Approved Document L - Conservation of fuel and power

Volume 1: Dwellings

Consultation version – November 2020

This draft guidance accompanies the November 2020 Stage 2A consultation on Part L and Part F of the Building Regulations. The Welsh Government is seeking views on the standards for existing dwellings, mitigating overheating in new dwellings, and amendments to non-domestic buildings guidance. The Part L and F standards for work to new dwellings are not a subject of this consultation.

Revision 1 minor amendments (7.12.2020):
-Page 58: in bullet point 'a' for existing dwellings, reference to paragraphs 9.1 to 9.3(i) removed and paragraph 9.5 inserted (highlighted yellow).
-Page 60: in Paragraph 9.5, added "*(with the exception of a floor plan for 9.2(iii)) and 9.3(i)*" (highlighted yellow).

The approved documents

In this Stage 2A consultation version of the Approved Document, we are consulting on the text associated with existing dwellings. Sections 3, 4, 5, 6, 8, 9 ,10, 11, 12, 13 and Appendix A are the applicable sections that provide guidance in relation to existing dwellings. As this is a complete new replacement Approved Document, we have not highlighted the changes to Approved Document L1B (2014 edition incorporating 2016 amendments), therefore, the whole of the applicable sections highlighted above in green should be read. The sections highlighted above may also reference paragraphs or tables within a non-highlighted section, which will then also need to be considered in the perspective of existing dwellings. Please note the text for new dwellings is still to be updated based on the stage 1 consultation response, and is not subject to this stage 2A consultation.

What is an approved document?

This Approved Document, which takes effect on [TBC] 2021, has been approved and issued by the Welsh Ministers to provide practical guidance on ways of complying with the ***energy efficiency requirements*** of the Building Regulations 2010 for Wales, as amended, which are referred to throughout the remainder of this document as 'the Building Regulations'.

These approved documents give guidance on each of the technical parts of the regulations and on regulation 7 (see the back of this document). The approved documents provide guidance for common building situations.

It is the responsibility of those carrying out building work to meet the requirements of the Building Regulations 2010. Although it is ultimately for the courts to determine whether those requirements have been met, the approved documents provide practical guidance on potential ways to achieve compliance with the requirements of the regulations in Wales.

Although approved documents cover common building situations, compliance with the guidance set out in the approved documents does not provide a guarantee of compliance with the requirements of the regulations because the approved documents cannot cater for all circumstances, variations and innovations. Those with responsibility for meeting the requirements of the regulations will need to consider for themselves whether following the guidance in the approved documents is likely to meet those requirements in the particular circumstances of their case.

Note that there may be other ways to comply with the requirements than the method described in an approved document. If you prefer to meet a relevant requirement in some other way than described in an approved document, you should seek to agree this with the relevant building control body at an early stage.

Where the guidance in the approved document has been followed, a court or inspector will tend to find that there is no breach of the regulations. However, where the guidance in the approved document has not been followed, this may be relied upon as tending to establish breach of the regulations and, in such circumstances, the person carrying out building works should demonstrate that the requirements of the regulations have been complied with by some other acceptable means or method.

In addition to guidance, some approved documents include provisions that must be followed exactly, as required by regulations or where methods of test or calculation have been prescribed by the Welsh Ministers.

Each approved document relates only to the particular requirements of the Building Regulations 2010 that the document addresses. However, building work must also comply with all other applicable requirements of the Building Regulations 2010 and all other applicable

legislation.

How to use this approved document

This document uses the following conventions.

a. Text against a grey background is an extract from the Building Regulations 2010 or the Building (Approved Inspectors etc.) Regulations 2010 (both as amended). These extracts set out the legal requirements of the regulations.

b. Key terms, printed in blue, are defined in Appendix A.

c. References are made to appropriate standards or other documents, which can provide further useful guidance. When this approved document refers to a named standard or other reference document, the standard or reference has been clearly identified in this document. Standards are highlighted in **bold** throughout. The full name and version of the document referred to is listed in Appendix D (standards) or Appendix C (other documents). However, if the issuing body has revised or updated the listed version of the standard or document, you may use the new version as guidance if it continues to address the relevant requirements of the Building Regulations.

d. Standards and technical approvals also address aspects of performance or matters that are not covered by the Building Regulations and may recommend higher standards than required by the Building Regulations. Nothing in this approved document precludes you from adopting higher standards.

e. 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.

User requirements

The approved documents provide technical guidance. Users of the approved documents should have adequate knowledge and skills to understand and apply the guidance correctly to the building work being undertaken.

Where you can get further help

If you are not confident that you possess adequate knowledge and skills to apply the guidance correctly or if you do not understand the technical guidance or other information in this approved document or the additional detailed technical references to which it directs you, you should seek further help. Help can be obtained through a number of routes, some of which are listed below.

a. If you are the person undertaking the building work: either from your local authority building control service or from an approved inspector

b. If you are registered with a competent person scheme: from the scheme operator

c. If your query is highly technical: from a specialist or an industry technical body for the relevant subject.

The Building Regulations

The following is a high level summary of the Building Regulations relevant to most types of building work. Where there is any doubt you should consult the full text of the regulations, available at www.legislation.gov.uk .

Building work

Regulation 3 of the Building Regulations defines 'building work'. Building work includes:

a. the erection or extension of a building

b. the provision or extension of a controlled service or fitting

c. the material alteration of a building or a controlled service or fitting.

Regulation 4 states that building work should be carried out in such a way that, when work is complete:

a. For new buildings or work on a building that complied with the applicable requirements of the Building Regulations: the building complies with the applicable requirements of the Building Regulations.

b. For work on an existing building that did not comply with the applicable requirements of the Building Regulations:

   (i) the work itself must comply with the applicable requirements of the Building Regulations and

   (ii) the building must be no more unsatisfactory in relation to the requirements than before the work was carried out.

Material change of use

Regulation 5 defines a 'material change of use' in which a building or part of a building that was previously used for one purpose will be used for another.

The Building Regulations set out requirements that must be met before a building can be used for a new purpose. To meet the requirements, the building may need to be upgraded in some way.

Materials and workmanship

In accordance with regulation 7, building work must be carried out in a workmanlike manner using adequate and proper materials. Guidance on regulation 7(1) is given in Approved Document 7, and guidance on regulation 7(2) is provided in Approved Document B.

Independent third party certification and accreditation

Independent schemes of certification and accreditation of installers can provide confidence that the required level of performance for a system, product, component or structure can be achieved.

Building control bodies may accept certification under such schemes as evidence of

compliance with a relevant standard. However, a building control body should establish before the start of the building work that a scheme is adequate for the purposes of the Building Regulations.

Energy efficiency requirements

Part 6 of the Building Regulations imposes additional specific requirements for energy efficiency.

If a building is extended or renovated, the energy efficiency of the existing building or part of it may need to be upgraded.

Notification of work

Most building work and material changes of use must be notified to a building control body unless one of the following applies.

a. It is work that will be self-certified by a registered competent person or certified by a registered third party.

b. It is work exempted from the need to notify by regulation 12(6A) of, or Schedule 4 to, the Building Regulations.

Responsibility for compliance

People who are responsible for building work (e.g. agent, designer, builder or installer) must ensure that the work complies with all applicable requirements of the Building Regulations. The building owner may also be responsible for ensuring that work complies with the Building Regulations. If building work does not comply with the Building Regulations, the building owner may be served with an enforcement notice.

