – coal	as actual	0.385	3, Oil	0.292
41	heat from electric heat pump	as actual	0.522	4, Electricity	0.522
42	heat from boilers – waste combustion	as actual	0.047	5, Biomass	0.047
43	heat from boilers – biomass	as actual	0.039	5, Biomass	0.039
44	heat from boilers – biogas (landfill or sewage gas)	as actual	0.098	5, Biomass	0.098
45	waste heat from power station	as actual	0.075	5, Biomass	0.075
46	geothermal heat source	as actual	0.037	5, Biomass	0.037

Impacts for different fuel types

29. The decision was taken to integrate the fuel factors into the elemental recipe building. Furthermore the decision was taken such that the elemental recipe building, apart from the heating system, was the same (apart from biomass) for the different fuel types. This was principally to avoid excessive amounts of renewable energy generation being required for off-gas grid homes, potentially exceeding the available roof area in sub-optimal locations or orientations.
30. For LPG and oil, effectively the fuel factor has increased. In 2010, homes heated by LPG or oil would have required tougher building specifications than for a gas heated home. It is now possible to achieve compliance with the same building specifications as a gas heated home.
31. For electric homes, the elemental recipe elemental recipe building is based on a heat pump. The coefficient of performance (COP) of the heat pump has been selected to approximately achieve similar carbon dioxide emissions as for a gas heated home. Due to the application of the same fuel factor to both direct electric and heat pump heated dwellings it was previously possible for comply with Part L 2010 with heat pumps delivering significantly higher carbon emissions than a gas heated home. This change reflects the improved efficiency of heat pumps over a direct electric heating solution and the requirement to improve the carbon efficiency of electrically heated homes to a similar level to gas heated homes.
32. An implication of this is that direct electric heated buildings (apartment buildings being traditionally most prevalent) will not have a relief in meeting the carbon target and will need to achieve significantly better specifications than that in the electric heat pump heated elemental recipe building. It is possible to improve the fabric performance beyond that in the elemental recipe building, although this will have diminishing returns, particularly for mid-floor flats with a small exposed surface area and thus relatively low space heating demand. An alternative option is to improve service efficiency, for example through the use of shower waste water heat recovery units.
33. A cost comparison would need to be undertaken between improving fabric and/or services or increasing the amount of low and zero carbon technologies. A further option is switching to an alternative fuel type for heating, such as a communal gas boiler, which may help to cost-effectively achieve the carbon target.
34. Finally, no PV has been included in the biomass elemental recipe building. This takes into account the low carbon intensity of biomass fuel. However, the elemental recipe building has the same standard of energy efficiency to ensure that such buildings will be both low energy and low carbon.

Non-domestic buildings

Introduction

35. For non-domestic buildings, the approved calculation tools include the Simplified Building Energy Model (SBEM) with iSBEM as its interface, SBEM with alternative approved commercial interfaces, and approved Dynamic Simulation Models (DSMs). Versions of current tools updated to deal with Part L 2013 are expected to be available in advance of implementation. To accompany this consultation package, an updated version of SBEM – cSBEM – is available to download from www.2013ncm.bre.co.uk.

36. The NCM Modelling Guide defines the calculation assumptions and protocols to be used for both the actual and notional building. Much of that document remains unchanged from 2010 with the important exception of the definition of a new target primary energy consumption (TPEC) as laid out in the proposed changes to the approved document. The TPEC, together with some key changes to calculation algorithms, are summarised below. We deal finally with the changes relating to the definition of the notional building.

37. The following changes are proposed for the calculation methodology for actual buildings from 2013.

Compliance with Building Regulations

38. This section of the manual defines the basis for setting the newly proposed 2013 Target Primary Energy Consumption (TPEC) and the 2013 Target Emission Rate (TER). Regulation 17C requires that all new buildings must achieve or better these targets. Both the TPEC and the TER are based on the performance of the Notional building (see below), and the following procedure must be followed in order to establish the TPEC and the TER. The procedure converts calculated building loads into energy (and hence primary energy and CO_2 emissions) using seasonal efficiency parameters. *This approach is adopted to avoid the need to define appropriate system models appropriate to each type of building. It also ensures a consistent approach to the target setting process.*

The target primary energy consumption (TPEC) and the target emission rate (TER)

39. The TPEC is the primary energy consumption of the 2013 Notional Building. All electrical demand is assumed to be supplied from the grid, i.e. energy generated by the notional building's PV system is disregarded.

40. The TER is the CO_2 emission rate of the 2013 Notional building *including* an allowance for energy generated by the notional building's PV system.

Low and zero carbon systems

41. When calculating the building primary energy consumption (BPEC) all electrical demand must be assumed to be supplied from the grid, i.e. any energy generated from renewable technologies (principally PV and wind) must be disregarded. This is because the TPEC/BPEC calculation is a measure of the energy efficiency of fabric and services only. Electrical energy generated by CHP

may however be counted towards reductions in energy associated with heating systems.

42. The following approach must be followed when calculating the impact of on-site electrical generation for both BER calculations and EPCs as applied to non-dwellings.

- Calculate the annual electrical energy used by the building irrespective of source of supply. Multiply that demand by the grid average CO_2 emission factor.

- Calculate the electricity generated by the on-site system and multiply that by grid-displaced CO_2 emission factor, irrespective of the proportion of the electricity that is used on site and how much is exported.

- The electricity related CO_2 emissions used to establish the BER is the net figure i.e. a) – b) above.

- Any fuel used in generating the electricity (e.g. in a CHP engine) is added (at its appropriate CO_2 emission factor) to arrive at the total building CO_2 emissions.

Lighting

43. Lighting is defined at zone level. The user sets the general power density required to achieve the design illuminance in each zone provided that the design illuminance is equal to or greater than the NCM activity lighting level. Where the design illuminance is less than the NCM activity lighting level the general power density should be pro-rated to the NCM activity lighting level.

44. For building regulations compliance, the general lighting can defined explicitly by calculating and inputting the design/installed circuit power or by inference, but the resulting wattage in each zone must be reported in the Building Regulations UK Part L (BRUKL) summary.

45. For general lighting the following inference methods can be used in addition to the explicit method for Building Regulations compliance to define the general lighting:

    a. **Inference method 1** - User sets the Lamp efficacy in lumens per circuit-watt, the light output ratio of the luminaire and the design illuminance, to determine the efficacy of the lighting system in terms of luminaire lumens per circuit-watt, which can be pro-rated against the notional lighting curve (*which is based on 65 luminaire lumens per circuit-watt*) to infer a power density for the general lighting.

    b. **Inference method 2** - User assigns a lamp type and design illuminance for each zone, based on Table 4, where the luminaire efficacy can be pro-rated against the notional lighting curve (*which is based on 65 luminaire lumens per circuit-watt*) defined by Table 4 below to infer a power density per 100 lux for the general lighting.

