2012 consultation on changes to the Building Regulations in England

Section two – Part L (Conservation of fuel and power)

Proposed changes to technical guidance

January 2012
Department for Communities and Local Government

Introduction

This document contains the proposed changes to the technical guidance which accompany the main proposals for changes to Part L in 2012/13. The main Part L proposals and the response forms can be found at: www.communities.gov.uk/publications/planningandbuilding/brconsultationsection2.

Note that although only lists of changes are shown for Approved Documents L1B, L2A and L2B, and the two Compliance Guides, when the final Building Regulations changes are made, complete new drafts of all these documents (incorporating final changes) will be published.

Contents

Chapter 1: Proposed Changes to Approved Document L1A

This chapter is a draft version of 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 *To be updated for final guidance*

Section 1: Introduction

What is an Approved Document?

1.1 This Approved Document, ~~which takes effect on 1 October 2010,~~ has been approved and issued by the 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'.

Proposed amendments would apply from October 2013 subject to any transitional arrangements and apply in England only.

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 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 DCLG website: www.communities.gov.uk;
- 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 and Regulation 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 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.

(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;

(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 he trades and 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.

(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.

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.~~ *Requirement L1(c) replaced by Regulation 40*	

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 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.

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/m^2). 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).

DFEE is the ***dwelling*** fabric energy efficiency expressed as kWh/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).

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 $kgCO_2/(m^2.year)$

TFEE is the Target Fabric Energy Efficiency expressed as $kWh/m^2/year$

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 43, 44(1, 2, 3 and 4) and 27 ~~20B, 20C and 20D~~ of the Building Regulations and regulations 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 the consultation proposals (section 1) for more details.

~~**3.13 Materials and workmanship**~~

~~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.~~

~~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.~~

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.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.

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

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.

~~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 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 2009 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 Dwelling Fabric Energy Efficiency (***DFEE***) must not be greater than the Target Fabric Energy Efficiency (***TFEE***), which is determined by following the procedure set out in paragraphs 4.1a to 4.1c.
- 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 4.2 to 4.6

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 ~~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.

*Regulations to be amended to cover **TFEE/DFEE** calculations*

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.

3.27 Criterion 3: the ***dwelling*** should have appropriate passive control measures to limit the effect of solar gains on indoor temperatures in summer, irrespective of whether or not the ***dwelling*** has mechanical cooling. The guidance given in paragraphs 4.25 to 4.27 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.*

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/m^2.K as calculated according to BS EN ISO 13370[6].

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.

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

Section 4: Design standards

The changes to this section reflect the preferred option in the consultation proposals: to introduce a regulatory fabric energy efficiency target for new homes alongside the existing CO_2 target.

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 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 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~~.

Regulation numbering to be confirmed at final stage.

Target Fabric Energy Efficiency (TFEE)

4.1a The Target Fabric Energy Efficiency ***(TFEE)*** is the maximum space heating and space cooling energy demand for a new ***dwelling*** approved by the Secretary of State in accordance with Regulation 25. It is expressed in units of kilowatt-hours of energy demand per m^2 of floor area per year (kWh/m^2/year).

- Apartment blocks and mid terrace homes have a ***TFEE*** of 39 kWh/m²/yr; and
- Semi detached, end of terrace and detached homes have a ***TFEE*** of 46 kWh/m²/yr

For the purposes of consultation, and to aid cross-referencing to the 2010 Building Regulations, it is assumed that the requirement for the fabric energy efficiency standard would be incorporated into Regulations 25 and 26. Final regulations will be confirmed for final proposals stage.

The two consultation options are for a TFEE of 39 and 46 kWh/m²/yr (equivalent to the Fabric Energy Efficiency Standard, FEES, proposed by Zero Carbon Hub for zero carbon dwellings) or 43 and 52 kWh/m²/yr (a less demanding fabric energy efficiency standard).

A separate document is available on the Zero Carbon Hub website which gives some examples of how these targets could be achieved for a variety of dwelling types: www.zerocarbonhub.org/consultations.aspx?news=26.

4.1b Some mid and end terraced houses/bungalows will need different targets due to the differences in the relative efficiency of their built forms. These are terraced houses with an internal garage or drive-through, and terraces built on a slope (stepped) and/or arranged so that each property is set back from its neighbouring property (staggered). Further guidance on setting a target for these dwellings can be found on the Zero Carbon Hub website at www.zerocarbonhub.org/consultations.aspx?news=26.

4.1c In accordance with the methodology approved by the Secretary of State in the Notice of Approval[7], the ***TFEE*** for individual ***dwellings*** must be calculated using SAP 2012.

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 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.

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

4.3 In accordance with the methodology approved by the Secretary of State in the Notice of Approval[8], the ***TER*** for individual ***dwellings*** must be calculated using SAP 2012 ~~2009~~.

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

a. First calculate the CO_2 emissions from a notional ***dwelling*** of the same size and shape as the actual ***dwelling*** and which is constructed according to the reference values as set out in Appendix XX of SAP 2012 *(see Chapter 5 Proposed changes to the National Calculation Methodology)*. No values may be varied from these reference values when establishing the ***TER***. The calculation tool will report the CO_2 emissions (based on SAP2012 CO_2 emission factors) arising from:

i. The provision of space heating and hot water, C_H
ii. The use of pumps and fans, C_{PF}
iii. The use of internal lighting, C_L

b. Secondly, calculate the 2013 TER using the following formula:

$$TER_{2013} = C_H \times FF + C_{PF} + C_L$$

Where FF is the fuel factor[9] taken from Table 1 in accordance with the guidance in paragraph 4.5.

*The main change is that the notional dwelling is now based on a set of parameters that deliver the targeted carbon improvement. It is not based on a historic notional building with improvement factors applied. As such, one means of achieving the **TER** would be to adopt the parameters in the notional dwelling for the actual dwelling. However, it is still a performance based approach and the actual dwelling can be based on any other solution as long as the **TER** is achieved and the guidance for Criteria 2 to 5 followed.*

Note that this paragraph is based on the AD as it would appear if the Government's preferred option of setting the CO_2 target was adopted (i.e. a target equivalent to the adoption of FEES plus efficient services). If the alternative approach (based on the targets set halfway between 2010 and Zero Carbon Hub's proposed 2016 targets) was adopted, the approach and guidance would be different. Then, instead of a notional dwelling, an absolute CO_2 target would be provided for different categories of dwelling. The target would be modified by the fuel factor depending on the fuel(s) used for space heating and domestic hot water.

See the chapter on National Calculation Methodology changes for full details of the two alternatives, and the main consultation document for the Government's rationale and preference for the notional dwelling approach.

~~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.~~

8 Notice of Approval of the methodology of calculation of the energy performance of buildings in England ~~and Wales~~.
9 The fuel factors have been modified to approximately deliver the same outcomes as in Part L 2010. The values have changed as a result of the change in methodology to calculate the TER.

~~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:~~

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

~~Where FF is the fuel factor[10] 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 CH 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).*~~

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:

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

b. 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.

10 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.

Table 1 Fuel factor	
Heating fuel	**Fuel factor**[1]
Mains gas	1.00
LPG	1.03 ~~1.10~~
Oil	1.08 ~~1.17~~
B30K	1.00
Grid electricity for direct acting and storage systems	1.25 ~~1.47~~
Grid electricity for heat pumps[2]	1.25 ~~1.47~~
Solid mineral fuel[~~3~~2]	1.15 ~~1.28~~
Any fuel with a CO_2 emission factor less than that of mains gas	1.00
Solid multi-fuel[~~3~~2]	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~~2. 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.

Government has not expressed a preference on the retention, and if so level, of fuel factor to be used for Part L 2013. The fuel factors shown above represent the central case in our modelling i.e. impact is reduced by approximately one half in relation to Part L 2010 values. See also Chapter 5 Proposed changes to the National Calculation Methodology and the consultation proposals.

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 ***TFEE*** and/or ***TER*** can be calculated for all the ***dwellings*** in the building. In such cases, the average ***TFEE*** or ***TER*** is the floor-area-weighted average of all the individual ***TFEEs*** or ***TERs***.

The average ***TER*** ~~and~~ is calculated according to the following formula:

$$\{(\mathbf{TER}_1 \times \text{Floor area}_1) + (\mathbf{TER}_2 \times \text{Floor area}_2) + (\mathbf{TER}_3 \times \text{Floor area}_3) + \ldots)\}$$

$$\div \{(\text{Floor area}_1 + \text{Floor area}_2 + \text{Floor area}_3) + \ldots\}$$

The average ***TFEE*** is calculated according to an identical formula, replacing ***TER*** with ***TFEE***.

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 *TFEE* and *TER*

The text from the current AD L1A has been reordered in this section. Paragraph numbers are as in the 2010 L1A guidance, and hence appear out of order. New paragraphs are shown in blue and numbered in accordance with the preceding paragraph. The numbering will be updated for the final guidance.

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

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~~.

Fabric energy efficiency and CO_2 emission rate calculations

4.9 Regulation 27 ~~20D~~[11] 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

11 There is a similar regulation (Regulation 12D) in the Building (Approved Inspectors etc.) Regulations 2000 (SI 2000/2532) which applies when an approved inspector is the BCB.

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 30 ~~17F~~; and

'specifications' means specifications used for the calculation of the CO_2 emission rate.

Fabric energy efficiency and 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 both the ***DFEE*** of the ***dwelling*** as designed is not greater than ***TFEE*** and 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.***

*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 software implementations of SAP 2012 ~~2009~~ 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.*

4.10a 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.

The recast Energy Performance of Buildings Directive (EPBD)[12] 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.