Contents

Section 0: Introduction

Introduction

0.1 This approved document is ***Approved Document L:*** *volume 1 - conservation of fuel and power in dwellings*. It gives guidance on how to comply with Part L of Schedule 1 of the Building Regulations and the associated energy efficiency requirements for dwellings. For guidance for non-domestic buildings, use ***Approved Document L****: volume 2 - conservation of fuel and power in buildings other than dwellings.*

0.2 This approved document contains the following sections.

Approved Document Section	***Related Building Regulations requirements***
Section 0: Introduction	N/A
Section 1: Calculating the target CO_2 emissions and primary energy	Regulations 24, 25, 25B, 26, 27, new Regulation for Primary Energy, and new regulation for householder affordability
Section 2: Calculating the dwelling CO_2 emissions and primary energy	
Section 3: Consideration of high-efficiency alternative systems	Regulation 25A (as amended)
Section 4: Limiting heat losses and gains	Requirement L1(a) of Schedule 1 and Regulation 25C, 26B and 27B
Section 5: Fixed building services efficiencies and controls – general guidance	Requirement L1(b)(i) and (ii) of Schedule 1 and new Regulation for Self-regulating devices
Section 6: System Specific Guidance	
Section 7: Air permeability and pressure testing	Regulation 43
Section 8: Commissioning	Regulation 44, and Requirement L1(b)(iii) of Schedule 1
Section 9: Providing information	Regulation 40 and new Regulation for technical building systems
Section 10: New elements in existing buildings, including extensions	Requirement L1(a) of Schedule 1
Section 11: Works to elements in existing buildings	Requirement L1(a) of Schedule 1 and Regulations 22 and 23
Section 12: Consequential improvements	Regulation 28
Section 13: Optional approaches for more design flexibility	Requirement L1(a)and (b) of Schedule 1
Appendix A: Key terms	N/A

Appendix B: Reporting evidence of compliance	N/A
Appendix C: Documents referred to	N/A
Appendix D: Standards referred to **Appendix E: Elemental specification for the PER/TER**	N/A

Application

0.3 The guidance in this volume of Approved Document L applies to dwellings only. **[Note for consultation: the guidance presented in this draft relates to new and existing dwellings. However, we are only consulting on the existing dwellings guidance. The new dwellings guidance is still to be finalised accounting for the consultation stage 1 response]**

In a mixed-use building, Approved Document L volume 2 should be consulted for building work in those parts of the building that are not dwellings.

NOTE: Dwellings are self-contained units**.** Rooms for residential purposes are not dwellings, and so Approved Document L volume 2 applies to them. Buildings that contain only rooms for residential purposes are not dwellings, and Approved Document L volume 2 applies to them.

New buildings

0.4 Guidance for newly constructed buildings is given in **Sections 1 to 8** of this approved document.

Common areas in buildings with multiple dwellings

0.5 The common areas of buildings containing more than one dwelling fall outside the scope of this document. For the common areas.

a. If they are heated follow *[the guidance for buildings other than dwellings]*

b. if they are unheated, individual fabric elements should meet the minimum standards set out in **Section 4**.

Extensions and work in existing buildings

Guidance for building work on existing buildings is given in the relevant paragraphs within **Sections 3 and 5 to 8** of this approved document.

Exemptions for historic and traditional buildings

Exempt historic and traditional buildings

Works to the following classes of building are exempt from the *energy efficiency requirements* where compliance would unacceptably alter the character or appearance of the buildings:

a. listed in accordance with Section 1 of the Planning (Listed Buildings and Conservation Areas) Act 1990; or

b. in a conservation area designated in accordance with Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990; or

c. included in the schedule of monuments maintained under Section 1 of the Ancient Monuments and Archaeological Areas Act 1979.

Historic and traditional buildings where special considerations apply
In addition, special considerations apply to works to the following three classes of non-exempt existing buildings:
a. of architectural and historic interest and are referred to as a material consideration in a local authority's development plan or local development framework; or
b. of architectural and historic interest and are within national parks, areas of outstanding natural beauty, registered historic parks and gardens, registered battlefields, the curtilages of scheduled ancient monuments, and world heritage sites; or
c. of traditional construction with permeable fabric that both absorbs and readily allows the evaporation of moisture.

Work to such buildings is required to comply with the *energy efficiency requirements* as far as is reasonably practicable. In considering what is reasonably practicable, the work should not unacceptably alter or mar the character of the building or increase the risk of long-term deterioration.

The detailed technical guidance on how to implement specific energy efficiency measures produced by English Heritage should be taken into account when determining appropriate energy performance standards for building work to existing dwellings. See list of available guidance documents at http://www.english-heritage.org.uk/professional/advice/advice-by-topic/climate-change/energy-efficiency/

In general, new extensions to dwellings of historic and architectural interest should comply with the energy efficiency requirements: guidance on how to comply is set out within Sections 10 and 11. The only exception would be where there is a need for the extension to be consistent with the character of the existing building.

Particular issues relating to work to dwellings of historic and architectural interest warrant sympathetic treatment and would benefit from further professional advice. These issues include:
a. restoring the historic character of a building that has been subject to a previous inappropriate alteration, for example, replacement windows and doors; or
b. rebuilding a former historic building, for example, following a fire or infilling a gap site in a terrace; or
c. enabling the fabric of historic buildings to 'breathe' to control moisture and potential long-term deterioration.

When assessing dwellings of historic and architectural interest where special consideration may apply, it is important that the Building Control Body takes into account the advice of the local authority's conservation officer, particularly where the work requires planning permission and/or listed building consent.

Exemptions for covered areas, conservatories and porches

Parts of a building which are not heated, for example garages, carports and outbuildings are exempt. Conservatories and porches are also exempt from the energy efficiency requirements if they fulfil **all** of the following requirements:
a. be at ground level; and
b. have an internal floor area that is less than 30 m2; and
c. be thermally separate from the heated area of the dwelling, and

d. the conservatory or porch contains no fixed heating appliance or the buildings heating system is not extended into the conservatory or porch.

New dwellings with conservatories and porches

Conservatories and porches should be included in the ***DPER***/***DER*** calculations only if they are constructed at the same time as a new ***dwelling***; and
a. there is no thermal element between the ***dwelling*** and the conservatory and/or porch; or
b. the conservatory and/or porch will be heated via fixed heating.

Live–work units

0.15 A unit that contains both living accommodation and space to be used for commercial purposes (e.g. as a workshop or office) should be treated as a dwelling, as long as the commercial part can revert to domestic use.

0.16 The commercial part of a building can revert to domestic use if, all of the following apply.

a. there is direct access between the commercial space and the living accommodation; and
b. the commercial space and the living accommodation are within the same thermal envelope; and
c. the living accommodation comprises a substantial proportion of the total area of the unit. What constitutes a 'substantial proportion' should be assessed on a case-by-case basis.

Note: A large non-domestic building that contains a small flat for a manager is not treated as a dwelling. A dwelling that contains a room used as an office or utility space is still treated as a dwelling.

Mixed-use developments

0.17 When constructing a dwelling as part of a larger building that contains other types of accommodation, sometimes called a mixed-use development, refer to the two volumes of Approved Document L as follows.

a. For guidance on each individual dwelling, use this Approved Document (Approved Document L volume 1).
b. For guidance on the non-dwelling parts of the building, such as heated common areas and the commercial or retail space, use *[the guidance for buildings other than dwellings]*.

Regulations 24, 25, 25B, 25C(b), 26, 26B, 27, 27B, new regulation(s) for primary energy and new regulation(s) for householder affordability: Energy performance of buildings calculations

This approved document deals with the requirements of regulations 24, 25, 25B, 25C(b), 26B, 27 and 27B, of the Building Regulations 2010.

(All regulations will be amended as necessary in line with the performance sections below)

Regulation 24 - Methodology of calculation and expression of energy performance

(1) The Secretary of State shall approve–

(a) a methodology of calculation of the energy performance of buildings, including methods for calculating asset ratings and operational ratings of buildings; and

(b) ways in which the energy performance of buildings, as calculated in accordance with the methodology, shall be expressed.

(2) In this regulation–

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

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

Regulation 25 - Minimum energy performance requirements for new buildings

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 calculated and expressed in accordance with the methodology approved pursuant to regulation 24.

Regulation 25B – Nearly zero-energy requirements for new buildings

Where a building is erected, it must be a nearly zero-energy building.

Regulation 25C (b) – New Buildings: Minimum energy performance requirements

Minimum energy performance requirements must be approved by the Welsh Ministers, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, for-
new dwellings, in the form of target fabric performance values.

Regulation 26 – CO_2 emission rates for new buildings

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, applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

Regulation 26B – Fabric performance values for new dwellings

Where a dwelling is erected, it must not exceed the target fabric performance values for the dwelling which have been approved pursuant to regulation 25C (b), applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

Regulation 27 - CO_2 emission rate calculations

(1) This regulation applies where a building is erected and regulation 26 applies.

(2) Not later than the day before the work starts, the person carrying out the work shall give the local authority a notice which specifies–

a. the target CO_2 emission rate for the building, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and

b. the CO_2 emission rate for the building as designed, calculated and expressed in and accordance with the methodology approved pursuant to regulation 24; and

c. a list of specifications to which the building is to be constructed.