Table 4 Lamp inference data

Lamp type	Luminaire lumens per circuit-watt			
	• For all buildings except those specified in the next column		For modular or portable "distress purchase" buildings with a planned time of use less than 2 years	
	Side-lit and no-lit activities	Roof-lit activity	Side-lit and no-lit activities	Roof-lit activity
LED	27.5	33.0	55.0	55.0
Tungsten and Halogen	7.5	9.0	7.5	9.0
Fluorescent - compact	22.5	27.0	22.5	27.0
T12 Fluorescent - halophosphate - low frequency ballast	25.0	30.0	25.0	30.0
T8 Fluorescent - halophosphate - low frequency ballast	27.5	33.0	55.0	55.0
T8 Fluorescent - halophosphate - high frequency ballast	32.5	39.0	55.0	58.5
T8 Fluorescent - triphosphor - high frequency ballast	36.3	43.5	55.0	65.3
Metal Halide	25.0	39.0	25.0	39.0
High Pressure Mercury	22.5	27.0	22.5	27.0
High Pressure Sodium	35.0	42.0	35.0	42.0
T5 Fluorescent - triphosphor-coated - high frequency ballast	37.5	45.0	56.3	67.5
Fluorescent (no details)	22.5	27.0	22.5	27.0

46. Design lighting power densities should be inputted as designed where design illuminance levels are greater than the NCM activity lighting levels. Where design illuminance levels are less than NCM activity lighting levels power densities are adjusted to the appropriate NCM activity lighting level. *For example, an office with installed lighting load density of 10 W/m² that delivers 500 lux illuminance would remain at 10 W/m² for the purpose of compliance because the NCM activity assumes a lower level of 400 lux illuminance. However, an office with installed lighting load density of 6 W/m² that delivers 300 lux illuminance (i.e. 2 W/m² per 100 lux) would be adjusted to 8 W/m² for the purpose of compliance.*

47. For Part L compliance, the lighting power density for activities such as storage warehouses and retail spaces which have racking/shelving should be adjusted to ignore these elements (as the notional building does not take these into account). (NB: this change was introduced into the 2010 NCM Modelling Guide in November 2011).

Pumps

48. The pump power density for the notional building will be zero in zones with roof-lit activities satisfying the conditions in the footnote in Table 7 in the NCM Modelling Guide. In all other cases, the pump power density for the notional building will depend on the HVAC system configuration in the actual building so that:

    - if the actual building's HVAC system is a wet system, the pump power density for the notional building is 0.30 W/m² where the HVAC system only provides heating, and 0.90 W/m² if it provides air-conditioning;
    - if the HVAC system in the actual building is based on a dry system (e.g. split system), then the notional building will have zero pump power.

District Heating

49. Where district heating systems are used for space heating and/or hot water, the primary energy factor for space heating and/or hot water in the notional building will be 0.85 kWh/kWh regardless of the fuel(s) used in the actual district heating system. For the purposes of calculating the TER the fuel emission factor for space heating and/or hot water will be 0.15 kgCO_2/kWh. This represents a typical, though, not exceptional district heating system supplied by gas-CHP with an electrical efficiency of 30% and heat efficiency of 50% supplying 70% of the heat load. In this way district heating systems offering improved performance are incentivised.

Activity Database

50. Following a review of all parameters in the Activities Database, a number of minor changes have been made to correct inconsistencies.

Changes to the Notional Building

51. One change from 2010 is that an additional category of notional building is defined. This has the effect of splitting the 'side-lit' building into those with and without artificial cooling in place. There are therefore 4 categories of notional building, applicable to each defined zone in the actual building and based on the source of daylight (if any):

    a. Side-lit, heated only
    b. Side-lit heated and cooled
    c. Top-lit
    d. Un-lit (theatres, cinemas, etc)

52. These buildings are then divided into a further sub-category based on gross internal area (GIA). A default air-permeability of 5m^3/m^2/hour will be set for the notional building in all buildings with a GIA less than or equal to 250m^2 in order to align better with the domestic notional building and address concerns that smaller buildings find high levels of air-tightness difficult to achieve.

53. Additional changes have been made to the treatment of heating fuels in the notional building. In 2010, a change was made to the notional building whereby, broadly, the same heating fuel was used in the notional building as specified in the actual building. This was to reduce the ability of lower carbon fuels to meet the TER and emphasise the importance of energy efficient fabric and services. Since a primary energy target is proposed for 2013 this is no longer necessary and it is proposed therefore that the actual building should be compared to gas or oil depending on whether a gas supply is available on site.

54. The following fuel must be used for space and water heating services in the notional building:

    a. Where mains gas is available on site (even if it does not supply any heating services in the actual building), mains gas must be used in the notional building to supply both space and water heating.

    b. Where mains gas is used for any space or water heating in the actual building, mains gas must also be used in the notional one. This means that if mains gas is used for heating, but another fuel is used to supply hot water (or vice versa), then in the notional building, gas must be used for both services on the basis that it is available.

    c. Where neither paragraph 54.a nor paragraph 54.b applies, oil must be used for space and water heating services in the notional building.

55. Other than the changes specified in the following two tables (Table 5 for the 7% aggregate improvement in primary energy and Table 6 for the 10% aggregate improvement), the specification for each of these buildings is as in the 2010 NCM modelling guide.

Table 5– Concurrent notional building specification – 7% aggregate saving in primary energy

Element	Side lit or unlit (where HVAC specification is heating only)	Sidelit 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)	1.8 (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	55%
Light Transmittance (%)	N/A	N/A	60%
Air-permeability (m^3/m^2/hour) Gross Internal Area greater than 250m^2	3	5	5
Air-permeability (m^3/m^2/hour) Gross Internal Area less than or equal to 250m^2	5	5	5
Lighting Luminaire (lm / circuit watt)	55	65	65
Occupancy control (Yes/No)	Yes	Yes	Yes
Daylight control (Yes/No)	Yes	Yes	Yes
Heating efficiency (Heating and hot water)	88%	91%	91%
Central Ventilation SFP (W/l/s)	1.8	1.8	1.8
Terminal Unit SFP (W/l/s)	0.5	0.4	0.4
Cooling (SEER / SSEER)	4.5 / 3.6	4.5 / 3.6	4.5 / 3.6
Cooling (SSEER)[67]	2.7	2.7	2.7
Heat recovery efficiency (%)	70%	70%	70%
Variable speed control of fans and pumps, controlled via multiple sensors (Yes/No)	Yes	Yes	Yes
Demand control (mechanical ventilation only). Variable speed control of fans via CO_2 sensors (Yes/No)	No	Yes	Yes

[67] Mixed mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses

Renewable Energy Contribution Monocrystalline PV with an efficiency of 15%. 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.	For 10% aggregate reduction in ***TER***: 1% of gross internal area

Table 6 – Concurrent notional building specification – 10% aggregate saving in primary energy (Welsh Government's preferred option)