Fabric energy efficiency and CO_2 emission rate calculation *after completion*

4.11 After work has been completed, the builder must notify the ***BCB*** of the on-constructed values of both the ***TFEE*** and ***DFEE*** and 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 Products Characteristics 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.*

Calculating the *DFEE* and CO_2 emissions for the actual dwelling

4.11a In accordance with the methodology approved by the Secretary of State in the Notice of Approval, the ***DFEE*** and ***DER*** for individual ***dwellings*** must be calculated using SAP 2012.

4.8 To comply with regulation 26 ~~17C~~:

- The ***DFEE*** must be no worse than the ***TFEE*** as set out in paragraphs 4.1a to 4.1c; and
- the ***DER*** must be no worse than the ***TER*** calculated as set out in paragraphs 4.2 to 4.6.

The final ***DFEE*** and ***DER*** calculation produced in accordance with regulation 27 ~~20D~~ (see paragraph 4.11 above ~~below~~) must be based on the building as constructed, incorporating:

12 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:153:0013:0035:EN:PDF

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

Secondary heating

4.12 A secondary heating appliance may meet part of the space heat demand. When calculating the ***DER***, the fraction provided by the secondary heating system must be as defined by SAP 2012 ~~2009~~ 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

Fabric energy efficiency calculation

4.13a 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 is achieved if:

a. EITHER every individual ***dwelling*** has a ***DFEE*** that is no greater than its corresponding ***TFEE***;

b. OR the average ***DFEE*** is no greater than the average ***TFEE***. The average ***DFEE*** is the floor-area-weighted average of all the individual ***DFEEs***, and is calculated in the same way as the average ***TFEE***. 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 **DFEE** approach, it will still be necessary to provide information for each individual **dwelling**, as required by regulation 27.*

CO_2 emissions calculation

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 ***TFEE*** and ***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[13]) can play in achieving the ***TER***.

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.~~ 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.

13 ~~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/~~

CRITERION 2 – LIMITS ON DESIGN FLEXIBILITY

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 One way of showing that the requirement has been satisfied would be to demonstrate that the fabric elements and the ***fixed building services*** all satisfy the minimum energy efficiency standards 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.*

Introducing FEES helps limit fabric heat gains and losses. However, achieving the FEES standard could be very dependent on the high performance of one specific feature of the fabric design with much poorer fabric performance elsewhere. If this key element of fabric design was to fail, or perform less well than expected, this would have a significant impact on performance. Hence, we propose to continue to include limiting fabric parameters so that the overall package of measures remains robust.

Fabric standards

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[14], 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[15]; 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 2012 ~~2009~~ Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.

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

4.22 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 given in BR 443.

Table 2 Limiting fabric parameters	
Roof	0.16 ~~0.20~~ W/m^2.K
Wall	0.20 ~~0.30~~ W/m^2.K
Floor	0.18 ~~0.25~~ W/m^2.K
Party wall	0.20 W/m^2.K
Windows, roof windows, glazed rooflights, curtain walling and pedestrian doors	1.60 ~~2.00~~ W/m^2.K
Air permeability	10.00 m^3/h.m^2 at 50 Pa

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

These revised values in Table 2 are based on a TFEE of 39 and 46 kWh/m²/yr. If TFEE was selected to be 43 and 52 kWh/m²/yr, the roof, wall and floor values would be increased by 0.02 W/m^2.K and the glazing elements increased by 0.2 W/m^2.K.

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 standard for the particular type of system as set out in the *Domestic Building Services Compliance Guide*[16]. 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.

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

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 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.

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[17] 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[18] 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.*

17 TM36 Climate change and the indoor environment: impacts and adaptation, CIBSE, 2005.
18 BS 8206–2:2008 Lighting for buildings. Code of practice for daylighting.

4.27a As required by paragraph L1(a)(i) 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 information 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.

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.*

5.1a The person carrying out the building work can demonstrate that reasonable provision has been made by:

a. Demonstrating that a Publicly Available Specification quality assurance standard [XX] that codifies good practice in the design and construction of new homes has been followed. In this case, the calculated ***DER*** can be used directly in comparison with the ***TER***; or

b. Demonstrating that an alternative quality assurance standard has been followed that is equivalent to the standard mentioned in (a). In this case, the calculated ***DER*** can be used directly in comparison with the ***TER***; or

c. Increasing the calculated ***DER*** by 3% prior to comparison with the ***TER***, where no quality assurance scheme has been followed. In addition, Paragraphs 5.2 to 5.13 should be followed.

These options and the development of the PAS (or similar standard) and ways for demonstrating compliance are discussed at paragraphs 152 to 159 in Chapter 5 of the Part L consultation proposals. For such an approach to work, builders will need to demonstrate to the ***BCB*** *that they have followed the PAS. The text presented here is an initial indication of how the guidance could be worded, and will be reconsidered in light of consultation responses.*

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.

DELIVERING FABRIC PERFORMANCE

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.

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 3 U-values for party walls

Party wall construction	U-value (W/m^{2}K)
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

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 reference in the DCLG Accredited Construction Details[19]. The calculated linear thermal transmittance values can be used directly in the ***DER*** calculation; or

Where the approved design details in the reference are available for some junctions but not for all junctions, 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 junctions can be calculated as in (b) below.

b. Calculate linear thermal transmittances and temperature factors following the guidance set out in BR 497[18]. The linear thermal transmittance values can be 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[19]; or

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

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. 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.

*It could be helpful to builders and building control bodies if such reports are signed by a suitably qualified person. Note that because there is no formal quality assured process associated with this approach, the **DER** is increased by 3% as explained in paragraph 5.2.*

~~**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[20]. 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[21].~~

~~**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~~

19 http://www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/bcassociateddocuments9/acd (subject to possible review and updating)
20 BR 497 Conventions for calculating linear thermal transmittance and temperature factors, BRE 2007.
21 IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, BRE 2006.

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 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*[22], 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-accredited facility.

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

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 $m^3/(h.m^2)$ 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

(A1) 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.

(1) 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.

(2) 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.

(3) 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 heating and 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*[23].

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

23 Domestic Ventilation: Installation and Commissioning Compliance Guide, CLG, 2010.

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.

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:
   i. appliance manuals
   ii. the data used to calculate the ***TER*** and the ***DER***
   iii. 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 ***TFEE*** and 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/m^{2}K
Roof U-value	0.13 W/m^{2}K
Floor U-value	0.13 ~~0.20~~ W/m^{2}K
Window/door U-value	1.20 ~~1.50~~ W/m^{2}K
Party wall U-value	0.20 W/m^{2}K
Thermal bridging value	0.04 W/m^{2}K
Design air permeability	4.0 ~~5.0~~ m^3/(h.m^2) 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 for Energy and Climate Change (DECC)

www.decc.gov.uk

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2012 ~~2009. (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

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

The National Planning Policy Framework is currently being reviewed, and this reference will be updated for the final Approved Document

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).

Index *(to be confirmed)*

Chapter 2: Proposed Changes to Approved Document L1B

This chapter summarises the proposed changes to Approved Document L1B (Conservation of fuel and power in existing dwellings) and has been produced for consultation purposes. This document should be read alongside the 2010 edition of Approved Document L1B which can be seen at: http://www.planningportal.gov.uk/uploads/br/BR_PDF_ADL1B_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 with effect from October 2012 (1000m^2 area threshold removed);* • *apply upon boiler replacement and replacement of windows in all existing dwellings with effect from April 2014;* • *apply upon extension or increase in habitable area to all existing non domestic buildings with effect from April 2014 (1000m^2 area threshold removed);* • *apply upon replacement of components and fittings in all existing non domestic buildings with effect from April 2014;* • *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. Increases in habitable area include such activities as loft and integral-garage conversions. A definition for "boiler" and "window" may need to be included in updated regulations. Proposals for consequential improvements upon replacement of components and fittings in all existing non domestic buildings are not set out in draft guidance. See also paragraphs 125 to 127 in Chapter 4 of the Part L consultation document and case studies in Impact Assessment.

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: Building Regulations and Historic Buildings, 2004: http://www.english-heritage.org.uk/content/publications/docs/ignpartlbuildingregs.pdf	References updated to reflect newer English Heritage guidance.
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).	Non-exempt conservatories are classed as extensions and must meet the energy efficiency requirements including Consequential Improvements as appropriate.
3.20	*To be amended to require a person registered with a competent persons self certification scheme for the installation of replacement boilers and windows to additionally inform the building owner that a consequential improvement may be required and provide information on where to find further advice.*	With effect from April 2014. See also paragraphs 129 to 133 in Chapter 4 of the Part L consultation document.
3.26 to 3.28	*To be amended to reflect the proposed changes to the Regulation 7 Approved Document.*	See consultation proposals (Section 1) and full text in draft ADL1A.
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.	New paragraph before **Reference method** for consistency with ADL2B. With effect from October 2012.
4.6	Where even greater design flexibility is required, reasonable provision would be to use SAP 2012 ~~2009~~ to show that the calculated carbon di-oxide (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.*	An updated SAP is scheduled to be published in 2012 by DECC following consultation, see www.bre.co.uk/SAP2012

4.8	Where the extension is a conservatory or porch that is not exempt from the ***energy efficiency requirements*** (see paragraphs 3.15 to 3.16 above), the conservatory or porch is an extension, and paragraphs 4.0 ~~4.1~~ 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.	Non-exempt conservatories are classed as extensions and must meet the energy efficiency requirements including Consequential Improvements as appropriate.
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 to 3.16 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 4.0 ~~4.1~~ to 4.7 and Section 6 ~~above~~.	Non-exempt conservatories are classed as extensions and must meet the energy efficiency requirements including Consequential Improvements as appropriate.
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/m^2.K as calculated according to BS EN ISO 13370[FN]. [FN] BS EN ISO 13370 Thermal performance of buildings – Heat transfer via the ground – Calculation methods. *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.*	
4.10 footnote	BS EN ISO 13370:2007 Thermal performance of buildings - Heat transfer via the ground - Calculation methods (incorporating corrigendum March 2009)	Updated reference
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 to a building's energy status.*	

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	
	Increase in habitable area	New heading after paragraph 4.16
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.	New paragraph below new heading **Increase in habitable area** With effect from October 2012.
4.17a	Where the provision or replacement of a controlled service or fitting is the replacement of a boiler or [50% of the windows in a single elevation/***dwelling***] this triggers the requirement for a c***onsequential improvement***. Regulation 28 limits the ***consequential improvement*** requirement to situations that are technically, functionally and economically feasible, with the appropriate guidance being given in Section 6. The guidance in Section 4 set outs reasonable provision in relation to the provision or replacement of the ***controlled service or fitting*** itself***.***	New paragraph below existing paragraph 4.17 With effect from April 2014.
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 have 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.~~	Move paragraph from before to after the **Controlled fittings** heading.
4.19	Where windows, roof windows, rooflights or doors are to be provided, 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/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.	