(3) Not later than five days after the work has been completed, the person carrying out the work shall give the local authority–

a. a notice which specifies–

i. the target CO_2 emission rate for the building, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and

ii. the CO_2 emission rate for the building as constructed, calculated and expressed in and accordance with the methodology approved pursuant to regulation 24; and

iii. whether the building has been constructed in accordance with the list of specifications referred to in paragraph (2) (c), and if not a list of any changes to those specifications; or

b. a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).

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

(5) In this regulation 'specifications' means specifications used for the calculation of the CO_2 emission rate.

Regulation 27B - Fabric performance values calculations

(1) This regulation applies where a dwelling is erected and regulation 26B applies.

(2) Not later than the day before the work starts, the person carrying out the work must give the local authority a notice which specifies—

(a) the target fabric performance values for the dwelling, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and
(b) the fabric performance values for the dwelling as designed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and
(c) a list of specifications to which the dwelling is to be constructed.

(3) Not later than five days after the work has been completed, the person carrying out the work must give the local authority—
(a) a notice which specifies—
(i) the target fabric performance values for the dwelling , calculated and expressed in accordance with the methodology approved pursuant to regulation 24;
(ii) the calculated fabric performance values for the dwelling as constructed, calculated and expressed in accordance with the methodology approved pursuant to regulation 24; and
(iii) whether the dwelling has been constructed in accordance with the list of specifications referred to in paragraph 2(c), and if not a list of any changes to those specifications; or
(b) a certificate of the sort referred to in paragraph (4) accompanied by the information referred to in sub-paragraph (a).

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

(5) In this Regulation, "specifications" means specifications used for the calculation of the fabric performance values."

***NEW* Regulation – Primary energy rates for new dwellings**

New regulation for Primary Energy target for new dwellings.

***NEW* Regulation – Householder affordability for new dwellings**

New regulation for householder affordability for new dwellings.

NOTE: Where the building control body is an approved inspector, see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

NOTE: Buildings which meet the standards set out in this Approved Document will meet the definition of nearly zero-energy buildings.

Performance

Regulation 24 and 25

Regulations 24 and 25 of the Building Regulations set requirements for the Welsh Ministers to set a methodology for the energy performance of a building. For a new dwelling, the approved methodology is the Standard Assessment Procedure.

Calculation methodologies are set out in **Section 1** and **Section 2**.

Regulation 26, 26B and [The Regulations for target primary energy]

A newly constructed building must be shown to meet Regulations 26 and [The Regulations for target

primary energy] of the Building Regulations 2010 by producing calculations to show that the dwelling meets all of the following.

a. target primary energy rate
b. target emission rate

The Target Emission Rate (TER) and Target Primary energy rate (TPER) is the minimum energy performance requirement for a new dwelling approved by the Welsh Ministers in accordance with regulation 25, based on the dwelling is built to the elemental specification as summarised in Appendix E of this Approved Document.

A newly constructed building must be shown to meet Regulations 27 and [The Regulations for target primary energy] of the Building Regulations 2010 by producing calculations to show that the dwelling meets all of the following.

a. dwelling primary energy rate
b. dwelling emission rate

Sections 1 and 2 set out both of the following:

a. the requirements for meeting the primary energy, CO_2 emission, and energy efficiency rating targets
b. the approved methodologies for calculating a dwelling's primary energy, CO_2 emission, and energy efficiency rating.

[The Regulations for householder affordability]

A newly constructed dwelling must be shown to meet [The Regulations for householder affordability] by demonstrating that under average household occupation, there are cost-efficient means of supplying:

a. Heating
b. Lighting
c. Hot water

In the Welsh Ministers view, [The Regulations for householder affordability] may be met by following **paragraph 1.4**.

Regulation 26B, 25C(b) and 27B

Section 4 sets out the requirements for meeting the target fabric performance values. In the Welsh Ministers view, Regulation 26B and 25C(b) may be met by following the mandatory minimum energy efficiency standards for the building fabric, which are set out in Section 4. The calculated fabric performance values for the new dwelling must be entered into the Standard Assessment Procedure. Regulation 27B requires that it must be demonstrated to the building control body before the work starts and at completion that the target fabric performance values have been met.

Section 1: Calculating the target emission rate, target primary energy rate, target fabric performance values, and householder affordability rate.

1.1 A new dwelling must be built to a minimum standard of total energy performance. This includes all of the following.

a. The emissions from the dwelling, influenced by the fabric and the fuel choice: this is the target emission rate
b. The primary energy from the dwelling, influenced by the fabric and fuel choice: this is the target primary energy rate
c. The cost of running the dwelling, influenced by the fabric and the fuel choice: this is the householder affordability rate

1.2 The target emission rate, target primary energy rate and the householder affordability for individual dwellings must be calculated using the The Government's Standard Assessment Procedure for Energy Rating of Dwellings, version 10.1. A list of approved software tools can be found by following the link to SAP10.1 at the following web page: https://www.gov.uk/guidance/standard-assessment-procedure [*Note for consultation: this list of approved software tools will not be available at consultation stage. A consultation version of the* Standard Assessment Procedure*, cSAP, will be available at the following web page:* wales.isap.org.uk *]*

Target emission rate and target primary energy rate

1.3 Both of the following should be calculated using the Standard Assessment Procedure in two stages:

a. The target emission rate, in kg/m^2/year.
b. The target primary energy rate, in kWh$_{PE}$/kWh

Stage 1

Calculate both:

a. the CO_2 emissions
b. the primary energy

from a theoretical dwelling (the notional dwelling) of the same size and shape as the actual dwelling, but with standardised properties for fabric and services. The standardised properties are set out in Appendix R of the Standard Assessment Procedure.

The calculation tool should report both:

c. the CO_2 emissions
d. the primary energy

arising from the use of all of the following.

i. Space heating and hot water, C_H

ii. Pumps and fans, C_{PF}

iii. Internal lighting, C_L

Stage 2

For dwellings served by a community heating scheme, calculate the target emission rate and the target primary energy rate using the following formulae:

$$Target\ Emission\ Rate_{2020} = (1.45C_H) + C_{PF} + C_L$$

$$Target\ Primary\ Energy\ Rate_{2020} = (1.05C_H) + C_{PF} + C_L$$

For all other dwellings, the target emission rate and target primary energy rate are a sum of C_H, C_{PF} and C_L.

[Note for consultation: the specifications for the Standard Assessment Procedure notional dwelling can be found in the consultation version of SAP10.1]

Householder affordability

1.4 [This stage 2A consultation is not seeking views on how this might be demonstrated in practice].

Buildings that contain multiple dwellings

1.5 For a building that contains more than one dwelling, for example a block of flats or a terrace of houses, an average target emission rate and target primary energy rate may be calculated as an alternative to an individual target for each dwelling. The floor-area-weighted average of the target emission rates and target primary energy rate for all the dwellings in the building should be calculated using the following formula:

$$\frac{\{(\text{target emission rate}1 \times Floor\ area1) + (\text{target emission rate}2 \times Floor\ area2) + (\text{target emission rate}3 \times Floor\ area3) + \ldots\}}{(Floor\ area1 + Floor\ area2 + Floor\ area3 + \ldots)}$$

1.6 The average target primary energy rate should be calculated using the formula above, but replacing target emission rate with target primary energy rate.

Calculating an average target emission rate or target primary energy rate for separate buildings on the same site is *not* considered to be a reasonable demonstration of compliance.

1.7 Each individual dwelling in a building that contains more than one dwelling should meet the householder affordability requirement in paragraph 1.4.

Section 2: Calculating the dwelling primary energy rate and dwelling emission rate

2.1 For all new dwellings:

a. the dwelling emission rate must be less than or equal to the target emission rate.

b. the dwelling primary energy rate must be less than or equal to the target primary energy rate.

2.2 The dwelling emission rate, and the dwelling primary energy rate must be calculated at both of the following points.

a. before work starts, using design values. The dwelling emission rate and the dwelling primary energy rate must be no greater than the target emission rate and the target primary energy rate.

b. when work is complete, using figures for the building as constructed, incorporating both of the following.

i. any changes to the list of specifications that have been made during construction

ii. the measured air permeability

2.3 The dwelling emission rate, and the dwelling primary energy rate should be calculated using the Government's Standard Assessment Procedure for Energy Rating of Dwellings, version 10.1. A list of approved software tools can be found by following the link to SAP10.1 at the following web page: https://www.gov.uk/guidance/standard-assessment-procedure [*Note for consultation: this list of approved software tools will not be available at consultation stage. A consultation version of the Standard Assessment Procedure, cSAP, is available at the following web page:* wales.isap.org.uk]

Building control notification

2.4 The building control body must be notified before the work starts of all of the following:

a. the dwelling primary energy rate(calculated using design values),

b. the dwelling emission rate and the target emission rate

c. the dwelling fabric performance values

d. a list of specifications used in the calculations.