Element	Side lit or unlit (where HVAC specification is heating only)	Sidelit 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 ($W/m^2.K$)	1.8 (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	55%
Light Transmittance (%)	N/A	N/A	60%
Air-permeability (m^3/m^2/hour) Gross Internal Area greater than $250m^2$	3	5	5
Air-permeability (m^3/m^2/hour) Gross Internal Area less than or equal to $250m^2$	5	5	5
Lighting Luminaire (lm / circuit watt)	65	65	65
Occupancy control (Yes/No)	Yes	Yes	Yes
Daylight control (Yes/No)	Yes	Yes	Yes
Heating efficiency (Heating and hot water)	91%	91%	91%
Central Ventilation SFP (W/l/s)	1.8	1.8	1.8
Terminal Unit SFP (W/l/s)	0.4	0.3	0.4
Cooling (air-conditioned) (SEER / SSEER)	4.5 / 3.6	4.5 / 3.6	4.5 / 3.6
Cooling (mixed mode) (SSEER)[68]	2.7	2.7	2.7
Heat recovery efficiency (%)	70%	70%	70%
Variable speed control of fans and pumps, controlled via multiple sensors	Yes	Yes	Yes
Demand control (mechanical ventilation only). Variable speed control of fans via CO_2 sensors	Yes	Yes	Yes
Renewable Energy Contribution	For 11% aggregate reduction in ***TER***: None		
Monocrystalline PV with an efficiency of 15%. 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.	For 20% aggregate reduction in ***TER***: 5% of gross internal area Welsh Government's preferred option		

[68] Mixed mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses

Chapter 7: Proposed changes to the Domestic Building Services Compliance Guide

This chapter lists the proposed changes to the Building Regulations Domestic Building Services Compliance Guide and has been produced for consultation purposes. It should be read alongside the online 2010 edition of the Guide, which can be viewed at: www.planningportal.gov.uk/uploads/br/domestic_building_compliance_guide_2010.pdf
Please note that this version incorporates corrections made to the Guide in July 2011.

Final guidance will be produced to accompany the final regulatory changes.

The changes are intended to:

- Clarify and correct guidance in the 2010 edition
- Raise product energy performance standards where practical and cost effective
- Harmonise standards throughout the UK
- Bring energy performance standards and methods of specifying performance into line with European directives and standards.

Text from the 2010 version is shown in black for statutory guidance and *italic black* for supplementary (non-statutory) advice.

Deletions from the 2010 version are shown in ~~black strikethrough~~.

Text which is new to this version is shown in blue for new statutory guidance and *italic blue for new supplementary (non-statutory) advice*.

Explanatory text that will not be part of the guidance is shown in *purple italic*.

Editorial changes to existing text (for example to punctuation) may not be shown.

Section	Revised text	Comment
1. Introduction Page 6	**1.3 European Directives** Fixed building services products such as boilers, circulators and heat pumps shall at the appropriate time comply with all relevant requirements of EU Directives, ~~including the Eco-design of Energy Using Products (EuP) Framework Directive 2005/32/EC and Directive 2009/28/EC on the Promotion of the Use of Energy from Renewable Sources (Renewable Energy Directive).~~ *Two key energy directives are the Eco-Design Directive 2009/125/EC, which sets minimum standards for products placed on the EU market and has been transposed in the UK by the Eco-Design for Energy- Related Products Regulations 2010 (SI 2010 No 2617); and the 'Renewable Energy Directive' 2009/28/EC, which among other things sets out criteria for certification schemes for installers of renewables, and has been transposed in the UK by the Promotion of the Use of Energy from Renewable Sources Regulations 2011 (SI 2011 No 243).*	These Directives do not necessarily impose mandatory requirements on designers and installers, so this information is included as supplementary guidance.
Page 8	**1.6 Key terms** ~~Replacement system means fixed building services installed as a replacement for a system in an existing building.~~ *Throughout the Guide, replace the term 'Replacement systems' with 'Component replacements' or 'Work on existing systems' as appropriate.*	To clarify that the guidance is about component replacement rather than replacement of whole systems
Page 8	**1.7 Replacement of primary heating appliances** *Throughout the Guide, replace references to 'SAP 2009' with 'SAP 2012'.*	An updated SAP is scheduled to be published in 2012 by DECC following consultation. See www.bre.co.uk/SAP2012

Page 8, Section 1.7.	*Insert after final paragraph on page 8:* **Electric flow boilers** If it is not practical or permissible to fit a replacement gas boiler in a dwelling – for example because the boiler installation would not comply with relevant British Standards or the Building Regulations, or listed building consent has not been granted to install a new flue or gas supply – then, providing there is no possible alternative, fitting an electric flow boiler in accordance with the guidance on electric heating systems in Section 4 of this Guide would be acceptable, and count as making 'reasonable provision' for the purposes of complying with Part L requirements.	To cater for existing buildings where there may be restrictions on the use of gas heating.
2. Gas-fired space heating and hot water systems Page 15, Table 1 Page 22, Table 2 **3. Oil-fired space heating and hot water systems** Page 36, Table 9 Page 43, Table 10	*Delete column three of Tables 1, 2, 9 and 10, headed 'Replacement systems'.* *Insert after Table 2 and after Table 10 the table in Appendix 1 of this chapter on 'Recommended minimum standards when replacing components of existing domestic heating systems'.*	To clarify recommendations when carrying out work on existing systems.
2. Gas-fired space heating and hot water systems Page 16 Table 1, 1.0: Efficiency	**Supplementary information** ~~*Where condensing boilers are fitted, systems*~~ *Systems with condensing boilers should be designed to have low primary return water temperatures, preferably less than 55 degC, to maximise condensing operation.* ~~*Low temperature heat emitters, such as underfloor heating, and weather compensation are examples of techniques which provide low return water temperatures.*~~ *Low return water*	

	temperatures can be obtained through techniques such as weather compensation and the use of low temperature heat emitters (for example oversized radiators and underfloor heating elements). *Low temperature heat emitters will also be compatible with low temperature heat generators, such as heat pumps, that might be installed as replacements in the future.*	Note added on future proofing.
2. Gas-fired space heating and hot water systems Page 23, Table 2: 5.0 **3. Oil-fired space heating and hot water systems** Page 45, Table 10: 5.0 **4. Electric heating systems** Page 55, Table 14: 4.0 **5. Solid fuel heating systems** Page 73, Table 21: 4.0	**Temperature control of space heating** a. Separate temperature control of zones within the dwelling should be provided using: i. room thermostats or programmable room thermostats in all zones; and/or ii. individual radiator controls such as thermostatic radiator valves (TRVs) on all radiators other than in reference rooms (with a thermostat) and bathrooms.	Revert to 2008 guidance allowing temperature control of zones with TRVs as well as room thermostats: to align with Scottish standards and because cost-effectiveness of having two room thermostats in dwellings under 150m^2 is not proven.
2. Gas-fired space heating and hot water systems Page 25, Table 3 **3. Oil-fired space heating and hot water**	***Recommended minimum standards for insulation of pipework*** a. Pipes should be insulated to comply with the maximum permissible heat loss indicated in the Supplementary Information column, and labelled accordingly, as follows: i. Primary circulation pipes for heating ~~and hot water~~ circuits should be insulated wherever they pass outside the heated living	Correction.