<table>
<tr><td>4.20</td><td>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 <s>2009</s> 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.</td><td></td></tr>
<tr><td>4.20 footnote</td><td>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)</td><td>Updated reference</td></tr>
<tr><td>Table 1</td><td>Table 1 Standards for controlled fittings
<table><tr><th>Fitting</th><th>Standard</th></tr><tr><td>Window, roof window or rooflight</td><td>WER Band B <s>C</s> or better (see paragraph 4.22), or U-value 1.4 <s>1.6</s> W/m^{2}K</td></tr><tr><td>Doors with > 50% of internal face glazed</td><td>Door Set Energy Rating (DSER) Band D or better (see paragraph 4.22), or U-value 1.4 <s>1.8</s> W/m^{2}K</td></tr><tr><td>Other doors</td><td>DSER Band D or better (see paragraph 4.22), or U-value 1.4 <s>1.8</s> W/m^{2}K</td></tr></table></td><td></td></tr>
</table>

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 4.21 and 4.22; and AL is the air leakage through the window in $m^3/h.m^2$ at 50Pa pressure difference based on testing to BS 6375 Part 1:2009. Note 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 ***BCB***s 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[FN1] The Door Set Energy Rating[FN2] is given by the following equation: DSER= -68.5 * (Udoor + Effective L_{50}) Where Udoor is the door U-vale 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.*	

<table>
<tr>
<td>Table 2</td>
<td>
<table>
<tr><th colspan="2">Table 2 Standards for new thermal elements</th></tr>
<tr><th>Element</th><th>Standard (W/m^2.K)</th></tr>
<tr><td>Wall</td><td>0.20 ~~0.28~~</td></tr>
<tr><td>Pitched roof – insulation at ceiling level</td><td>0.15 ~~0.16~~</td></tr>
<tr><td>Pitched roof – insulation at rafter level</td><td>0.15 ~~0.18~~</td></tr>
<tr><td>Flat roof or roof with integral insulation</td><td>0.15 ~~0.18~~</td></tr>
<tr><td>Floors</td><td>0.17 ~~0.22~~</td></tr>
<tr><td>Swimming pool basin</td><td>0.25</td></tr>
</table>
Table footnotes as ADL1B 2010 edition.
FN1 http://www.energysavingtrust.org.uk/Home-improvements-and-products/Home-insulation-glazing/Glazing
FN2 http://www.fenestration-news.com/news/newsItem.aspx?id=9119
</td>
<td>See also paragraphs 88 to 89 in Chapter 4 of the Part L consultation document.</td>
</tr>
<tr>
<td>Table 3</td>
<td>Add footnote:
The improved U-values given in Table 3 represent minimum acceptable standards in normal circumstances.
In some cases, better standards could be explored in conjunction with Green Deal FN providers.

FN http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx</td>
<td>Green Deal is a financing mechanism that enables private firms to offer consumers energy efficiency improvements to their buildings at no upfront cost, and to recoup payments through a charge in instalments on the consumer's energy bill.</td>
</tr>
<tr>
<td>6.1</td>
<td>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.</td>
<td>Regulation numbering to be confirmed at final stage.</td>
</tr>
<tr>
<td>6.2</td>
<td>This requirement arises in existing dwellings ~~buildings with a total useful floor area of over 1,000 m^2~~ where the proposed work consists of:
a) an extension (including a non-exempt conservatory) or an increase in habitable area;
b) the replacement of a boiler or [50% of the windows in a single elevation/dwelling]. ~~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);~~
The extension or increase in habitable area, replacement boiler and windows must comply with the energy efficiency requirements in the normal way. Increases in habitable area include such activities as loft and integral-garage conversions.</td>
<td>See also Chapter 4 of the Part L consultation document.
Requirement to come into effect upon extensions or an increase in habitable area from October 2012. Requirement to come into effect upon replacement of boiler or windows from April 2014.</td>
</tr>
</table>

6.3	***Consequential improvements*** should only be carried out to the extent that they are technically, functionally and economically feasible. Where it can be demonstrated to the ***BCB*** that Green Deal finance has been sought but cannot be obtained on the grounds of cost effectiveness, ***consequential improvements*** are not required.	The Green Deal has a built-in test of cost-effectiveness (the Golden Rule). A building owner accepting a Green Deal should not see any increase in their energy bills – i.e. the savings should be equal to or exceed the monthly cost of repayment, within the particular payback period for that measure (or the package overall). See also Chapter 4 of the Part L consultation document.
6.4	Where improvement works other than the 'trigger activities' listed in Regulation [28] 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 4.6 to 4.7). ~~Only a relatively small number of ***dwellings*** will exceed 1000m^2 in size. Where there is doubt the ***BCB*** can be consulted for advice.~~	For consistency with ADL2B. Regulation numbering to be confirmed at final stage.
6.5	Where the trigger is the construction of an extension or an increase in habitable area, the extent of the requirement is that the value of the additional works should be [not more than/not less than] 10% of the value of the principal work. 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) SAP Appendix T[FN]. ~~Technical guidance on achieving compliance with regulation 17D is not given in this Approved Document but where the regulation applies it is available in Approved Document L2B~~. [FN] http://www.bre.co.uk/filelibrary/SAP/2009/SAP-2009_9-90.pdf to be updated in SAP2012	In reaching a view on which of these measures would be appropriate to install, a building owner not wishing to use a Green Deal 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. See also paragraphs 101 to 111 in Chapter 4 of the Part L consultation document.

6.6	Where the trigger is the provision or replacement of a boiler or replacement of [50% of the windows in a single elevation/***dwelling***], reasonable provision for a ***consequential improvement*** would be to implement [at least XX/all] of the following measures in the ***dwelling*** (or demonstrate that they have already been implemented). a) If the thickness of loft insulation is less than 150mm, upgrade to 250mm; b) Fill any unfilled cavity walls that are suitable for filling; c) Upgrade any hot water cylinder insulation as follows: i. If there is no cylinder insulation, provide a 160mm jacket ii. If the cylinder has factory applied foam to a thickness of <25mm, add an 80mm jacket iii. If the cylinder has a jacket < 100mm, make up the total thickness to 160mm. d) Draught proof any single glazed windows. Note that [at least XX/all of] these items should be brought up to standard, provided Green Deal finance is available to fund the work (thereby demonstrating that it is technically, functionally and economically feasible).	In reaching a view on which of these measures would be appropriate to install, a homeowner not wishing to use a Green Deal 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. See also paragraphs 112 to 117 in Chapter 4 of the Part L consultation document.
6.7	For all other controlled services and fittings, or where less than [50% of the windows in a single elevation/***dwelling***] are replaced**,** reasonable provision would be to make no ***consequential improvement***.	
6.8	Building work including ***consequential improvement*** that involves improving the airtightness of the ***dwelling*** may impact negatively on provisions for ventilation and/or air for combustion - see guidance in Approved Documents F and J. Moisture control in the building fabric would also need special consideration if the building is of traditional construction.	
Appendix B	BRE: BR 262 Thermal insulation: avoiding risks (2002 Edition) printed in 2006. ISBN 1860815154 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 reference
Appendix C	BS EN 410:2011 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)	Updated references to legislation and standards

Chapter 3: Proposed Changes to Approved Document L2A

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.