2.5 The building control body must be notified once the work is complete of all of the following.

a. the as-built target emission rate and as-built dwelling emission rate

b. the as-built target primary energy rate and as-built dwelling primary energy rate

c. the as-built fabric performance values

d. whether the building was constructed in accordance with the list of specifications submitted to the building control body before work started. A list of any changes to the design-stage list of specifications must be given to the building control body. Building control bodies are authorised to accept a certificate of compliance signed by a suitably accredited energy assessor.

Buildings that contain multiple dwellings

2.6 Buildings that contain more than one dwelling must comply with one of the following.

a. every individual dwelling has all of:
   i. a dwelling emission rate that is no greater than the individual dwelling's target emission rate
   ii. a dwelling primary energy rate that is no greater than the individual dwelling's target primary energy rate
   iii. Each individual dwelling meets the householder affordability requirements in paragraph 1.4

OR

b. all of:
   i. the average dwelling emission rate for the whole building, calculated to paragraph 2.7, is no greater than the average target emission rate
   ii. the average dwelling primary energy rate for the whole building is no greater than the average target primary energy rate
   iii. Each individual dwelling meets the householder affordability requirements in paragraph 1.4

2.7 The average dwelling emission rate and dwelling primary energy rate are the floor-area-weighted average of the individual dwelling emission rates and dwelling primary energy rate for all the dwellings in the building. The average dwelling emission rate and dwelling primary energy rate are calculated in the same way as the average target emission rate, in paragraphs 1.5 and 1.6.

An average dwelling emission rate or dwelling primary energy rate should *not* be calculated across separate buildings on a site.

NOTE: Information must be provided for each individual dwelling, as described in **Section 8**.

Secondary heating in the dwelling emission and primary energy calculation

2.8 When calculating the dwelling emission rate, dwelling primary energy rate for a dwelling with a secondary heating appliance, all of the following apply.

a. The fraction of heat provided by the secondary heating system in the calculation must be as defined by the Standard Assessment Procedure for the particular combination of main heating system and secondary heating appliance.

b. The efficiency of the secondary heating appliance with its appropriate fuel should be used in the calculation of all of the dwelling emission rate and dwelling primary energy rate.

c. If a chimney or flue is provided but no appliance is installed, the presence of the following appliances should be assumed when calculating of all of the dwelling emission rate and dwelling primary energy rate.

i. if a gas point is located adjacent to the hearth, assume 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, either:

- if the dwelling is *not* in a smoke control area, assume an open fire in grate for burning multi-fuel with an efficiency of 37 per cent.
- if the dwelling is in a smoke control area, the fuel should be taken as smokeless solid mineral fuel.

d. If no secondary heating appliance is installed and there is no chimney or flue provided, then no secondary heating system should be assumed in the calculation.

Internal lighting in the dwelling emission and dwelling primary energy rate calculations

2.9 Both the dwelling emission rate and dwelling primary energy rate calculations should allow for the proportion of low-energy lamps installed in the fixed lighting locations.

Achieving the target emission rate and target primary energy rate

2.10 Provided the dwelling satisfies the minimum standards for fabric set out in **Section 4**, the designer can achieve all of the target emission rate and the target primary energy rate by using any of the following.

a. fabric energy efficiency
b. system measures
c. low and zero carbon technologies integrated in an appropriate mix.

NOTE: The target emission rate and the target primary energy rate are not likely to be met by using the minimum standards for fabric alone.

Special considerations when calculating dwelling emission rate and dwelling primary energy rate

Community energy systems

2.11 When determining the dwelling emission rate and dwelling primary energy rate for a dwelling connected to a community energy system, the annual percentage of heat supplied from each heat source should be the same for each newly connected dwelling. A submission to the building control body should be made to demonstrate that the community scheme has the capacity to provide the percentage of heat that is assumed.

When calculating the percentage of heat supplied from a district heating system, the calculation should account for the predicted effect of all dwellings which will be connected to the system in

the first 12 months of operation, so that the increased operation of any marginal plant (e.g. gas boilers) is properly accounted for.

Swimming pool basins

2.12 When determining the emission rate and the primary energy rate for a dwelling with a swimming pool, the thermal performance of the pool basin should not be included in the calculation. Instead, the dwelling emission rate and dwelling primary energy rate should be calculated as if the area covered by the pool were replaced with the equivalent area of floor with the same U-value as the pool surround.

Party walls

2.12 When calculating the dwelling emission rate and primary energy rate for a dwelling, a party wall U-value for the type of construction adopted as set out in Table 2.1 should be applied.

Table 2.1 U-values for party walls

Party wall construction	U-value W/(m^2.K)
Solid[1]	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[1]	0.2
A fully filled cavity with effective sealing at all exposed edges and in line with insulation layers in abutting elements	0.0

NOTES

1. In order to claim a reduced U-value (0.2 or 0.0), it is necessary to demonstrate that the edge sealing is likely to be robust under normal site conditions.

Regulation for the Consideration of high-efficiency alternative systems

This approved document deals with the requirements of [the Regulation for the consideration of high efficiency alternative systems as amended] of the Building Regulations 2010.

Regulation for the consideration of high-efficiency alternative systems.

[Amended regulation for the consideration of high efficiency alternative systems]

NOTE: Where the building control body is an approved inspector, see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

Performance

When a dwelling is erected, it must comply with [the regulation for the consideration of high efficiency alternative systems] of the Building Regulations 2010 by analysing the feasibility of installing high efficiency alternative systems. The local authority should be notified that this analysis has been carried out.

The Building Regulations do not require that high-efficiency alternative systems or other low and zero carbon systems are installed.

Section 3 of this document provides more details, including guidance when an existing building undergoes a major renovation.

Section 3: Consideration of high efficiency alternative systems

3.1 Before building work starts, the person undertaking the work must analyse the technical, environmental and economic feasibility of using high-efficiency alternative systems in the dwelling design. This analysis should be taken into account when designing the dwelling.

3.2 The analysis of high-efficiency alternative systems must be documented and available for verification processes. The documentation should state whether high-efficiency alternative systems have been included in the building design.

3.3 The analysis may be carried out for individual dwellings, groups of similar dwellings, or for common types of dwelling in the same area. Where a number of dwellings are connected to a community energy system, a single analysis may be carried out for all the dwellings connected to the system.

3.4 The documented results of the analysis should be retained for the building control body to inspect upon request.

3.5 When an existing building undergoes a major renovation, this may represent an opportunity to consider and take into account all of the following;

a. The technical, environmental and economic feasibility of installing high-efficiency alternative systems, and
b. Healthy indoor conditions, fire safety and risks related to intense seismic activity.

Requirement L1(a): Limiting heat gains and losses

This approved document deals with the requirements of Part L1 of Schedule 1 to the Building Regulations 2010.

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.	

Performance

Requirements for the conservation of fuel and power are given in Part L of Schedule 1 of the Building Regulations 2010.

In the Welsh Ministers view, Regulation L1(a) for new dwellings will be met where both of the following are achieved.

a. Limiting unwanted heat *losses* from the dwelling by meeting the standards for all of the following.
   i. the building fabric, including walls, floors, roof, windows and openings **paragraphs 4.1 to 4.10**
   ii. uncontrolled air loss (- **Section 7**)

iii. the pipework and services **paragraphs 4.13 to 4.21**

b. Limiting unwanted heat *gains* to the dwelling, throughout the year, through any of the routes listed in point a. as set out in **Section 4**.

In the Welsh Ministers view, Regulation L1(a) for existing dwellings will be met by meeting the standards in sections 9, 10, 11 and 12.

Section 4: Limiting heat losses and gains, and target fabric performance values

Limiting standards for fabric

Regulation 26B – Fabric performance values for new dwellings
Where a dwelling is erected, it must not exceed the target fabric performance values for the dwelling which have been approved pursuant to regulation 25C (b), applying the methodology of calculation and expression of the energy performance of buildings approved pursuant to regulation 24.