systems Page 47, Table 11 **4. Electric heating systems** Page 59, Table 16 **5. Solid fuel heating systems** Page 74, Table 22 **6. Community heating systems** Page 88, Table 28	space or through voids which communicate with and are ventilated from unheated spaces. ii. Primary circulation pipes for domestic hot water circuits should be insulated throughout their length, subject only to practical constraints imposed by the need to penetrate joists and other structural elements. iii. All pipes connected to hot water storage vessels, including the vent pipe, should be insulated for at least 1 metre from their points of connection to the cylinder (or they should be insulated up to the point where they become concealed). iv. If secondary circulation is used, all pipes kept hot by that circulation should be insulated.	
6. Community heating systems Page 89, Table 28	**Supplementary information** ***Designing for minimum heat losses*** *Heat losses can be reduced by optimising operating temperatures in conjunction with the need to minimise pumping energy. Variable volume control systems will assist in maintaining low return temperatures. While some bypasses may be needed to maintain the system in a hot condition ready to meet the demand, these should be controlled to the minimum flow needed. The use of temperature-controlled bypass valves – where the bypass operates only when flow temperature has dropped below a set level – is recommended.* *All pipework should be insulated to prevent uncontrolled heat loss when passing through communal spaces that may otherwise suffer from overheating.*	To reduce the likelihood of overheating in all spaces.

7. Underfloor heating systems Page 91, Table 29	*Replace existing text:* **1.0 System temperature control: Wet and electric underfloor heating systems** a. For systems with a high temperature heat source such as a boiler, a mixing valve should be fitted to ensure that the temperature of the water to the floor is reduced to the correct temperature for the type of floor and for the designed comfort conditions. The mixing valve may be of a two, three or four port type and will usually have thermostatic control to provide a fixed water temperature, set by the installer to suit the system. b. For systems with a low temperature heat source such as a heat pump, it may not be necessary to use a mixing valve but this should be verified as individual types of heat pump can vary. c. A high-limit thermostat should be installed as an additional safeguard. The thermostat should be positioned to sense the flow temperature produced by the mixing valve, and should be set to limit the flow temperature to prevent both damage to the floor and discomfort to the user. **2.0 Room temperature control: Wet and electric underfloor heating systems** a. Each room should be provided with its own sensor, thermostat or programmable thermostat. b. Where two adjacent rooms have a similar function, for example a kitchen and utility room, it may be appropriate to use one temperature control for both rooms. **Supplementary information** *There may be a benefit from fitting other types of controller which provide a water temperature which will vary according to the outside temperature.*	Provision of weather compensation is no longer a recommendation

Page 92, Table 29	*Replace existing text:* **4.0 Boiler control: Wet underfloor heating systems only** a. The heating system controls should be connected so that when there is no demand for heat, the heat source and pump are switched off.	
8. Mechanical ventilation systems Page 97	**8.2 Energy efficiency of mechanical ventilation systems** Mechanical ventilation systems should: a. follow the guidance in: ~~i. GPG 268 'Energy efficient ventilation in dwellings – a guide for specifiers'; and~~ ~~ii.~~ the CLG publication 'Domestic ventilation compliance guide' (available from www.planningportal.gov.uk/approveddocuments > Part F > Associated documents); b. meet the minimum standards for specific fan power, heat recovery efficiency and controls in Table 32; and c. comply with Commission Regulation (EU) No 327/2011 of 30 March 2011 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to eco-design requirements for fans driven by motors with an electrical input power between 125 W and 500 kW. **Supplementary information** *GPG 268 'Energy efficient ventilation in dwellings – a guide for specifiers', is a source of further information.*	GPG is no longer up-to-date but does contain useful information. So that the energy efficiency of installed products is no worse than that of products that can be placed on the market.
9. Heat pump systems Page 105 Table 34, 4.0: Controls	***External controls for warm water, hot water and warm air heat pumps*** a. Heat pump unit controls should include: i. ... *As existing*	

Page 108 Table 35, 2.0: Controls	b. External controls should include: ~~i. room thermostat to regulate the space temperature and interlocked with the heat pump unit operation;~~ ~~ii. timer to optimise operation of the heat pump.~~ i. weather compensation or internal temperature control; ii. timer or programmer for space heating. c. Minimum heat pump flow rates or volume requirements should be met. If all zones are thermostatically controlled then a buffer would be an acceptable method of compliance.	
10. Comfort cooling systems Page 109	**10.1 Scope of guidance** This section provides guidance on the specification of fixed mechanical comfort cooling systems and fans in dwellings to meet relevant energy efficiency requirements in building regulations. **10.2 Air-cooled and water-cooled air conditioners** Cooling systems in new and existing dwellings should: a. meet the minimum standards for efficiency in Table 36; ~~and~~ b. be controlled to prevent simultaneous heating and cooling of the same space within the dwelling; and c. comply with Commission Regulation (EU) No 327/2011 of 30 March 2011 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to eco-design requirements for systems with a cooling capacity of less than 12 kW, and fans driven by motors with an electrical input power between 125 W and 500 kW.	To clarify. So that the energy efficiency of installed products is no worse than that of products that can be placed on the market.
12. Lighting Page 123, Table 40	**Supplementary information** *A single switch should operate no more than four lamp units, with a total lamp capacity no greater than 50 circuit-watts.*	So that no more lamps than necessary are switched on to service smaller spaces.

14. Heating system circulators Page 127, Table 41	**Table 41: Recommended minimum standards for stand-alone, glandless heating system circulators** **New and ~~replacement~~ existing systems** a. ~~Stand-alone glandless circulators should be labelled for energy efficiency in accordance with the Europump Labelling Scheme, and have a rating in the range A to G.~~ In accordance with European Commission Regulation (EC) 641/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to eco-design requirements for stand-alone glandless circulators and glandless circulators integrated in products: a. From 1 January 2013, stand-alone glandless circulators, other than those specifically designed for primary circuits of thermal solar systems and of heat pumps, should have an Energy Efficiency Index (EEI) no greater than 0.27. b. From 1 August 2015, stand-alone glandless circulators and glandless circulators integrated in products should have an Energy Efficiency Index (EEI) no greater than 0.23.	The industry Europump Labelling Scheme is being superseded by an EC Regulation.

Appendix 1: Recommended minimum standards when replacing components of domestic heating systems

Component	Reason for replacing	Minimum standard	Best practice
Hot water cylinder	Emergency	Where the cylinder or installation is of a type that precludes the fitting of wired controls, either a wireless or thermo-mechanical hot water cylinder thermostat. If only the hot water cylinder is being replaced and separate time control for the heating circuit is not present, a single timing control for space heating and hot water.	For gravity-fed systems, consider upgrading to fully pumped.
	Planned	Boiler interlock and separate timing for space heating and hot water.	
	Emergency/ planned	For copper vented cylinders and combination units, the standing losses should not exceed $Q=1.28x(0.2+0.051V^{2/3})$ kWh/day, where V is the volume of the cylinder.	
Boiler or boiler heat exchanger	Emergency/ planned	Room thermostat or programmable room thermostat in all zones or Boiler interlock and room thermostat or programmable room thermostat in the living area, plus individual radiator controls such as thermostatic radiator valves (TRVs) in at least all bedrooms and bathrooms.	
Radiator	Emergency Planned	TRV to new radiator. TRVs to all radiators except in reference room.	
Replacement heating system but existing pipework retained		Boiler interlock and room thermostat, or programmable room thermostat in the living area, plus TRVs on all radiators except in reference room.	
New heating system in existing building		Follow guidance for new build	

Chapter 8: Proposed changes to the Non-Domestic Building Services Compliance Guide

This chapter lists the proposed 2013 changes to the Building Regulations Non-Domestic Building Services Compliance Guide and has been produced for consultation purposes. It should be read alongside the online 2010 edition of the Guide, which can be viewed at: www.planningportal.gov.uk/uploads/br/non-domestic_building_compliance_guide_2010.pdf.
Please note that this version incorporates corrections made to the Guide in July 2011.