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Para	Revised text	Comment
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
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
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
4.44 footnote	BS EN 410:2011 Glass in building - Determination of luminous and solar characteristics of glazing	Updated reference

4.6	The ***TER*** is established by using approved software to calculate 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 2013 ~~2010~~ 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 ***TER*** is set equal to 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:* *As for 2010 the **TER** is 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 NCM modelling guide. The specification delivers an overall [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
4.11	As required by regulations 26 ~~17C~~ and 27 ~~20D~~, before the work starts, the builder shall carry out a calculation that demonstrates that the ***BER*** of the building as designed is not greater than 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 ***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 ***BER***, the CO_2 emission factors shall be as specified in the paper published by DECC[FN]. [FN] The proposed 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 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, 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 emission factor 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 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 ***BER*** submission 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.*	The CO_2 emission factor 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.
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 ***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
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	To be updated if boiler efficiency in notional

<table>
<tr><td></td><td>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 ***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 ***TER/BER*** calculation is not available for a module constructed prior to 1 October 2013 ~~2010~~, reasonable provision would be to demonstrate that the BER is not greater than the 2013 ~~2010~~ ***TER*** adjusted by the relevant factor from Table 3.</td><td>building changes.</td></tr>
<tr><td>Table 3</td><td>Table 3 TER multiplying factor for modular and portable buildings
<table><tr><th>Date of manufacture of 70% of modules making up the external envelope</th><th>***TER*** multiplying factor
For 11% aggregate</th><th>***TER*** multiplying factor
For 20% aggregate</th></tr><tr><td>After 1 Oct 2013</td><td>1.00</td><td>1.00</td></tr><tr><td>1 Oct 2010 – 1 Oct 2013</td><td>1.12</td><td>1.25</td></tr><tr><td>6 April 2006 – 1 Oct 2010</td><td>1.50</td><td>1.67</td></tr><tr><td>1 April 2002 – 5 April 2006</td><td>2.00</td><td>2.20</td></tr><tr><td>Pre 1 April 2002</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>Multiplying TER factors given for both 11% and 20% consultation options.</td></tr>
<tr><td>4.29</td><td>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 ***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 ***TER***.</td><td>Concurrent specification of the notional building given for both 11% and 20% consultation options.</td></tr>
<tr><td>Table 4 Note 4</td><td>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</td><td></td></tr>
</table>

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.

5.1	Buildings should be constructed and equipped so that performance is consistent with the calculated ***BER***. As indicated in paragraph 4.12, a calculation of the ***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* ***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 ***BER*** 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.* 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 ***BER*** calculation.	No quality assured accredited construction details schemes have been approved by the Secretary of State. 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	
5.26	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/).*	
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

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. If the actual building is constructed entirely to this concurrent speciation it will meet the ***TER*** and therefore pass Criterion 1. Note that submittal of the actual building specification will not be sufficient to demonstrate compliance with the ***TER***. In all cases the ***TER*** must be calculated using an approved calculation tool. 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 NCM Modelling Guide 2013.	Summary of the notional building specifications set out for both 11% and 20% consultation options.
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 ***TER***. It is expected that low and zero carbon technologies will increasingly be employed for compliance, 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 both the 11% and 20% aggregate improvement 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. 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 6 – Summary of concurrent notional building specification for an 11% aggregate saving option

Element	**Unit**	**Side lit (where HVAC specification is heating only)**	**Side lit (where HVAC specification includes cooling)**	**Toplit**
Roof	U-value ($W/m^2.K$)	0.16	0.18	0.18
Wall	U-value ($W/m^2.K$)	0.20	0.26	0.26
Floor	U-value ($W/m^2.K$)	0.20	0.22	0.22
Window	U-value ($W/m^2.K$)	1.6 (10% FF)	1.8 (10% FF)	N/A
	G-Value	40%	40%	N/A
	Light transmittance	71%	71%	N/A
Roof-light	U-value ($W/m^2.K$)	N/A	N/A	1.8 (15% Frame Factor)
	G-Value	N/A	N/A	52%
	Light transmittance	N/A	N/A	57%
Air-permeability	m^3/m^2/hour	3	5	3
Lighting	Luminaire lm / circuit watt	65	65	65
Occupancy control	Yes (MAN ON/AUTO OFF) / 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	0.4	0.4
Cooling (air-conditioned)	SEER / SSEER	N/A	4.5 / 3.6	4.5 / 3.6
Cooling (mixed-mode)*	SSEER	N/A	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	Yes	Yes	Yes
Renewable energy contribution	Monocrystalline PV with an efficiency of 15%. Active area of south facing panels (120kWh/m2/year output) equivalent to stated % of gross floor area but limited to 50% of roof area.	None	None	None

* Mixed Mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses.

Table 6 – Summary of concurrent notional building specification for a 20% aggregate saving option [***Government's preferred option***]

Element	**Unit**	**Side lit (where HVAC specification is heating only)**	**Sidelit (where HVAC specification includes cooling)**	**Toplit**
Roof	U-value ($W/m^2.K$)	0.16	0.18	0.16
Wall	U-value ($W/m^2.K$)	0.20	0.26	0.20
Floor	U-value ($W/m^2.K$)	0.20	0.22	0.20
Window	U-value ($W/m^2.K$)	1.6 (10% FF)	1.8 (10% FF)	N/A
	G-Value	40%	40%	N/A
	Light transmittance	71%	71%	N/A
Roof-light	U-value ($W/m^2.K$)	N/A	N/A	1.6 (15% Frame Factor)
	G-Value	N/A	N/A	48%
	Light transmittance	N/A	N/A	53%
Air-permeability	m^3/m^2/hour	3	5	3
Lighting	Luminaire lm / circuit watt	65	65	65
Occupancy control	Yes (MAN ON/AUTO OFF) / 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)	0.3	0.3	0.3
Cooling (air-conditioned)	SEER / SSEER	N/A	4.5 / 3.6	4.5 / 3.6
Cooling (mixed-mode)*	SSEER	N/A	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 fans via CO_2 sensors	Yes / No	Yes	Yes	Yes
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.	1.6%	1.6%	1.6%

* Mixed Mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses

Chapter 4: Proposed Changes to Approved Document L2B

This chapter summarises the proposed changes to 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 with effect from October 2012 (1000m^2 area threshold removed);* • *apply upon boiler replacement and replacement of windows in all existing dwellings with effect from April 2014;* • *apply upon extension or increase in habitable area to all existing non domestic buildings with effect from April 2014 (1000m^2 area threshold removed);* • *apply upon replacement of components and fittings in all existing non domestic buildings with effect from April 2014;* • *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. A definition for "boiler" and "window" may need to be included in updated regulations. Proposals for consequential improvements upon replacement of components and fittings in all existing non domestic buildings not set out in draft guidance. See also paragraphs 125 to 127 in Chapter 4 of the Part L consultation document and case studies in Impact Assessment.

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.
3.22	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 proposals (Section 1) and full text in draft ADL1A.
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 with effect from April 2014.

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 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 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.	New paragraph below new heading **Increase in habitable area** To apply to existing non domestic buildings below the 1000m^2 area threshold with effect from April 2014.
4.24	Where windows, roof windows, rooflights or doors are to be provided, 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.	

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.	

<table>
<tr><td>4.25 footnote</td><td>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)</td><td>Updated reference</td></tr>
<tr><td>Table 3</td><td>
<table>
<tr><th colspan="2">Table 3 Standards for controlled fittings</th></tr>
<tr><th>Fitting</th><th>Standard</th></tr>
<tr><td>Windows in buildings that are essentially domestic in character [2]</td><td>A Window Energy Rating [3] of Band B ~~C~~ or 1.4 W/m^2.K</td></tr>
<tr><td>All other windows, roof windows and glazed rooflights [1,4].</td><td>1.8 W/m^2.K for the whole unit</td></tr>
<tr><td>Plastic rooflight [4]</td><td>1.8 W/m^2.K</td></tr>
<tr><td>Curtain Walling</td><td>See paragraph 4.28</td></tr>
<tr><td>Pedestrian doors where the door has more than 50% of its external face area glazed</td><td>1.8 W/m^2.K for the whole unit</td></tr>
<tr><td>High usage entrance doors for people</td><td>3.5 W/m^2.K</td></tr>
<tr><td>Vehicle access and similar large doors</td><td>1.5 W/m^2.K</td></tr>
<tr><td>Other doors</td><td>1.8 W/m^2.K</td></tr>
<tr><td>Roof ventilators (including smoke extract ventilation)</td><td>3.5 W/m^2.K</td></tr>
</table>
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.
</td><td></td></tr>
</table>

4.29	Where the work involves the provision or extension 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~~. *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/m^2.K)</td></tr>
<tr><td>Element[1]</td><td>Buildings that are essentially domestic in character [6]</td><td>All Other Buildings
<s>Standard (W/m^2.K)</s></td></tr>
<tr><td>Wall[2]</td><td>0.2</td><td>0.26 <s>0.28</s>[2]</td></tr>
<tr><td>Pitched roof – insulation at ceiling level</td><td colspan="2">0.15 <s>0.16</s></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.

See also paragraphs 88 to 89 in Chapter 4 of the Part L consultation document.

</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>Table 5</td><td>Add footnote:

The improved U-values given in Table 5 represent minimum acceptable standards in normal circumstances.

In some cases, better standards could be explored in conjunction with Green Deal [FN] providers.

FN

www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx</td><td>Green Deal is a financing mechanism that enables private firms to offer consumers energy efficiency improvements to their buildings at no upfront cost, and to recoup payments through a charge in instalments on the consumer's energy bill.</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 with effect from April 2014 (1000m^2 area threshold removed);* • *apply upon replacement of components and fittings in all existing non domestic buildings with effect from April 2014;* • *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. Proposals for consequential improvements upon replacement of components and fittings in all existing non domestic buildings are not set out in this draft guidance. See paragraphs 125 to 127 in Chapter 4 of the Part L consultation document and case studies in Impact Assessment.
6.3	Where regulation 28 ~~17D~~ applies, ***consequential improvements***, in addition to the proposed building work (the ***principal works***), should be made to ensure that the building complies with Part L, to the extent that such improvements are technically, functionally and economically feasible. Where it can be demonstrated to the ***BCB*** that Green Deal finance has been sought but cannot be obtained on grounds of cost effectiveness, ***consequential improvements*** are not required. Paragraphs 6.4 to 6.11 below set out guidance on what will constitute technically, functionally and economically feasible ***consequential improvements*** in various circumstances. *The **principal works** must comply with the **energy efficiency requirements** in the normal way.*	The Green Deal has a built-in test of cost-effectiveness (the Golden Rule). A building owner accepting a Green Deal should not see any increase in their energy bills – i.e. the savings should be equal to or exceed the monthly cost of repayment, within the particular payback period for that measure (or the package overall). See also 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	See Chapter 4 of the Part L consultation document.