Regulation 25C (b) – New Buildings: Minimum energy performance requirements
Minimum energy performance requirements must be approved by the Welsh Ministers, calculated and expressed in accordance with the methodology approved pursuant to regulation 24, for-
new dwellings, in the form of target fabric performance values.

4.1 For a new dwelling, it must be demonstrated that the target fabric performance values have been met. The calculated fabric performance values for the new dwelling must be entered into the Standard Assessment Procedure. For new dwellings, in order to demonstrate compliance with regulation 25C (b), the fabric performance values must be as good as or better than the worst acceptable values set out in Table 4.1.

4.2 The stated U-values in table 4.1 for the main building elements are expressed as area-weighted average value for all types of that element in each dwelling. Approved Document C provides worst acceptable U-values for individual sections comprising each element to minimise the risk of condensation in dwellings.

4.3 For existing buildings, new insulation fabric elements should meet the limiting standards in Table 4.1. This includes all of the following.

a. new elements in existing buildings, such as those constructed as part of an extension.
b. Replacement elements in existing buildings.

4.4 U-values should be calculated using the methods and conventions set out in BRE publication **BR 443**. U-values should be for the whole thermal element (e.g. in the case of a window, the combined performance of the glazing and the frame).

Windows, doors and roof-lights

4.5 The U-value of a window should be calculated for one of the following:

a. the specific size and configuration of the window; or

b. the smaller of the two standard windows defined in **BS EN 14351-1**; or

c. the standard configuration set out in **BR 443**;

The U-value of a door should be calculated for either of the following:

a. the specific size and configuration of the door; or.

b. the standard size as laid out in **BS EN 14351-1**;

4.6 Alternatively, the default value from the Standard Assessment Procedure Table 6e can be used for doors or windows.

4.7 The limiting U-values for roof windows and roof windows in Table 4.1 are assuming the element is assessed in the vertical position. The limiting U-Value for a roof-light in Table 4.1 is presented assuming it is assessed in the horizontal position. If a roof window was not assessed in the vertical plane or roof-light was not assessed in the horizontal plane its U-value should be adjusted according to the guidance in **BR 443**.

NOTE: Further guidance on evaluating the U-value of out-of-plane roof-lights is given in NARM Technical Document **NTD 2**.

Table 4.1 Worst acceptable fabric performance values

Element type	Maximum U-value W/(m^2.K)[1]	
	In new dwellings	In existing dwellings
Roofs[2]	0.13	0.13
Wall – Dwelling Houses	0.18	0.18
Wall – Flats	0.21	0.21
Floor	0.15	0.15
Party wall	0.20	0.20
Swimming pool basin	0.25	0.25
Window or roof window [3,4,5]	1.4	1.4 or WER Band B
Roof-light [6,7,8]	2.2	2.2
Doors (including glazed doors)	1.4	1.4 or DSER Band [*TBC*]
Air Permeability	8.0 m^3/ h.m^2 at 50Pa	N/A

[Note – Doors: The appropriate DSER rating is to be confirmed to align with a U-value of 1.4 W/(m^2.K)]

Notes:

1. Area-weighted average values.

2. For dormer windows, 'roof' includes the roof parts of the windows, and 'wall' includes the wall parts (cheeks).

3. The effects of ~~Georgian bars and/or~~ decorative features such as ~~leaded lights~~ leadwork and/or saddle/stanchion bars can be ignored.

4. If performance needs require thicker glass to be used, an equivalent window unit with standard thickness (6mm) glazing should be shown to meet the required standard.

5. Including roof windows and curtain walling

6. U-values for roof-lights should be based on the total heat loss through the product divided by the surface area of the roof light. The surface area may be different to the aperture area. Further guidance is given in BR 443 and NARM Technical Document **NTD 2**.

7. Further guidance on evaluating the U-value of out of plane roof-lights is given in NARM Technical Document **NTD 2.**

8. The U-value upstands and builders' kerbs is subject to the limiting U-value for walls.

Continuity of insulation

4.8 The building fabric should be constructed so that all of the following apply.

a. the insulation is reasonably continuous over the whole building's thermal envelope; and

b. thermal bridging, including at the party wall, is reasonably limited

NOTE: Any solution to edge sealing or thermal bridging should take account of **Part E** of the Building Regulations.

4.9 Thermal bridges should be assessed using one of the following means.

a. Use construction joint details calculated by a suitably competent person following the guidance in BRE **Report BR 497** and the temperature factors set out in BRE **Information Paper IP 1/06**

b. Use the values in the Standard Assessment Procedure, Table K1, in the 'default' column

c. Use a default *y*-value of 0.20 W/(m^2·K)

NOTE: A mixture of approaches may be used for different elements on the same building. When using the approach in (a), an appropriate system of site inspection should be in place.

4.10 To avoid air movement within thermal elements, either

a. the insulation layer should be against the air barrier at all points in the building envelope
b. the space between the air barrier and insulation layer should be filled with solid material.

Limiting the effects of solar gains in summer for new dwellings

*[**Note for stage 2A consultation**: – Paragraphs 4.11 and 4.12 relate to overheating. We are proposing additional standards for overheating in certain dwellings within this consultation. Following analysis of the consultation responses, these paragraphs may be amended/removed]*

4.11 For a new dwelling, the effects of solar gain in summer should be limited by an appropriate combination of all of the following.

a. window size and orientation
b. solar protection e.g. through shading
c. ventilation
d. exposed thermal mass

4.12 For a new dwelling, it should be demonstrated, by following the procedure in the Standard Assessment Procedure Appendix P, that the dwelling does not have a high risk of high internal temperatures. This assessment should be carried out regardless of whether 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 ventilation rates.

Limiting heat losses from building services

Hot water pipework

4.13 In a new system, all of the following new pipework should be insulated.

a. Primary circulation pipes for heating circuits where they pass outside the heated living space, including where pipework passes into voids.
b. All primary circulation pipes for domestic hot water.
c. All pipes that are connected to hot water storage vessels, for at least 1 metre from the point at which they connect to the cylinder.
d. All secondary circulation pipework that is kept hot by that circulation.

4.14 In an existing system whenever a boiler or hot water storage vessel is replaced, any accessible pipes in the dwelling, should be insulated.

4.15 Heat losses from insulated pipework should not exceed those in **BS 5422** for hot water services at 60°C, regardless of the actual design temperature. Meeting the standards in Table 4.2 is one way of demonstrating that this has been achieved.

Table 4.2 Minimum thicknesses of pipework insulation for hot water services and space heating applications using high performance insulation

Nominal internal pipe diameter (mm)	Minimum insulation thickness[1] (mm) for low temperature hot water systems
≤ 10	5
≤ 25	10
≤ 50	15
≤ 100	20

Notes:

1: Thicknesses apply for insulation with a thermal conductivity of 0.025W/m.K or better. For other circumstances consult **BS 5422**.

External pipework for community heating systems

4.16 Pipework for community heating systems should be installed to either of the following.

a. the standards in BS EN 253 for pre-insulated pipes

b. the equivalent performance for conventionally heated pipes.

4.17 Where pipework is run above ground, the performance of the pipe insulation should be at least as high as the insulating performance of pipework in the buried part of the system.

Heated water storage for space or domestic hot water

4.18 Vessels that store heated water for a heating or domestic hot water system should have

standing losses that are a maximum of the heat loss given in Table 4.3 for that system type.

Table 4.3 Maximum daily heat loss for a hot water cylinder

Nominal volume (litres)	Heat loss (kWh/24h)	Nominal volume (litres)	Heat loss (kWh/24h)
50	1.03	400	2.59
100	1.49	500	2.80
150	1.88	600	2.98
200	2.06	700	3.14
250	2.22	800	3.29
300	2.36	900	3.44
350	2.48	1000	3.57

NOTE: The heat loss from cylinders (volume V litres) larger than 1000 litres should not exceed (16.66 + 8.33 x $V^{0.4}$)/(1000 x 24)

4.19 Hot water storage vessels should comply with the following.

a. Copper hot water storage combination units should comply with **BS 3198**.
b. Vented cylinders should comply with the heat loss and heat exchanger requirements of **BS 1566-1** or **BS EN 12897** as appropriate.
c. Unvented hot water storage system products should comply with **BS EN 12897**.

4.20 Primary storage systems should meet the insulation requirements of the Hot Water Association Performance Specification for Thermal Stores.

Heat interface units

4.21 Vessels that store heated water for a heating or domestic hot water system should have standing losses that are a maximum of the heat loss given in Table 4.3 for that system type.