Final guidance will be produced to accompany the final regulatory changes.

The changes are intended to:

- Clarify and correct guidance in the 2010 edition
- Raise product energy performance standards where practical and cost effective
- Harmonise standards throughout the UK
- Bring energy performance standards and methods of specifying performance into line with European Directives and standards.

Appendix 1 shows the proposed changes to the recommended minimum energy efficiency standards for non-domestic building services. This is a revised version of Table 1 in the 2010 edition of the Non-Domestic Building Services Compliance Guide.

Appendix 2 presents a proposal for two alternative approaches to specifying recommended minimum energy efficiency standards for lighting in non-domestic buildings, which is applicable to both new and existing buildings.

Text from the 2010 version is shown in black for statutory guidance and *italic black* for supplementary (non-statutory) advice.

Deletions from the 2010 version are shown in ~~black strikethrough~~.

Text which is new to this version is shown in blue for new statutory guidance and *italic blue for new supplementary (non-statutory) advice*.

Explanatory text that will not be part of the guidance is shown in *purple italic*.

Editorial changes to existing text (for example to punctuation) may not be shown.

Section	Revised text	Comment
1. Introduction Page 8	**1.3 European Directives** Fixed building services products such as boilers, circulators and heat pumps shall at the appropriate time comply with all relevant requirements of EU Directives~~, including the Eco-design of Energy Using Products (EuP) Framework Directive 2005/32/EC and Directive 2009/28/EC on the Promotion of the Use of Energy from Renewable Sources (Renewable Energy Directive)~~. *Two key energy directives are the Eco-Design Directive 2009/125/EC, which sets minimum standards for products placed on the EU market and has been transposed in the UK by the Eco-Design for Energy-Related Products Regulations 2010 (SI 2010 No 2617); and the 'Renewable Energy Directive' 2009/28/EC, which among other things sets out criteria for certification schemes for installers of renewables, and has been transposed in the UK by the Promotion of the Use of Energy from Renewable Sources Regulations 2011 (SI 2011 No 243).*	These Directives do not necessarily impose mandatory requirements on designers and installers, so this information is included as supplementary guidance.
Page 9	**1.5 How to use the guide** For each building service, the guide sets out recommended minimum energy efficiency standards for compliance with building regulations. Table 1 below presents a summary of the requirements. Unless specified otherwise in this guide, it is recommended that, where appropriate, building services are provided with controls that as a minimum correspond to Band C in BSEN 15232:2007, 'Energy performance of buildings – impact of building automation, controls and building management'.	To address the need for all fixed building services to be provided with a minimum level of cost-effective control.

Page 12	**Table 1: Summary of recommended energy efficiency standards for building services** *See Appendix 1of this chapter for revised table.*	To correct and raise standards as appropriate.
2. Gas, oil and biomass-fired boilers Page 19	**2.3 Key terms** **Direct acting weather compensation** is a type of control that enables a heat generator to work at its optimum efficiency. The control allows the boiler to vary its operating flow temperature to suit ~~weather~~ the external temperature conditions and the temperatures inside the building. Weather compensation relies on communication between an external sensor and one inside the boiler. The boiler's water flow temperature is varied accordingly, so that energy is not wasted by the boiler turning on and off. **Weather compensation via a mixing valve** is similar to **direct acting weather compensation** except that the outside temperature is used to control the temperature of water supplied to the heat emitters ~~is controlled by~~ mixing the boiler flow and return rather than by altering the boiler temperature.	To improve accuracy.
Page 24 first paragraph:	**2.5 Boilers in new buildings** **Condensing boilers** will meet projected efficiencies only when they operate with a system return temperature between 30˚C and 40˚C for 80 per cent of the annual operating hours. With a return temperature of 55˚C and above, **condensing boilers** will not produce condensate and will have similar efficiencies to non-condensing high efficiency boilers. Some systems are suitable for ~~outside compensator control~~ weather compensation, which allows return temperatures to fall into the condensing range for some periods of the heating season, and they may be best served by a mixture of condensing	

	and non-condensing boilers.	
8.0 Domestic hot water Page 56	**8.2 Scope of guidance** The guidance in this section covers the conventional gas, electric and oil-fired domestic hot water systems shown in Table 26. The recommended minimum standards of this section apply only to dedicated water heaters. Central heating boilers which provide space heating and domestic hot water should meet the minimum standards in Section 2. Section 3 contains guidance on the use of heat pumps to heat domestic hot water. This section does not cover solar thermal hot water systems. ~~– for this~~ For solar systems with a cylinder capacity of less than 440 litres or collector surface area less than 20 sq metres, see the 'Domestic building services compliance guide'. For larger systems, consult the CIBSE solar thermal design guide. ~~However,~~ The guidance in this section does apply to back-up gas or electric systems used with solar thermal hot water systems.	To add reference to guidance for larger commercial and industrial installations.

Page 59	**8.4 Domestic hot water systems in new and existing buildings** Domestic hot water systems in new and existing buildings should meet the recommended minimum standards for: a. heat losses from DHW storage vessels in Table 28, or maintenance consumption values in EN 89:2000, 'Direct-fired storage water heaters', section 8.2, 'Maintenance consumption' *[insert reference as footnote]* b. thermal efficiency (gross calorific value) in Table 29 c. controls in Table 30.	To add reference to relevant European standard.
9. Comfort cooling Page 66	**9.2 Scope of guidance** The guidance covers the specification of refrigeration plant efficiency in terms of the European seasonal energy efficiency ratio (ESEER – see definition below), which is the value used by SBEM to calculate the carbon dioxide emission rate for a new building. SBEM allocates standard correction factors[33] to the performance of cooling plant to account for the use of the different systems of distributing cooling to the spaces. Evaporative cooling and desiccant cooling systems are not within the scope of this guidance. *Throughout the rest of Section 9, the term ESEER replaces the term SEER.*	Industry has adopted the ESEER as a standard formula for calculating energy efficiency using load profile weighting factors suited to European conditions.
Page 67	**9.3 Key terms** **Seasonal energy efficiency ratio (SEER)** means the ratio of the total amount of cooling energy provided divided by the total energy input to the cooling plant (which may comprise more than one cooling unit), summed over the year.	