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 [not more than / 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 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 more than/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.*	See Chapter 4 of the Part L consultation document.
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 5: Proposed Changes to the National Calculation Methodology

1. This chapter summarises the key changes proposed for the National Calculation Methodology (NCM).

Overview of changes

2. 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 only changes, apart from those to the parameter values, are the introduction of an additional notional building type and the specification, for consultation purposes, of two alternative aggregate improvement levels (11% and 20%). These changes, together with refinements to the calculation itself, are described below.

3. For new homes a more significant 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. So for Part L 2013, it is proposed that this 'flat' uplift will be replaced by a differentiated approach to target setting. As a step towards 2016, it is also proposed that compliance will be based on both a carbon dioxide (CO_2) target and a new and separate energy target. The NCM therefore needs to accommodate this new approach to target setting.

4. The most significant implications of this change will be for those who develop the compliance tools, as the tools will need to be adjusted to deliver the new targets. Designers and builders will need to adapt to using the new energy target, but the intention is that they should not see significant change in the way the tools actually operate.

Homes

5. 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 (cSAP) which implements the proposals for Part L 2013, can be downloaded from www.2013ncm.bre.co.uk

6. The consultation considers two options for the setting of a new minimum energy target, based on the Fabric Energy Efficiency Standard (FEES)

approach and targets developed by the Zero Carbon Hub[1]. The two options for the energy target in Part L 2013 are:

a. An energy target set at an interim level: 43kWh/m²/yr for apartment blocks and mid terrace houses, and 52kWh/m²/yr for end terrace, semi-detached and detached houses.

b. An energy target set at full FEES: 39kWh/m²/yr for apartment blocks and mid terrace houses, and 46kWh/m²/yr for end terrace, semi-detached and detached houses.

7. The consultation also considers two options for the CO_2 emissions target in Part L 2013:

   a. An emissions target set at 'FEES plus efficient services' (the Government's preferred option). This option would use a concurrent notional dwelling to set the Target Emission Rate (TER);

   b. An emissions target set at a 'half-way point' to the Hub's proposed 2016 Carbon Compliance targets[2]. This option would set an absolute target based on dwelling type.

Energy target for Part L 2013

8. The FEES for zero carbon homes was developed by a Task Group led by the Zero Carbon Hub in 2009. It was agreed that it should limit the energy demands of space heating and cooling for the dwelling and be achieved through passive measures only. Hence it is met through appropriate selection of the following:

   a. Building fabric U-values.

   b. Thermal bridging.

   c. Air permeability.

   d. Thermal mass.

   e. Features which affect lighting and solar gains.

9. The standard is expressed in absolute terms (kWh/m^2/yr) depending on dwelling type. The Hub proposed that for 'zero carbon' homes, the maximum energy demand levels should be set at 39kWh/m²/yr for apartment blocks and mid terrace houses, and 46kWh/m²/yr for end terrace, semi-detached and detached houses. The procedure for calculating fabric energy efficiency is defined in Section 11 of the SAP2012 Specification (www.bre.co.uk/SAP2012).

[1] Zero Carbon Hub, *Defining a Fabric Energy Efficiency Standard for Zero Carbon Homes*, November 2009 http://www.zerocarbonhub.org/building.aspx?page=2

[2] Carbon Compliance refers to the on-site carbon target for zero carbon homes. See Zero Carbon Hub, *Carbon Compliance: Setting an appropriate limit for zero carbon new homes*, February 2011 http://www.zerocarbonhub.org/definition.aspx?page=8

10. In a similar manner to the CO_2 target it is a 'performance standard' meaning that different combinations of fabric specification can be used to reach the standard. This provides the designer with flexibility in meeting the standard.

11. The September 2010 version of the Code for Sustainable Homes adopted the Hub's methodology for ENE2: Fabric Energy Efficiency, giving up to 9 credits for various levels of achievement of fabric performance.

12. The two options for the setting of an energy target for Part L 2013 are based on the scale within the Code. Designers and builders will need to take a similar approach as they do now when building to the ENE2 scale: the compliance tools will generate a Target for Fabric Energy Efficiency (TFEE), and then they will need to modify the fabric specification such that their actual Dwelling Fabric Energy Efficiency (DFEE) is less than or equal to the TFEE.

13. The proposed levels for the TFEE are:

    a. Interim levels equivalent to achieving five ENE2 credits. The standard is set at a level of 43kWh/m²/yr for apartment blocks and mid terrace houses, 52kWh/m²/yr for end terrace, semi-detached and detached houses;

    b. Full FEES levels, equivalent to achieving seven Ene2 credits. As noted above, the standard is set at a level of 39kWh/m²/yr for apartment blocks and mid terrace houses, 46kWh/m²/yr for end terrace, semi-detached and detached houses. This is a more demanding target than the Interim option. It is the minimum standard proposed by Zero Carbon Hub for zero carbon homes.

14. A separate document is available on the Zero Carbon Hub website which gives some examples of how the full and interim targets could be achieved for a variety of dwelling types: www.zerocarbonhub.org/consultations.aspx?news=26

15. Terraces of houses/bungalows are often stepped or staggered to account for factors such as site topography or local planning requirements. This varies the area of exposed side wall and the ease of meeting a particular fabric energy efficiency standard. A similar issue occurs for houses with an internal garage or drive through. As a result, the minimum fabric energy efficiency standard is varied for these building types to provide a comparable challenge. An outline of how the fabric energy efficiency standard is applied to these dwellings is given in the Code for Sustainable Homes. In addition, further details can be found on the Zero Carbon Hub website: www.zerocarbonhub.org/consultations.aspx?news=26

CO_2 emissions target for 2013

16. Part L 2006 and Part L 2010 apply an improvement factor to the emissions from an historic (2002) notional dwelling. The same improvement factor is equally applied to all building types, and there is only one notional dwelling. However, this does not account for some dwelling types finding it more challenging (and costly) to achieve the CO_2 target than others.

17. 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.

18. **'FEES plus efficient services'**: FEES is a performance based target. The necessary thermal performance of the building envelope to deliver the FEES value will depend on the size and shape of the building. Furthermore, given that FEES is a performance target, there is also, in principle, an infinite number of combinations of say U-values for walls, floors, roofs and glazing elements which will deliver the FEES value.

19. The NCM therefore needs to include a procedure to define a credible Notional Building which meets the relevant 39 or 46 kWh/m^2/year target and which is then used to model the effect of applying a specified 'efficient' servicing strategy in order to calculate a 'FEES plus efficient services' CO_2 target. The proposed methodology is to iteratively alter the fabric values until FEES is achieved. Then the other building service parameters from Table 1 are used to calculate the 'FEES plus efficient services' CO_2 target.

20. The way users interface with compliance tools will be as before, the only difference being in the algorithms that generate the TER. For the building under consideration, the software will generate a TER as above.

21. Proposed changes to the parameters used to define the concurrent Notional Building are contained in Table 1. Other than the changes specified the specification is as per SAP Specification 2009.

Table 1 - SAP 2012 notional dwelling definition

Element or system	**Value in 2002**	**Value for SAP 2012**
	Notional dwelling	**TER derived from concurrent notional dwelling**
Opening areas (windows and doors)	25% of total floor area (or, if total exposed façade area is less than 25% of the total floor area, the total exposed façade area)	Same as actual dwelling
	The above includes one opaque door of area 1.85 m², any other doors are fully glazed	
	All glazing treated as windows (i.e. no roof windows)	
Walls	U = 0.35 W/m²K	Iterate to deliver FEES value of 39 kWh/m²/yr for mid terrace houses and apartments, and 46 kWh/m²/yr for end terrace and detached houses
Floors	U = 0.25 W/m²K	
Roofs	U = 0.16 W/m²K	
Opaque door	U = 2.0 W/m²K	
Windows and glazed doors	U = 2.0 W/m²K	
	Double glazed, low-E hard coat	Emissivity = 0.1
	Frame factor 0.7	Frame factor 0.7
	Solar energy transmittance 0.72	Solar energy transmittance 0.63

	Light transmittance 0.80	Light transmittance 0.80
Party wall U-value	U = 0.4 W/m²K	U = 0 W/m²K
Thermal mass parameter	250 kJ/m^{2}K	Same as actual dwelling
Shading and orientation	All glazing orientated E/W;	Same as actual dwelling
	average overshading	As defined by SAP section 11 (FEE): same as actual dwelling except 'less than average' changed to 'average'
Number of sheltered sides	2	Same as actual dwelling
Allowance for thermal bridging	0.11 x total exposed surface area (W/K)	Iterated as above for achievement of FEES
Ventilation system	Natural ventilation with intermittent extract fans	Natural ventilation with intermittent extract fans (system 1)
Air permeability	10 m³/h·m² at 50 Pa	5 m³/h.m² @ 50Pa (or adjusted as necessary in iteration for FEES)
Extract fans	3 for dwellings with floor area greater than 80 m^2	As defined by SAP section 11 (FEE): 2 for TFA up to 70m²; 3 for 70 < TFA < 100; 4 for TFA > 100
	2 for smaller dwellings	
Heating system	Boiler and radiators	Gas boiler. Heating type 1, Responsiveness 1.0
	Water pump in heated space	Pump in heated space
Boiler	SEDBUK 78%	SEDBUK 2009 90% Efficiency adjustment for space heating +3
	Room-sealed	Room sealed
	Fanned flue	Fan flue
Heating system controls	Programmer + room thermostat + TRVs	Control type 3 Temp adjustment 0
	Boiler interlock	Boiler interlock
Hot water system	Stored hot water, heated by boiler	Stored hot water heated by boiler
	Separate time control for space and water heating	Separate time control for space and water heating
Hot water cylinder	150 litre cylinder insulated with 35 mm of factory applied foam	150 litre cylinder. Heat loss 1.14 kWh/day
Water use <= 125 l/p/d	not applicable	Water use <=125 l/p/d
Secondary space heating	10% electric	None
Low energy light fittings	30% of fixed outlets	100%