Requirement L1(b)(i) and (ii): Fixed building services efficiency and controls

This approved document deals with the requirements of Part L1 of Schedule 1 to the Building Regulations 2010.

[regulations will be amended as necessary in line with the intention sections below]

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.

Performance

In the Welsh Ministers view, Regulation L1(b)(i) and (ii) will be met in a new dwelling by achieving all of the following.

a. Providing fixed building services which meet the minimum efficiencies in **Section 6.**
b. Providing controls to fixed building services that both:
    i. meet the general controls for heating and hot water systems in **paragraphs 5.7 to 5.14**
    ii. meet system specific controls in **Section 6**.
c. Any building automation and control systems and on-site electricity generation systems provided meet both a. and b.

In the Welsh Ministers view, requirement L1(b) (i) and (ii) are met in an existing dwelling by achieving all of the following.

a. Any fixed building services installed meet the minimum efficiencies in **Section 6** and the criteria in **paragraph 5.4**.
b. Any fixed building services installed have controls that both:
    i. meet the general controls for heating and hot water systems in **paragraphs 5.7**

to 5.22

ii. meet system specific controls in **Section 6**.

c. Any building automation and control systems and on-site electricity generation systems provided meet both a. and b.

Regulation for Self-regulating devices

This approved document deals with the requirements of [the Regulation for self-regulating devices] of the Building Regulations 2010.

Self-regulating devices

Regulation to transpose the requirement of Article 8(1) of the energy performance of buildings directive:

[*Member states shall require new buildings, where technically and economically feasible, to be equipped with self-regulating devices for the separate regulation of the temperature in each room or, where justified, in a designated heated zone of the building unit. In existing buildings, the installation of self-regulating devices shall be required when heat generators are replaced, where technically and economically feasible.]*

Performance

In the Welsh Minister's view [the regulation for self-regulating devices] is met in a new dwelling by achieving both of the following.

a. Self-regulating devices are installed where technically and economically feasible, as set out in **paragraphs 5.15, 5.17 and 5.18**.
b. Self-regulating devices provide separate regulation of the temperature in either:
    a. each room
    b. where justified in accordance with **paragraph 5.17**, in a designated heated zone of the building unit.

When a heat generator is replaced in an existing dwelling, in the Welsh Minister's view [the regulation for self-regulating devices] is met by achieving both of the following.

a. Self-regulating devices are installed where technically and economically feasible, as set out in **paragraphs 5.16 to 5.18**.
b. Self-regulating devices provide separate regulation of the temperature in either:
    i. each room
    ii. where justified in accordance with **paragraph 5.17**, in a designated heated zone of the building unit.

Section 5: Minimum building services efficiencies and controls – general guidance

*[**Note for consultation:** This consultation regards work to **existing** dwellings. Guidance for new dwellings is provided only for reference].*

New building services

5.1 Each new fixed building service, in a new or existing dwelling, should be at least as efficient as the value set out in **Section 6.** If a proposed service is not covered in **Section 6**, it should be demonstrated that it is no less efficient than a comparable service that is covered.

NOTE: Minimum efficiencies may also be set under the Ecodesign for Energy-Related Products Regulations 2010 (as amended).

5.2 Both of the following apply to the efficiency claimed for a fixed building service.

a. The efficiency should be based on the appropriate test standard set out in **Section 6**.
b. The test data should be certified by a notified body.

5.3 For heating and hot water systems in new dwellings, paragraphs 5.7 to 5.18 should be followed, in addition to system specific guidance in **Section 6.**

Replacement building services in existing dwellings

5.4 A replacement fixed building service should be at least as efficient as the value set out in **Section 6** and should either:

a. use the same fuel as the service being replaced and have a seasonal efficiency not worse than 2 percentage points lower than that of the service being replaced
b. use a different fuel than the service being replaced. The system should both:
    i. not produce more CO_2 emissions per kWh of heat than the appliance being replaced
    ii. not produce more primary energy per kWh of heat than the appliance being replaced.

For example:

Replacing an old LPG boiler of 70% efficiency with an oil-fired boiler at 90% efficiency.

CO_2 emissions

LPG boiler: 0.241/0.7 = 0.34 kgCO_2/kWh

Oil boiler: 0.298/0.9 = 0.33 kgCO_2/kWh

Primary energy

LPG boiler: 1.141/0.7 = 1.63 kgCO_2/kWh
Oil boiler: 1.18/0.9 = 1.31 kgCO_2/kWh

In this instance, the oil boiler has both lower CO_2 and primary energy than the LPG boiler being replaced, and therefore complies.

NOTE: If the efficiency of the appliance being replaced is not known, Tables 4a and 4b from the Standard Assessment Procedure should be used but with no adjustments from tables 4c and 4d. CO_2 emission factors and Primary Energy Factors should be taken from Table 12 of the Standard Assessment Procedure.

5.5 If renewable technology such as a wind turbine or photovoltaic array is being replaced, the new system should have an electrical output that is at least that of the original installation.

5.6 For heating and hot water systems replacements, paragraphs 5.16 to 5.22 should be followed, in addition to system specific guidance in **Section 6**. Consideration should be given to connect to any local heat networks (for example, providing capped off connections in pipework to allow subsequent connection to a local heat network).

Heating and hot water systems

Sizing space heating systems

5.7 The specification of space heating systems should be based on an appropriate heat loss calculation for the building, based on the manufacturer's instructions, and a sizing methodology that takes account of the properties of the dwelling, such as **CE54 Domestic Heating Sizing Method** or the **Plumbing Engineering Services Design Guide**. Systems should not be significantly oversized. In most circumstances this means that the heating appliance should not be sized for more than 120 per cent of the design heating load.

5.8 Where a wet heating system is being newly installed or fully replaced in an existing dwelling, including both the heating appliance and the emitters, the system should be sized to allow the space heating system to operate at a flow temperature of 55°C or lower. Where it is not feasible to install a space heating system which can operate at this temperature (for example, where there is insufficient space for larger radiators) the space heating system should be designed to the lowest design temperature possible which will still meet the heating needs of the dwelling.

Sizing domestic hot water systems

5.9 Domestic hot water systems should be sized for the anticipated domestic hot water demand of the building, based on **BS EN 12831-3** or the **Plumbing Engineering Services Design Guide**. Systems should not be significantly oversized.

Controls and zoning

5.10 For wet heating systems in new dwellings with a floor area of 150m^2 or greater, a minimum of two independently controlled heating circuits should be provided.

5.11 System controls should be wired so that when there is no demand for space heating or hot water, the heating appliance and pump are switched off.

5.12 Domestic hot water circuits that are supplied from a hot water store should have both of the following.

a. Time control which is independent of space heating circuits.
b. Electronic temperature control.

5.13 Primary hot water circuits for domestic hot water or heating should have fully pumped circulation where this is compatible with the heat generator.

5.14 For space heating systems, both:

- electric temperature control should be installed for the heating appliance
- all heat emitters except those in the reference room should be fitted with individual controls such as thermostatic radiator valves.

Self-regulating devices

5.15 For a new dwelling, each room or, where justified in accordance with paragraph 5.17, a heating zone must be provided with self-regulating devices for the separate control of heating in the room/zone. The installation of self-regulating devices should follow guidance in paragraph 5.18.

5.16 For work in existing dwellings, when a heat generator, such as a boiler, is replaced, self-regulating devices must be installed where technically and economically feasible for the separate control of heating in each room served by the heat generator. Alternatively, where justified in accordance with paragraph 5.17 heating may be controlled for each heating zone rather than individual rooms. The installation of self-regulating devices should follow guidance in paragraph 5.18. For the installation of self-regulating devices, economically feasible is defined as a simple payback period of 7 years or less.

NOTE: In normal circumstances, the installation of thermostatic radiator valves in wet central heating systems is likely to be economically feasible.

5.17 It may be justified to control a heating zone rather than individual rooms where any of the following apply.

a. In single-storey, open-plan dwellings in which the living area is greater than 70 per cent of the total floor area, sub-zoning of temperature control might not be appropriate. In such cases, the dwelling should be considered as a single heating zone.
b. Where two adjacent rooms have a similar function and heating requirements (e.g. kitchen and utility room).

NOTE: It might not be possible to equip some heating system types with self-regulating devices for the control of individual rooms. Such systems must still be equipped with self-regulating devices and may still be used where controlling a heating zone can be justified.