	Where an industry approved test procedure for obtaining performance measurements of cooling plant at partial load conditions exists, the SEER of the cooling plant may be estimated from the EER of the cooling plant measured at partial load conditions, adjusted for the cooling load profile of the proposed building. Equation 10 illustrates how to determine the seasonal efficiency of the cooling plant at four steps of load control for a single chiller well matched to the applied load: SEER = $a(EER_{100})+b(EER_{75})+c(EER_{50})+d(EER_{25})$ **Equation 10** where: EER_x is the EER measured at the defined partial load conditions of 100%, 75%, 50% and 25% and: a, b, c, and d are the load profile weighting factors relevant to the proposed application. *Insert new definition:* **European seasonal energy efficiency ratio (ESEER)** means the **SEER** with load profile weighting factors of: a = 0.23, b = 0.41, c = 0.33, d = 0.03	
Page 68	**9.4 Comfort cooling in new and existing buildings** For comfort cooling systems in new and existing buildings: a. the full load energy efficiency ratio (EER) of each cooling unit of the cooling plant should be no worse than recommended in Table 34; ~~and~~ b. controls should be no worse than recommended in Table 35; and	

	c. cooling units should comply with Commission Regulation (EU) No 327/2011 of 30 March 2011 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to eco-design requirements for systems with a cooling capacity of less than 12 kW, and fans driven by motors with an electrical input power between 125 W and 500 kW.	So that the energy efficiency of installed products is no worse than that of products that can be placed on the market.
10. Air distribution systems Page 74 Page 75	**10.4 Air distribution systems in new and existing buildings** Air distribution systems in new and existing buildings should meet the following recommended minimum standards: a. Air handling systems should be capable of .... e. The specific fan power of air distribution systems at the design air flow rate should be no worse than in Table 36 for new buildings and in Table 39 for existing buildings. Specific fan power is a function of the system resistance that the fan has to overcome to provide the required flow rate. EN 13779, 'Performance requirements for ventilation and room-conditioning systems', Table A8 provides guidance on system pressure drop. To minimise specific fan power it is recommended that the 'low range' is used as a design target. . . h. Ventilation fans driven by electric motors should comply with Commission Regulation (EU) No 327/2011 of 30 March 2011 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to eco-design requirements for fans driven by motors with an electric input power between 125 W and 500 kW.	To help reduce design pressure drops in systems, which will help with meeting the SFPs. So that the energy efficiency of installed products is no worse than that of products that can be placed on the market.

Page 76	*Amend heading of Table 37:* Table 37: Extending SFP for additional components for new and existing buildings	To clarify
12. Lighting Page 85	*See Appendix 2 of this chapter for revised guidance on lighting.*	
13. Heating and cooling system glandless circulators and water pumps Page 90, Table 48	**Table 48: Recommended minimum standards for heating system glandless circulators and water pumps in new and existing buildings** a. ~~All glandless circulators up to 2.5 kW should be labelled under the Europump Labelling Scheme, and have a rating within the range A to G.~~ a. In accordance with European Commission Regulation (EC) 641/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to eco-design requirements for stand-alone glandless circulators and glandless circulators integrated in products: i. From 1 January 2013, stand-alone glandless circulators up to 2.5 kW, other than those specifically designed for primary circuits of thermal solar systems and of heat pumps, should have an Energy Efficiency Index (EEI) no greater than 0.27. ii. From 1 August 2015, stand-alone glandless circulators up to 2.5 kW, and glandless circulators integrated in products, should have an Energy Efficiency Index (EEI) no greater than 0.23. b. Variable speed glandless circulators should be used on variable volume systems. c. If a water pump is used on a closed loop circuit and the motor is rated at	The industry Europump Labelling Scheme is being superseded by an EC Regulation.

	more than 750 W, then it should be fitted with or controlled by an appropriate variable speed controller on any variable volume system. On water pump booster sets with an open loop circuit, the static head should be checked before an appropriate variable speed controller is used.	

Appendix 1

Table 1: Summary of recommended minimum energy efficiency standards for building services		
Building service		**Standard**[69]
Gas, oil and biomass-fired boilers (a) New buildings		**Boiler seasonal efficiency (gross[70])**
Natural gas	Single boiler system	~~86%~~ 91%
	Multiple-boiler system	82% for any individual boiler 86% for the overall multi-boiler system
LPG	Single boiler system	~~87%~~ 93%
	Multiple-boiler system	82% for any individual boiler 87% for the overall multi-boiler system
Oil	Single boiler system	~~84%~~ 86%
	Multiple-boiler system	82% for any individual boiler 84% for the overall multi-boiler system
Biomass – independent automatic pellet/woodchip		75%
Gas, oil and biomass-fired boilers (b) Existing buildings		**Effective boiler seasonal efficiency (gross)**
Natural gas		84%
LPG		85%
Oil		86%
Biomass – independent automatic pellet/woodchip		75%
Heat pump systems		**CoP (Heat generator efficiency)**
All types (except absorption heat pumps and gas-engine heat pumps) for space heating		~~2.2~~ 2.5 (~~220%~~ 250%) when operating at the rating conditions[71]

69 All values are minimum values and apply to new and existing buildings, except where stated.

70 Efficiency is heat output divided by calorific value of fuel. The net calorific value of a fuel excludes the latent heat of water vapour in the exhaust, and so is lower than the gross calorific value. Efficiency test results and European standards normally use net calorific values. SAP 2012 (at www.bre.co.uk/sap2012), which uses gross values, gives factors in Table E4 for converting net efficiency to gross efficiency (e.g. 0.901 for natural gas, 0.921 for LPG, 0.937 for oil).

71 Rating conditions – standardised conditions provided for the determination of data presented in BS EN 14511:2007 *Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling*.

Table 1: Summary of recommended minimum energy efficiency standards for building services		
Building service	**Standard**[69]	
All types (except absorption heat pumps and gas-engine heat pumps) for domestic hot water heating	2.0 (200%) when operating at the rating conditions	
Absorption heat pumps	0.5 (50%) when operating at the rating conditions	
Gas-engine heat pumps	1.0 (100%) when operating at the rating conditions	
Heat pump systems (BS EN 15450:2007 Tables C1 & C2)	**Seasonal performance factor**	
	New build	**Retrofit**
Air / water	2.7	2.5
Ground / water	3.5	3.3
Water / water	3.8	3.5
Gas and oil-fired warm air systems	**Thermal efficiency (net)**	
Gas-fired forced convection (natural gas)	~~91%~~ 100%	
Gas-fired forced convection (LPG)	~~91%~~ 100%	
Direct gas-fired forced convection	100%	
Oil-fired forced convection	91%	
Radiant heaters	**Efficiency (net)**	
	Thermal	**Radiant**
Luminous radiant heater (unflued)	86%	~~55%~~ 60%
Non-luminous radiant heater (unflued)	86%	~~55%~~ 60%
Non-luminous radiant heater (flued)	86%	~~55%~~ 60%
Multi-burner radiant heater	~~91%~~ 86%	~~N/A~~ 60%
CHP	**CHPQA quality index**	**Power efficiency**
All types	105	20%
Electric (primary) heating	**Seasonal efficiency**	
Boiler	N/A	
Warm air	N/A	