22. **'Halfway point'**: Absolute CO_2 emissions targets for zero carbon homes were developed by a Task Group led by the Zero Carbon Hub in 2010/11[3]. The standard is expressed in absolute terms ($kgCO_2/m^2/yr$) depending on dwelling type using the assumed CO_2 emission values for 2016:

[3] Zero Carbon Hub, *Carbon Compliance: Setting an appropriate limit for zero carbon new homes*, February 2011 http://www.zerocarbonhub.org/definition.aspx?page=8

a. 10 kgCO_2 /m^2/year for detached houses.

b. 11 kgCO_2 /m^2/year for attached houses.

c. 14 kgCO_2 /m^2/year for low rise apartments blocks (four storeys and below).

23. The Task Group were not able to determine a recommendation for high rise apartment blocks (over 4 storeys) and it is recognised that further work to develop CO_2 emissions targets for these buildings is needed.

24. Again, these are performance targets in that there is flexibility in how these targets are achieved. The advantages and disadvantages of both the notional building approach and absolute approach to carbon target setting are discussed in the Zero Carbon Hub's reports[4] and the 2013 consultation proposals.

25. For Part L 2013, this option is to move half-way from the current Part L 2010 baseline to these proposed 2016 targets for zero carbon homes. The calculations need also to take into account that the 2010 baseline values also differ depending on the dwelling type. Based on modelling using preliminary 2013 CO_2 emission factors, the absolute 2013 values would be:

    a. 13 kgCO_2 /m^2/year for detached houses.

    b. 14 kgCO_2 /m^2/year for end terrace or semi-detached houses.

    c. 13 kgCO_2 /m^2/year for mid terrace houses.

    d. 15 kgCO_2 /m^2/year for low rise apartments blocks (four storeys and below).

    Part L 2013 will use the updated SAP methodology and CO_2 factors to be consulted upon and published by DECC.

26. The half-way targets have been derived based on a representative 2010 TER for the house types above, and the absolute targets for 2016, with both values re-based to use preliminary 2013 CO_2 emission factors. The resultant half-way point for each dwelling type was then rounded to the nearest 1kgCO_2, this being the granularity implied in the zero carbon target.

27. Note that due to the differences in absolute CO_2 emissions for the '2010 baseline compliant' case for attached houses (19 kg CO_2 /m^2/year for the end-terrace and 17.5 kg.CO_2/m^2/yr for the mid-terrace), the half-way targets are different for end and mid terraces whereas they are the same for the proposed zero carbon targets.

28. If the target for a building is set using an absolute value for emissions, then there is no need for a notional building. Under this option, SAP would be

[4] Zero Carbon Hub, *Carbon Compliance for Tomorrow's New Homes: A review of the modelling tool and assumptions*, July 2010

used to calculate the Dwelling Emission Rate (DER) for the actual dwelling, and that value would be compared directly with the appropriate absolute target.

29. The approximate improvements over and above Part L 2010 standards are shown below[5].

Table 2 – improvements over Part L 2010 new homes standards

	Mid terrace house	**End of terrace house**	**Detached House**	**4-storey apartment block**	**4-storey apartment block**	**Aggregate % reduction from 2010**
'FEES plus efficient services'	**4%**	**7%**	**15%**	**0%**	**12%**	**8%**
'Half-way point' rounded	26%	28%	29%	19%	28%	26%
Fuel assumed	*Gas*	*Gas*	*Gas*	*Gas*	*Electricity*[6]	*Mix*

Buildings containing Multiple Dwellings

30. Where a building contains more than one dwelling (such as in a terrace of houses or in a block of flats), an average fabric energy efficiency target and/or 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 energy or CO_2 targets. For more detail see paragraph 4.6 in draft Approved Document L1A.

National Weather

31. 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 in Part L 2013, such that both the heating and cooling aspects of the calculation are based on UK average weather data based on a single region (East Pennines).

[5] These figures are illustrative for consultation purposes and use preliminary CO_2 emission factors and for electrically heated apartments, a reduced fuel factor (central case).
[6] If the fuel factor was retained at 2010 levels these figures would as for the gas heated 4 storey block.

32. This is particularly relevant to the fabric energy efficiency standard methodology, which under SAP2009 included regional data in determination of the space cooling demand. For the purposes of Part L 2013 compliance, it is proposed that FEES uses UK average (East Pennines) weather data only for the purpose of calculating actual and target energy efficiency and carbon emissions. This is the approach implemented in cSAP.

Fuel Factor

33. The fuel factor provides partial relief to Part L CO_2 targets where mains gas is not available or not preferred for safety reasons. Reducing or removing the fuel factor could aid the transition to zero carbon but increases the cost of construction for homes off the gas grid. Government has not expressed a preference on the retention, and if so level, of fuel factor to be used for Part L 2013. Rather we are seeking views on options to retain the fuel factor at current levels, reduce the impact by approximately one half or to remove the fuel factor entirely.

34. The set of fuel factors for Part L 2010 relate to a CO_2 emissions target based on an historic notional dwelling. Work has been carried out to translate these factors into appropriate values for use with a concurrent notional dwelling which is different in some important aspects. For example, the relative energy uses differ between the historic and concurrent notional building – in particular the percentage of energy use from space heating and lighting energy use is now significantly lower.

35. Fuel factors were determined with the aim of achieving a similar impact with the concurrent notional building as would have been achieved with the historic notional building and an improvement factor to reflect the proposed Part L 2013 carbon reduction targets. They account for the revision of the CO_2 emission factors for 2013, based on an early set provided by DECC.

36. Table 3 lists the resultant fuel factors for key fuels:

Table 3: List of key fuel factors for 2013

Fuel type	Full fuel factor option	Reduced fuel factor option	No fuel factor option
Mains gas and all fuels with CO_2 intensity less than gas	1.00	1.00	1.00
Grid electricity for direct heating	1.57	1.25	1.00
Grid electricity for heat pumps	1.57	1.25	1.00
LPG	1.07	1.03	1.00
Heating oil	1.17	1.08	1.00
Solid mineral fuel	1.33	1.15	1.00

37. These fuel factors would be used in the target CO_2 emissions equation for 2013 as follows:

    a. For the 'FEES plus efficient services' approach (i.e. target based on concurrent notional dwelling):

    $TER_{2013} = C_H \times FF + C_L$

    Where:

    C_H = CO_2 emissions from space heating and hot water in the concurrent notional dwelling

    C_L = CO_2 emissions from lighting and pumps & fans in the concurrent notional dwelling

    FF = Fuel Factor from Table 3

    Note that under previous versions of Part L, C_H included CO_2 emissions from pumps & fans. This has been adjusted such that the Fuel Factor is applied to the CO_2 emissions from space heating and hot water only. All regulated CO_2 emissions from electrical energy use in the concurrent notional building are contained in C_L.

    b. For the 'half-way point' absolute targets:

    $TER_{2013} = TER_{2013Absolute} \times (0.8 \times FF + 0.2)$

    Where:

    $TER_{2013Absolute}$ = Absolute carbon target as discussed above

    FF = Fuel Factor from Table 3

38. With an absolute target, there is no notional building to give a split of CO_2 emissions from various sources (i.e. C_H and C_L).Therefore a pragmatic approach has been taken, based on the approximate split of C_H and C_L for dwellings which comply with the FEES, which leads to the fuel factor being applied to a fraction (0.8) of the absolute target.

Electrically heated apartments

39. Reduction or removal of the fuel factor will impact those dwellings that use a more carbon intensive fuel than gas. Electrically heated flats are the most prevalent case.

40. For electrically heated flats, it is possible to improve the fabric performance beyond FEES, although this will have diminishing returns, particularly for mid-floor flats with a small exposed surface area and thus relatively low space heating demand. Another option is to improve service efficiency, for example through the use of shower waste water heat recovery units.

41. A cost comparison would need to be undertaken between improving fabric and/or services or introducing low and zero carbon technologies such as photovoltaic (PV) panels on the roof of the apartment block. 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.

Non-domestic buildings

Introduction

42. 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.

43. 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. Some key changes to calculation algorithms are summarised below. We deal then with the changes relating to the definition of certain elements of the notional building.

44. The following changes are proposed for the calculation methodology for actual buildings from 2013.

Lighting

45. 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.

46. 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.

47. 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

48. Design lighting power densities should be inputed 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.*

49. 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). Note that this change was introduced into the 2010 NCM Modelling Guide in November 2011.

Pumps

50. 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 heating ventilation and air-conditioning (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

51. Where district heating systems are used for space heating and/or hot water, the fuel emission factor for space heating and/or hot water in the notional building will be 0.15 kgCO_2/kWh regardless of the fuel(s) used in the actual district heating system. 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 **d**atabase*

52. 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

53. 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)

54. Other than the changes specified in the following two tables (Table 5 for the 20% aggregate improvement and table 6 for the 11% aggregate improvement), the specification for each of these buildings is as in the 2010 NCM modelling guide.