5.18 The requirement for self-regulating devices may be satisfied by providing any of the following.

a. An individual networked heat emitter control for each emitter.
b. Both of the following.
    i. A thermostat in a room that the heating circuit serves.
    ii. An individual self-regulating device for each heat emitter, such as a thermostatic radiator valve, on all heat emitters outside the room which contains the thermostat.
c. An individual room/zone thermostat or fan coil thermostat for each room/zone.
d. Any other controls which meet the function of [the regulation for self-regulating devices].

Controls in existing heating and domestic hot water systems

5.19 In addition to **paragraphs 5.16 to 5.18**, work on existing systems should incorporate the controls given in **paragraphs 5.20 to 5.22**.

5.20 If domestic hot water and space heating are controlled by a single time controller in the existing system, then these may continue to be controlled together after the work is complete. Otherwise, domestic hot water and space heating should each have separate time controls.

5.21 If work is carried out on a system which includes a boiler, a boiler interlock should be installed.

5.22 If replacing a boiler, the boiler controls are considered to be part of the boiler installation and should therefore meet the standards in **Section 6**.

Section 6: System specific guidance

*[**Note for consultation:** This consultation regards work to **existing dwellings**. Guidance for new dwellings is provided only for reference].*

Gas-fired heating systems

6.1 In addition to meeting the general requirements for heating and hot water systems in **Section 5**, a gas-fired heating system should either:

a. for new dwellings, meet the minimum efficiencies in Table 6.1
b. for existing dwellings, meet the minimum efficiencies in Table 6.2.

NOTE: The minimum system efficiency in Table 6.1 might need to be improved upon to meet the target emission rate and target primary energy rate for the building.

Table 6.1 Minimum efficiencies for gas-fired heating systems in new dwellings

System type	Minimum efficiency
Wet Heating (e.g. radiators or underfloor heating)	92% (as defined in ErP[1])

Table 6.2 Minimum efficiencies for gas-fired heating systems in existing dwellings

System type	Minimum efficiency	Notes
Wet Heating (e.g. radiators or underfloor heating)	92% (as defined in ErP[1])	Or, in exceptional circumstances in existing buildings SEDBUK 2009 efficiencies as follows[2]: • 78% for natural gas • 80% for LPG Follow paragraph 6.2.
Range cooker with integral central heating boiler	75% (as defined in SEDBUK 2009)	Follow paragraph 6.3.
Warm air heating	**BS EN 778** or **BS EN 1319**	If a gas-fired circulator is incorporated for domestic hot water its full and part load efficiency should meet **BS EN 483:1999+A4:2007** Follow paragraph 6.4.
Independent space heating appliance for	63% gross 70% net	Gross efficiency using the following standards as appropriate: • **BS EN 1266** • **BS 7977-1**

primary and secondary space heating		• **BS EN 613** • **BS EN 13278** Follow paragraph 6.5.
Inset live fuel-effect combined fire/backboiler	45% for natural gas 46% for LPG	Gross efficiency using **BS 7977-2** Follow paragraph 6.6.
All types except inset live fuel-effect combined fire/backboiler	63% for natural gas 64% for LPG	Gross efficiency using **BS 7977-2** as appropriate.
Decorative fuel-effect fires	No minimum efficiency	Meet product standards in **BS EN 509** Follow paragraph 6.7.
NOTES: 1. For Standard Assessment Procedure modelling, SEDBUK values should be used. 2. Exceptional circumstances are defined in the MHCLG's **Guide to the Condensing Boiler Installation Assessment Procedure for Dwellings.**		

6.2 If a gas-fired combination boiler is installed in an existing dwelling, at least one of the following energy efficiency measures, appropriate to the system, should be installed.

a. Flue gas heat recovery.
b. Weather compensation.
c. Load compensation.
d. Smart thermostat (with remote access) with automation and optimisation.

6.3 If a gas-fired range cooker with an integral central heating boiler (within a single appliance body) is provided as part of a new system or replacement component in an existing dwelling, the appliance should have two independently controlled burners (one for the cooking function, and one for the boiler).

NOTE: This paragraph does not apply to appliances with fully independent boiler and cooker parts within a shared case. In this case, the boiler should be treated in the same way as a conventional gas-fired boiler.

6.4 If a gas-fired warm air system is installed in an existing dwelling, all the following should apply.

a. Installed in accordance with **BS 5864.**
b. All new or replacement ductwork should be insulated in accordance with **BS 5422.**
c. Where controls are external to the heater, the system should be provided with a time switch/programmer and room thermostat, or programmable room thermostat.
d. Where controls are integrated in the heater, the system should be provided with a time switch/programmer and room temperature sensor linked to heater firing and fan speed control.
e. Independent temperature control of the hot water circuit should be implemented with a cylinder thermostat and a timing device, wired such that when there is no demand for hot water both the pump and circulator are switched off.
f. The guidance for self-regulating devices in **paragraphs 5.16 to 5.18** should be met.

6.5 If a gas-fired fixed independent space heating appliance is installed in an existing dwelling, either:

a. an appliance for primary space heating should meet the standards i to iv below

b. an appliance for secondary space heating should meet one or more of the standards below:
   i. **BS EN1266**
   ii. **BS 7977-1**
   iii. **BS EN 613**
   iv. **BS EN 13278**
   v. **BS EN 14829**
   vi. **BS EN 449.**

For new systems each appliance should be capable of controlling the temperatures independently in areas that have different heating needs (e.g. separate sleeping and living areas). In existing systems, temperature controls should be upgraded to the standards for new systems, and meet the guidance for self-regulating devices in **paragraphs 5.16 to 5.18**.

6.6 If a gas fire is provided as a secondary heat source as part of a combined fire and back boiler unit in an existing system, the standards in **BS 7977-2** should be met.

6.7 Where a gas-fired fixed decorative fuel-effect fire is installed in an existing dwelling, both the following should apply:

a. the standards in **BS EN 509** should be met
b. There should be a maximum of one appliance per 100 m^2 of dwelling floor area.

Oil-fired heating systems

6.8 In addition to meeting the general requirements for heating and hot water systems in **Section 5,** an oil-fired heating system provided as part of a new system or replacement component in an existing dwelling should meet the minimum efficiencies in Table 6.3.

Table 6.3 Minimum efficiencies for oil-fired heating systems in existing dwellings

System type	Minimum efficiency	Notes
Wet heating – regular boiler	91% (as defined in ErP[1])	Or, in exceptional circumstances[1] in existing buildings 84% SEDBUK 2009.
Wet heating – combi-boiler	86% (as defined in SEDBUK 2009)	Or, in exceptional circumstances[1] in existing buildings 82%.
Range cooker with integral central heating boiler	80%	Follow paragraph 6.9.
Continuously burning vaporising appliance providing secondary heating or hot water	-	Follow paragraph 6.10.
Fixed independent space heating	60% (as given in OFTEC standard **OFS A102:2004** and converted using Table E4 of the Standard Assessment Procedure)	

NOTES:

1. For Standard Assessment Procedure modelling, SEDBUK values should be used.
2. Exceptional circumstances are defined in the MHCLG's Guide to the **Condensing Boiler Installation Assessment Procedure for Dwellings.**

6.9 If an oil-fired range cooker with an integral central heating boiler (within a single appliance body) is part of a new system or replacement component in an existing dwelling, the appliance should have two independently controlled burners (one for the cooking function, and one for the boiler).

NOTE: This paragraph does not apply to appliances with fully independent boiler and cooker parts within a shared case. In this case, the boiler should be treated in the same way as a conventional gas-fired boiler.

6.10 If a continuously burning oil-fired vaporising appliance is provided for secondary heating or hot water, either of the following should apply.

a. For a manually operated appliance, no further control is required above the integral manual controls that the appliance manufacturer provided.
b. For an electrically operated appliances, an integral remote or thermostatic control should be provided.

NOTE: This guidance does not apply to appliances that have been converted from another fuel.

Electric heating systems

NOTE: Electric resistance heating is assumed to be 100 per cent efficient, therefore no minimum efficiency is set for these types of system.

6.11 In addition to meeting the general requirements for heating and hot water systems in **Section 5**, electric heating systems should follow paragraphs 6.12 to 6.14.

6.12 If an electric storage heater is installed, automatic control of input charge should be provided for electric storage heaters. Temperature control should operate by adjusting the rate of heat release from the appliance, using an adjustable damper or other thermostatically controlled method.