Table 1: Summary of recommended minimum energy efficiency standards for building services			
Building service		**Standard**[69]	
Domestic hot water systems		**Thermal efficiency (gross)**	
		New building	**Existing building**
Direct-fired	Natural gas	90%	73%
	LPG-fired	92%	74%
	Oil-fired	77%	75%
Indirect-fired (dedicated hot water boiler)	Natural gas	80%	
	LPG-fired	81%	
	Oil-fired	82%	
Electric DHW heaters	Electricity	100%	
Comfort cooling systems		**Energy efficiency ratio (ESEER)**	
Packaged air conditioners – single duct types		~~2.5~~ 2.7	
Packaged air conditioners – other types		~~2.5~~ 2.7	
Split and multi-split air conditioners		~~2.5~~ 2.7	
Variable refrigerant flow systems		~~2.5~~ 2.7	
Vapour compression cycle chillers, water cooled <750 kW		~~3.85~~ 4.25	
Vapour compression cycle chillers, water cooled >750 kW		~~4.65~~ 5.05	
Vapour compression cycle chillers, air cooled <750 kW		~~2.5~~ 2.7	
Vapour compression cycle chillers, air cooled >750 kW		~~2.6~~ 2.9	
Water loop heat pump		3.2	
Absorption cycle chillers		0.7	
Gas engine-driven variable refrigerant flow		1.0	

Table 1: Summary of recommended minimum energy efficiency standards for building services	
Building service	**Standard**[69]
Air distribution systems (a) New buildings	**Specific fan power (max)**[72]
Central mechanical ventilation system including heating and cooling	~~1.8 W/(l/s)~~ 1.6 W/(l/s)
Central mechanical ventilation system including heating only	~~1.6 W/(l/s)~~ 1.5 W/(l/s)
All other central mechanical ventilation systems	~~1.4 W/(l/s)~~ 1.1 W/(l/s)
Zonal supply system where the fan is remote from the zone, such as ceiling void or roof mounted units	~~1.2 W/(l/s)~~ 1.1 W/(l/s)
Zonal extract system where the fan is remote from the zone	~~0.6 W/(l/s)~~ 0.5 W/(l/s)
Zonal supply and extract ventilation units such as ceiling void or roof units serving a single room or zone with heating and heat recovery	~~2.0 W/(l/s)~~ 1.9 W/(l/s)
Local supply and extract ventilation system such as wall/roof units serving a single area with heating and heat recovery	~~1.8 W/(l/s)~~ 1.6 W/(l/s)
Local supply or extract ventilation units such as window/wall/roof units serving a single area (e.g. toilet extract)	~~0.4 W/(l/s)~~ 0.3 W/(l/s)
Other local ventilation units	~~0.6 W/(l/s)~~ 0.5 W/(l/s)
Fan-assisted terminal VAV unit	~~1.2 W/(l/s)~~ 1.1 W/(l/s)
Fan coil units (rating weighted average)	~~0.6 W/(l/s)~~ 0.5 W/(l/s)
Air distribution systems (b) Existing buildings	**Specific fan power (max)**
Central balanced mechanical ventilation system including heating and cooling	2.2 W/(l/s)
Central balanced mechanical ventilation system including heating only	~~1.6 W/(l/s)~~ 1.8 W/(l/s)
All other central balanced mechanical ventilation systems	~~1.8 W/(l/s)~~ 1.6 W/(l/s)

[72] Maximum external pressure drop is not specified.

Table 1: Summary of recommended minimum energy efficiency standards for building services	
Building service	**Standard**[69]
Zonal supply system where the fan is remote from the zone, such as ceiling void or roof mounted units	~~1.5 W/(l/s)~~ 1.4 W/(l/s)
Zonal extract system where the fan is remote from the zone	~~0.6 W/(l/s)~~ 0.5 W/(l/s)
Zonal supply and extract ventilation units such as ceiling void or roof units serving a single room or zone with heating and heat recovery	~~2.0 W/(l/s)~~ 1.9 W/(l/s)
Local balanced supply and extract ventilation system such as wall/roof units serving a single area with heating and heat recovery	~~1.8 W/(l/s)~~ 1.6 W/(l/s)
Local supply or extract ventilation units such as window/wall/roof units serving a single area (e.g. toilet extract)	~~0.5 W/(l/s)~~ 0.4 W/(l/s)
Other local ventilation supply and/or extract units	~~0.6 W/(l/s)~~ 0.5 W/(l/s)
Fan-assisted terminal VAV unit	~~1.2 W/(l/s)~~ 1.1 W/(l/s)
Fan coil units (rating weighted average)	~~0.6 W/(l/s)~~ 0.5 W/(l/s)
Air distribution systems	**Dry heat recovery efficiency**
Plate heat exchanger	50%
Heat pipes	60%
Thermal wheel	65%
Run around coil	45%
Internal lighting	**Lighting efficacy**
See Appendix 2 below	
~~General lighting in office, storage and industrial areas~~	~~55 luminaire lumens per circuit watt~~
~~General lighting in other types of space other than office areas~~	~~55 lamp lumens per circuit watt~~
~~Display lighting~~	~~22 lamp lumens per circuit watt~~

Appendix 2

8 Lighting

8.1 Introduction

This section provides guidance on specifying lighting for new and existing non-domestic buildings to meet relevant energy efficiency requirements in building regulations. There are two alternative approaches, applicable both to systems in new buildings and to replacement systems in existing buildings.

8.2 Scope of guidance

The guidance in this section applies to the following types of lighting:

- general interior lighting
- display lighting.

8.3 Key terms

Add to existing key terms in 2010 edition of the guide:
LENI (Lighting Energy Numerical Indicator) is a measure of the performance of lighting in terms of energy per square meter per year (kWh/m^2/year), based on BS EN 15193 : 2007, 'Energy performance of buildings'.

8.4 Lighting in new and existing buildings

a. Lighting in new and existing buildings should meet the recommended minimum standards for
   i. efficacy (averaged over the whole area of the applicable type of space in the building) and controls in Table 44; or
   ii. the LENI in Table 45. The LENI should be calculated using the procedure described in section 12.5
b. Metering of lighting for new and existing buildings (to record the lighting energy consumption) should meet the minimum standards in Table 46.
c. Lighting controls in new and existing buildings should ~~meet the minimum standards in Table 47, or~~ follow the guidance in BRE Digest 498, 'Selecting lighting controls'. Display lighting, where provided, should be controlled on dedicated circuits that can be switched off at times when people will not be inspecting exhibits or merchandise or being entertained.

Minimum initial luminaire lumens per circuit-watt

This approach is similar to that adopted for 2010 in which a minimum initial luminaire lumens per circuit-watt (efficacy) is specified and acceptable reductions permitted on the basis of appropriate controls being used to control the lighting system. The proposal for 2013 is that the initial efficacy should be increased from 55 to 60 luminaire lumens per circuit-watt. The control factors

and corresponding reduced efficacies for 2010 and as proposed for 2013 are shown in the tables below.