Table 5 – Concurrent notional building specification – 20% aggregate saving

Element	Side lit or unlit (where HVAC specification is heating only)	Sidelit or unlit (where HVAC specification includes cooling)	Toplit
Roof U-value ($W/m^2.K$)	0.16	0.18	0.16
Wall U-value ($W/m^2.K$)	0.20	0.26	0.20
Floor U-value ($W/m^2.K$)	0.20	0.22	0.20
Window U-value ($W/m^2.K$)	1.6 (10% Frame Factor)	1.8 (10% Frame Factor)	NA
G-Value			
Light transmittance	40%	40%	NA
	71%	71%	NA
Roof-light U-value ($W/m^2.K$)	NA	NA	1.6 (15% Frame Factor)
G-Value			
Light transmittance	NA	NA	48%
	NA	NA	53%
Air-permeability (m^3/m^2/hour)	3	5	3
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)	0.3	0.3	0.3
Cooling (air conditioned) (SEER / SSEER)	N/A	4.5 / 3.6	4.5 / 3.6
Cooling (mixed mode) (SSEER)*	N/A	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 fans via CO_2 sensors (Yes/No)	Yes	Yes	Yes
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.	1.6%	1.6%	1.6%

* Mixed Mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses

Table 6 – Concurrent notional building specification – 11% aggregate saving

Element	Side lit (where HVAC specification is heating only)	Sidelit (where HVAC specification includes cooling)	Toplit
Roof U-value (W/m^2.K)	0.16	0.18	0.18
Wall U-value (W/m^2.K)	0.20	0.26	0.26
Floor U-value (W/m^2.K)	0.20	0.22	0.22
Window U-value (W/m^2.K)	1.6 (10% Frame Factor)	1.8 (10% Frame Factor)	NA
G-Value Light transmittance	40%	40%	NA
	71%	71%	NA
Roof-light U-value (W/m^2.K)	NA	NA	1.8 (15% Frame Factor)
G-Value Light transmittance	NA	NA	52%
	NA	NA	57%
Air-permeability (m^3/m^2/hour)	3	5	3
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	0.4	0.4
Cooling (air conditioned) (SEER / SSEER)	N/A	4.5 / 3.6	4.5 / 3.6
Cooling (mixed mode) (SSEER)*	N/A	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 (mech vent only). Variable speed control of fans via CO_2 sensors (Yes/No)	Yes	Yes	Yes
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.	None	None	None

* Mixed Mode assumed to be cooled by DX unit where SSEER includes indoor and outdoor units and fans, pumps and losses

Recast Energy Performance of Buildings Directive

55. The calculation methodology is required to produce two additional pieces of output information in order to comply with the recast Energy Performance of Buildings Directive (EPBD)[7].

    a. The first is to report the total energy use for the actual building (domestic or non-domestic) in terms of primary energy. Conversion factors will be available as part as the SAP2012 consultation.

    b. The second is a facility for the builder to declare that an analysis of high efficiency alternative systems e.g. renewable energy systems, heat pumps etc. has been carried out and documented before work starts, and where this analysis is available for verification purposes.

CO_2 emission factors

56. Alongside its SAP 2012 consultation, DECC are consulting upon updated CO_2 emission factors for different fuels, which would apply to Part L 2013 new build compliance calculations for both dwelling and non-dwellings. The proposed CO_2 emission factors and methodology for generating these can be seen at www.bre.co.uk/SAP2012.

SBEM 'Appendix Q'

Background

57. In its 2010 report on Low Carbon Construction[8],the BIS Innovation and Growth Team (IGT) recognised that "*Because the only way to show compliance for dwellings is via SAP, and for most other buildings SBEM, if a particular energy saving or renewable technology is not modelled within SAP or SBEM then it cannot show any advantage to the designer in terms of compliance with Part L – so unless the tools can rapidly incorporate innovative products, then they become barriers to the uptake of such products and solutions*"

58. For dwellings, this problem has been addressed over recent years by the introduction and use of Appendix Q of the SAP specification, which sets out a procedure by which suppliers of innovative technologies and products can get them recognised in the calculation process. DECC will be considering whether this process could be streamlined, but there is a critical need not to sacrifice technical rigour at the expense of speed.

59. The June 2011 Low Carbon Construction Action Plan[9] (the Government's response to the IGT report) said that, alongside the review of SBEM to support the Part L 2013 changes, a process for integrating new technologies into SBEM would be developed.

[7] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:153:0013:0035:EN:PDF
[8] http://www.bis.gov.uk/assets/biscore/business-sectors/docs/l/10-1266-low-carbon-construction-igt-final-report.pdf
[9] http://www.bis.gov.uk/assets/biscore/business-sectors/docs/l/11-976-low-carbon-construction-action-plan.pdf

60. This section describes the proposed approach. It should be recognised that there is a fundamental difference between SAP and SBEM that will require a slightly different approach. SAP is normally reviewed and fixed as a procedure once every 3 or 4 years, to parallel changes in Part L. The Appendix Q mechanism therefore generates a set of factors by which the standard calculation is adjusted to allow for the effect of the new product. Furthermore, each individual product within each agreed technology has its performance and modifying factors logged on the Appendix Q database.

61. SBEM is also reviewed and changed to parallel Part L amendments, but SBEM software has, to date, been updated on a more regular basis to incorporate additional functionality or correct bugs. It may therefore possible to incorporate new technologies within the core calculation algorithms during these regular updates.

Proposed procedure

62. The procedure described here is intended to allow technologies not currently represented in SBEM to be included and to have their energy saving benefits evaluated and taken into account for Building Regulation and Energy Performance Certification (EPC) purposes. These may be new technologies or advanced versions of existing technologies. This may include technologies which can already be represented in one or more DSMs. While SBEM estimates will usually be more general – and therefore perhaps more cautious – than those from DSMs, consistency will be important.

63. The Building Research Establishment (BRE) is the contractor currently appointed for developing and managing SBEM on behalf of DCLG. References to BRE in this document should be read in that context. The inclusion procedure assumes that DCLG would approve the incorporation of any new technology into the SBEM system where those benefits have been robustly and independently proven by its SBEM contractor. To maintain the integrity of SBEM, any technology considered for inclusion must have an energy calculation methodology agreed and accepted. Once this has been achieved, it can be added within the iSBEM/SBEM software.

64. It should be appreciated that in considering technologies, the SBEM calculation methodologies must maintain fairness and impartiality. Analytical treatment should remain proportionate to the scope, purpose, and resolution of SBEM, and not conflict with existing SBEM methodology or with the requirements of Building Regulations and statutory guidance documents such as the Building Services Compliance Guides.

65. It should be recognised that new ideas and products may be difficult to assess if they fall outside the traditional assessment methodologies. Where they exist, relevant EN and BS standards should be considered and reviewed although they may not be satisfactory in assessing a new technology. Reports and test results from other independent third parties could be submitted for consideration, although these may not be relevant to SBEM's requirements, in which case further testing may be required.

66. Sufficient checks would be put in place to ensure that applications from any company attempting to distort the energy savings of a technology or products, including falsifying data or reports from independent third parties, would be refused, and where applicable, the relevant third party(s) notified.

67. It is important to clarify that this proposal requires that only generic technologies, not commercial product names, can be directly incorporated into the SBEM system.

68. At this stage we are not proposing a product database however this could be developed in future, using current standards to help manufacturers enter details of new improved systems. For example if there is a new efficient cooling system, the manufacturer would need to enter the relevant information for the EER and SEER. Users could then access the database to enter and model that specific system. Such data would need to be generated based on the agreed data parameters needed by SBEM and to be quality controlled as part of an acceptance process, as with SAP Appendix Q.

Proposed application process

69. To have a technology considered for inclusion in the SBEM system, it is proposed that the application should include:

- Brief description of the technology, specifying the scope of its application and the mechanism by which it operates (received in confidence).
- Any relevant standards governing all or part of the technology.
- Any limitations as to its application.
- Key parameters which will affect the energy use and standardised methods to measure them if applicable.
- Any theoretical or empirical data supporting the energy performance of the system, if available.
- Any existing testing and/or modelling track-record – for example via DSMs, SAP Appendix Q, Eurovent Certification, etc.
- Any additional information.

70. The proposed application process for inclusion into the SBEM system is outlined within the flow chart in Figure 1 below. As the diagram shows, the first phase of the application process would require the acceptable completion and submission of an application form (to be developed).

71. Once the application is received (Stage 1), it would be reviewed and a decision made as to whether an initial preliminary meeting should be held (Stage 2). This preliminary meeting will be held free of charge between the applicant and a member of the SBEM team to consider any additional relevant information and review the application framework (Stage 3). If an application was unsuccessful during any part of the application process, a formal letter would be issued detailing the reasons.

72. If the outcome of the preliminary meeting was successful, the application would proceed to a feasibility assessment at a proposed standard upfront fee of £2,000 (Stage 4). This single-page assessment would consider the empirical and theoretical research required for progression of the application to the next stage of the application – the scoping study (Stage 5). The intention of this assessment is a low-risk method for determining the probable scale of the application process.

73. The purpose of the scoping study (Stage 5) is to devise a potential implementation process, provide an indication of the probable energy savings that can be represented within SBEM, and to make an initial assessment of the performance and other information that would be required.