2010		***Initial luminaire lumens/circuit-watt***
		55
Controls	***Control factor***	***Reduced luminaire lumens/circuit-watt***
a daylit space with photo-switching or dimming with or without override	*0.90*	*49.50*
b unoccupied space with manual on and auto off	*0.90*	*49.50*
a + b	*0.85*	*46.75*

Table 44: Recommended minimum lighting efficacy with controls in new and existing buildings		
		Initial luminaire lumens/circuit-watt*
		60
Controls	**Control factor**	**Reduced luminaire lumens/circuit-watt**
a daylit space with photo-switching with or without override	0.90	54
b daylit space with photo-switching and dimming with or without override	0.85	51
c unoccupied space with automatic on and off	0.90	54
d unoccupied space with manual on and auto off	0.85	51
e space not daylit, dimmed for constant illuminance	0.90	54
a + c	0.80	48
a + d	0.75	45
b + c	0.75	45
b + d	0.70	42
e + c	0.80	48
e + d	0.75	45

** This applies to 'general lighting in office, industrial and storage areas: for 'general lighting in other types of space' 55 luminaire lumens per circuit Watt is retained and likewise for 'display lighting' the minimum of 22 lamp lumens per circuit Watt is unchanged.*

8.5 Lighting Energy Numerical Indicator (LENI)

*The alternative approach proposed for 2013 is to adopt the **Lighting Energy Numerical Indicator (LENI)** method.*

The LENI method calculates the performance of lighting in terms of energy per square meter per year. The approach described below must be followed in calculating the LENI for a lighting scheme. The LENI should not exceed the Lighting Energy Limit in Table 45 for a given illuminance and hours run.

Design the Lighting

The first step to energy efficient lighting is to design the lighting installation in a way that meets all of the users' needs for the space under consideration. Recommendations for appropriate illuminance values and other lighting requirements may be found in BS EN 12464-1: 2011, 'Light and lighting - Lighting of work places - Indoor work places.' The Society of Light and Lighting (SLL) 'Code for Lighting' also provides these recommendations and the SLL Handbook provides practical advice on how to provide lighting for a number of different applications.

Look up the Lighting Energy Limit

In designing the lighting, a level of illuminance will have been selected as necessary for the tasks being done in a particular area. It is also necessary to determine how many hours per year the lighting will be needed. Once both the hours and the illuminance are known it is possible to look up the Lighting Energy Limit in Table 45. For example, a classroom in a school may be lit to 300 lux and used for 40 hours per week for 39 weeks of the year, giving a total of 1560 hours per year. Values of 1500 hours and 300 lux give a Lighting Energy Limit of 7.70. Table 45 also gives day time (Td) and night time (Tn) hour values which are used in the calculation of energy consumption.

If display lighting is used, then the Lighting Energy Limit may be increased by the value given for normal display lighting for the area of the room where display lighting is used. For example, in an entrance area for a building there may be some display lighting in a small area around the reception desk but not in the rest of the area.

Shop windows use a lot of display lighting and may use up to 192.72 kWh/m^2/yr if the window faces a public road, and 96.8 kWh/m^2/yr if the window is in a shopping centre that is closed during the night.

Calculate the Parasitic Energy Use (Ep)

If some form of lighting control system is used, then an allowance needs to be made for the energy used by the control system, and the fact that the luminaires take a little power even if they are dimmed down to give no light. An allowance of 0.3 W/m^2 should be made for power used in this way. If the

whole lighting system is switched off when the room is not in use, then the power loss is only during the hours of use. If the system is left on all the time then the power loss occurs for 8760 hours per year.

If no lighting control system is used, then the parasitic energy use is zero.

Determine the Total Power of Lighting (Pl)

This is the total power in Watts consumed by the luminaires within a space.

Determine the Occupancy Factor (Fo)

Fo allows for the fact that energy is saved if an automatic control system detects the presence or absence of people in a room and switches off the lights when there is nobody using the room. If no automatic control is used, then the Occupancy Factor Fo = 1. If controls turn off the lights within 20 minutes of the room being empty, then Fo = 0.8.

Determine the Factor for Daylight (Fd)

Fd allows for the fact that if the lighting is dimmed down when there is daylight available, then less energy will be used. If no daylight-linked dimming system is used, then Fd = 1. If the electric lighting dims in response to daylight being available, then in areas with adequate daylight Fd = 0.8. Adequate daylight may be found in areas that are within 6 m of a window wall or in areas where 10% or more of the roof is translucent or made up of rooflights.

Determine the Constant Illuminance Factor (Fc)

When lighting is designed, a maintenance factor (MF) is used to allow for the fact that as the lighting system ages it produces less light. This means that on day one the lighting system is providing more light than needed. Thus with a constant illuminance system, it is possible to under-run the lighting on day one and then slowly increase the power used by the lighting, until the point is reached when maintenance needs to be carried out by changing the lamps or cleaning the luminaires. Systems that control the lighting in this way have an Fc = 0.9, and those that do not have an Fc = 1.

Determine the Daytime Energy Use (Ed)

The day time energy use is:

$$Ed = \frac{Pl \times Fo \times Fd \times Fc \times Td}{1000}$$

Determine the Night Time Energy Use (En)

The night time energy use is:

$$En = \frac{Pl \times Fo \times Fc \times Tn}{1000}$$

Calculate Total Energy (kWh) per Square Meter per Year (LENI)

The total energy per square meter per year is the sum of the day time, night time and parasitic energy uses per year divided by the area, as set out in the formula below:

$$LENI = \frac{Ep + Ed + En}{A}$$

Table 45: Recommended maximum lighting energy consumption (kWh) per sqm per year in new and existing buildings												
Hours			Illuminance (lux)								Display Lighting	
Total	Day	Night	50	100	150	200	300	500	750	1000	Normal	Shop window
1000	821	179	1.11	1.92	2.73	3.54	5.17	8.41	12.47	16.52	10.00	
1500	1277	223	1.66	2.87	4.07	5.28	7.70	12.53	18.57	24.62	15.00	
2000	1726	274	2.21	3.81	5.42	7.03	10.24	16.67	24.70	32.73	20.00	
2500	2164	336	2.76	4.76	6.77	8.78	12.79	20.82	30.86	40.89	25.00	
3000	2585	415	3.31	5.72	8.13	10.54	15.37	25.01	37.06	49.12	30.00	
3700	3133	567	4.09	7.08	10.06	13.04	19.01	30.95	45.87	60.78	37.00	
4400	3621	779	4.89	8.46	12.02	15.59	22.73	37.00	54.84	72.68	44.00	96.80
5400	4184	1216	6.05	10.47	14.90	19.33	28.18	45.89	68.03	90.17	54.00	
6400	4547	1853	7.24	12.57	17.89	23.22	33.87	55.16	81.79	108.41	64.00	
8760	4380	4380	10.26	17.89	25.53	33.16	48.43	78.96	117.12	155.29	87.60	192.72