74. Depending on the application and availability of theoretical or empirical information, this stage could, in addition to the development of a modelling process, involve laboratory or field measurements, or comparisons with DSM calculations. This last possibility might, for example, involve the following steps:

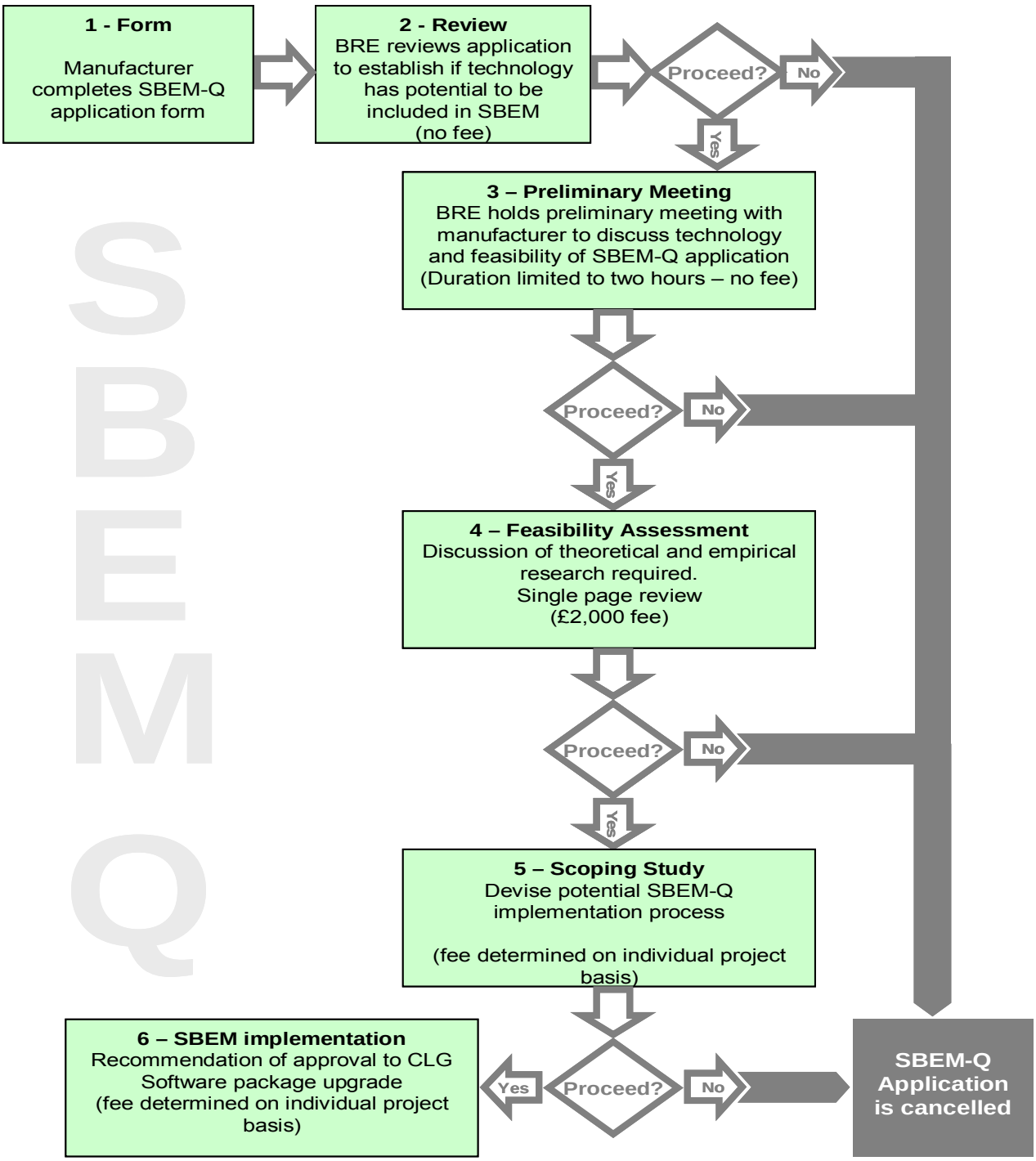
    a) Establishment of modelling framework for the analysis of the suggested technology.
    b) Configure base case scenarios on DSM models and SBEM for calibration.
    c) Configure technology specific scenarios on DSM models.
    d) Suggest and explore feasibility of technical solutions adapted to a monthly methodology to reflect results from detailed procedures. Low level modifications of development SBEM engine.
    e) Calibrate SBEM methods with DSM results.

75. The scale and extent of the study would be highly variable between technologies depending upon the complexity of the technology concerned and the availability of existing information.

76. Stage 6 (Software implementation) would include upgrades/enhancements of the interface (iSBEM), conversion tool for backward compatibility (nctconvert.mdb), public calculation engine (SBEM), compliance/EPC modules (BRUKL, EPCgen) – and if required, user guides and technical manuals such as SBEM SDK.

77. BRE would provide quotations for devising a modelling process and for software implementation. Where appropriate, BRE would also provide a quotation for the collection of information and for comparison studies with DSM results. There would be no obligation on applicants to employ BRE for this work, but data provided in support of implementation should meet agreed requirements for scope and quality.

Figure 1. Proposed SBEM-Q application process



Notes:

78. The inclusion procedure would require DCLG to approve the incorporation of any new technology. BRE would contact DCLG at Stage 2 to raise awareness of the process, keep DCLG updated at Stage 3 and request final approval at Stage 6 after BRE's recommendation for inclusion.

79. All details of the technology provided by the manufacturer would be handled in strict confidence by BRE until and unless incorporated within SBEM, at which point any publicity would be to the extent agreed between BRE and the applicant.

80. The SBEM application process is likely to take some time to complete, depending on the nature of the technology and the complexity of the analysis required. The application costs may therefore be quite high, and applicants may wish to consider applying for support under HMRC's R&D Tax Credits programme. More information can be found at: http://www.hmrc.gov.uk/ct/forms-rates/claims/randd.htm

SBEM Integrity Group

81. Mindful of the recommendations in the Low carbon Construction IGT report and plans to set up an Integrity Group to support future developments of SAP we are keen to explore something similar to support the 2013 and future technical developments of SBEM.

82. In the medium term it is anticipated that such a group would support the current SBEM contractor, BRE, by acting as an impartial and expert sounding board for the development of the software focusing in particular on the difficulties associated with accommodating new and innovative solutions.

83. It is anticipated that membership of the group would comprise of individuals who are willing to declare commercial interests and remain impartial and have expertise in energy modelling and the application of SBEM.

Chapter 6: 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	To cater for existing buildings where there may be restrictions on the use of gas heating.

Section	Revised text	Comment
	complying with Part L requirements.	
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.

Section	Revised text	Comment
2. Gas-fired space heating and hot water systems Page 25, Table 3 **3. Oil-fired space heating and hot water 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	***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 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.	Correction.
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 oveheating.*	To reduce the likelihood of overheating in all spaces.

Section	Revised text	Comment
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.* *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.	Provision of weather compensation is no longer a recommendation

Section	Revised text	Comment
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 DCLG 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 Page 108 Table 35, 2.0: Controls	***External controls for warm water, hot water and warm air heat pumps*** a. Heat pump unit controls should include: i. ... *As existing* 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.	

Section	Revised text	Comment
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	The industry Europump Labelling Scheme is being superseded by an EC Regulation.

Section	Revised text	Comment
	circulators and glandless circulators integrated in products should have an Energy Efficiency Index (EEI) no greater than 0.23.	

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 7: Proposed Changes to the Non-Domestic Building Services Compliance Guide

This chapter lists the proposed 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 1 of this chapter for revised table.*	To correct and raise standards as appropriate.

Section	Revised text	Comment
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	To add reference to guidance for larger commercial and industrial installations.

Section	Revised text	Comment
	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. **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:	
Page 59	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.	

Section	Revised text	Comment
Page 68	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 **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	**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	

Section	Revised text	Comment
	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.	To help reduce design pressure drops in systems, which will help with meeting the SFPs.
Page 75	. . 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.	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	The industry Europump Labelling Scheme is being superseded by an EC Regulation.

Section	Revised text	Comment
	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 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**[4]
Gas, oil and biomass-fired boilers (a) New buildings		**Boiler seasonal efficiency (gross[5])**
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[6]
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

[4] All values are minimum values and apply to new and existing buildings, except where stated.

[5] 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).

[6] 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**[4]	
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	
Domestic hot water systems		**Thermal efficiency (gross)**	
Direct-fired	Natural gas	~~73%~~ 90%	
	LPG-fired	~~74%~~ 92%	
	Oil-fired	~~75%~~ 77%	
Indirect-fired (dedicated hot water boiler)	Natural gas	80%	
	LPG-fired	81%	
	Oil-fired	82%	
Electric DHW heaters	Electricity	100%	

Table 1: Summary of recommended minimum energy efficiency standards for building services	
Building service	**Standard**[4]
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
Air distribution systems (a) New buildings	**Specific fan power (max)**[7]
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)

[7] Maximum external pressure drop is not specified.

Table 1: Summary of recommended minimum energy efficiency standards for building services	
Building service	**Standard**[4]
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)
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 of this chapter	
~~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

Section 12. Lighting

12.1 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.

12.2 Scope of guidance

The guidance in this section applies to the following types of lighting:

- general interior lighting
- display lighting.

12.3 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'.

12.4 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 for general lighting in office, industrial, storage and other types of space. The control factors and corresponding reduced efficacies for 2010 and as proposed for 2013 are shown in the tables below. The average efficacy for display lighting remains at not less than 22 lamp lumens per circuit-watt

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 occupancy control	0.90	54
d unoccupied space with manual on and auto off occupancy control	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

12.5 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[1].

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

[1] For further information, see www.sll.org.uk/resources/partl

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