6.13 If an electric panel heater is installed or provided as a replacement component, time and temperature control should be provided to allow separate control for either of the following.

a. Each room.
b. Each appliance, where this meets the guidance for self-regulating devices in paragraphs 5.15 to 5.18**.**

6.14 If an electric warm air system is installed or provided as a replacement component provided, both of the following should be provided.

a. a programmable room thermostat or a time switch and room thermostat.
b. separately controllable heating zones which meet the guidance for self-regulating devices in paragraphs 5.15 to 5.18**.**

Solid fuel heating systems

6.15 Solid fuel appliances in new and existing dwellings should have a minimum efficiency (gross calorific value) as specified in Table 6.4 for the category of appliance.

6.16 If a solid fuel appliance used to deliver primary heating as part of a central heating system is in one of the following categories from Table 6.4:

a. D1/2/3/4
b. F
c. G2
d. J2
e. J5.

then, the system should comply with all of the following.

a. Meet the general requirements for heating and hot water systems in **Section 5**.
b. Have separate time control for space heating and hot water circuits.
c. Have automatic control of the burning rate.
d. Follow the manufacturer's instructions on the size and position of radiators designed to keep the system operating effectively by leaking heat (known as heat leak radiators).

6.17 For central heating systems in which a solid fuel appliance is installed as part of a new system or as a replacement component in an existing dwelling, the appliance should both:

a. be from categories D, F, G and J
b. have a ratio of room heat to water heat appropriate for the room and total property.

Table 6.4 Solid fuel appliance categories and minimum efficiencies

Category[1]	Appliance description	Minimum efficiency (gross calorific value)	Feed-type
D1/2/3/4	Open fire and high output boiler	63%	Batch
E1/2/3	Dry room heater – wood or multi-fuel	65%	Batch/auto
E4	Dry room heater – pellet stove	65% part load 70% nominal load	Auto
F	Room heater with boiler	67% (mineral fuels and wood logs) 70% (wood pellets – part load) 75% (wood pellets – nominal load)	Batch/Auto
G1	Cooker without boiler not exceeding 3.5 kW	55% (wood fuels)	Batch
G2	Cooker without heating boiler exceeding 3.5 kW	60% (wood fuels)	Batch
J2	Independent boiler – wood logs only	75%	Batch
J5	Independent boiler – wood/pellets/chips	75% nominal load 70% part load	Auto

NOTES:

1. Refers to the categories as set out in **The Official Guide to HETAS Approved Products and Services,** 2017.

Community heating systems

6.18 Paragraphs 6.19 to 6.24 apply where work involves connecting dwellings to a new or existing community heating scheme that achieves both of the following.

a. Supplies 15 or more dwellings from a central source such as a boiler, combined heat and power unit, or heat pumps.
b. Distributes heat from the central source using a wet radiator system (although warm air heating and underfloor heating systems may also be used).

6.19 The central heat source should comply with the requirements in **Approved Document L, volume 2, *buildings other than dwellings***, except where specified in this section.

Connecting dwellings to an existing community heating scheme

6.20 When connecting to an existing district or community heating system, the carbon intensity and primary energy of the scheme should be assessed. Emission factors and primary energy factors should be determined by a suitably qualified person, based on the particular details of the scheme, and taking account of the annual average performance of the whole system, including distribution circuits and all the heat generating plant, combined heat and power, waste heat recovery and heat dumping.

Minimising energy used by pumps

6.21 For new community heating systems, both of the following should apply.

a. The design temperature difference for the community heating primary circuit should be a minimum of 20°C.
b. Variable volume control systems should be used to reduce the volume of water and the pressure difference required from the pumps under part load.

Controls

6.22 The maximum design flow rate into the dwelling's heating system should be limited by suitable control and balancing valves to maintain the overall balance in the network and to avoid excessive pumping energy.

6.23 For new community heating systems, the hot water system should be controlled using variable volume controls designed to maintain low return temperatures in the primary community heating circuit.

Metering

6.24 Community heating systems should be designed to accommodate heat meters for each dwelling at the point of installation.

Underfloor heating systems

Zoning and Controls

6.25 In addition to meeting the general requirements for heating and hot water systems in **Section 5,** all of the following apply to new underfloor heating systems.

a. All floor heating systems should be fitted with controls to adjust the operating temperature.
b. Room thermostats for electric underfloor heating systems should have a manual override feature.

c. Thick screed floor heating systems (>65 mm) should have facilities to automatically adjust the room temperature to a lower level at night or when the room is unoccupied.
d. Heat loss should be minimised by following paragraphs 6.26 to 6.29.

Minimising heat losses

6.26 Ground floors and those in contact with the outside should be insulated to limit heat losses to not more than 10 W/m^2. The heat loss from the floor should be calculated using the sum of the thermal resistance of the floor finish and the underlying heated layer, multiplied by 10.

6.27 Floor heating systems intended for intermittent or cyclical operation or installed over unheated rooms should be separated from the structural floor by a layer of thermal insulation of at least 1.25 (m^2.K)/W.

6.28 The intermediate floor should have a separating layer of system thermal insulation with thermal resistance of one of the following.

a. As in paragraph 6.26.
b. As specified in **BS EN 1264-4**, in one of the following scenarios.
   i. For electric systems, of not less than 0.5 (m^2.K)/W.
   ii. For wet systems, of not less than 0.75 (m^2.K)/W.

6.29 Distribution pipework which does not provide useful heat to a room should be insulated to the standards of paragraph 4.16.

Specific standards for electric underfloor heating

6.30 Electric cables for underfloor heating should be installed within screeds as follows.

a. For direct-acting systems, within screeds not exceeding 60mm.
b. For night energy storage systems, within screeds of at least 65mm.

6.31 Where electric cable underfloor heating night energy storage systems are used, both of the following should apply.

a. A minimum of 20% of the floor area of the dwelling should have fast-response systems such as panel heaters.
b. Controls should be installed which are designed to modify the input charge in response to both of the following.
   i. The room thermostat.
   ii. Floor temperature sensing.

6.32 Programmable room thermostats with an override feature should be provided for all direct-acting zones of the electric underfloor heating system with air and floor temperature sensing capabilities, to be used individually or combined.

Heat pump heating systems

NOTE: Where the heat pump provides comfort cooling, guidance is also given in paragraphs 6.42 to 6.44.

6.33 Electrically driven air-to-air heat pumps with an output less than or equal to 12 kW should have a seasonal coefficient of performance as defined by Eco design Commission Regulation No 206/2012 Annex II, average rating conditions.

6.34 Other types of heat pump should have a coefficient of performance that meets both of the following requirements.

a. For space heating, a minimum of **3.0** for space heating in a new or existing dwelling
b. A minimum of **2.0** for heating domestic hot water.

6.35 In addition to meeting the general requirements for heating and hot water systems in **Section 5**, the heat pump unit should include controls to do all of the following.

a. Control water pump operation (internal and external as appropriate).
b. Control both of the following.
    i. Water temperature for wet systems.
    ii. Air temperature for air systems.
c. Control outdoor fan operation for air-to-water and air-to-air units.
d. Provide defrost control of external airside heat exchanger for air-to-water and air-to-air systems.
e. Control secondary heating (if fitted) on air-to-air systems.
f. Protect for water flow failure.
g. Protect for high water temperature.
h. Protect for high refrigerant pressure.
i. Protect for air flow failure on air-to-water and air-to-air units.

6.36 External heat pump controls should include both of the following.

a. Weather compensation or internal temperature control.
b. Timer or programmer for space heating.

Solar water heating systems

NOTE: The guidance for solar water heating in this document applies to indirect solar systems that supply domestic hot water and have both of the following.

a. A solar collector area of less than 20 m^2.
b. A solar heated water storage volume of less than 440 litres.

6.37 New solar hot water collectors should be independently certified as complying with all required tests according to **BS EN 12975-1** for both of the following.

a. Thermal performance.
b. Reporting and identification.

6.38 The electrical input power of the primary pump in the solar system should be less than the higher of the following.

a. 50 Watts.
b. 2 per cent of the peak thermal power of the collector.

6.39 For a heat exchanger between a solar primary and secondary system, a minimum of 0.1 m^2 or equivalent of heat exchanger area should be provided or every 1 m^2 of the net absorber area of the solar collector, or equivalent.

6.40 For work on new or existing solar water heating system, controls should be fitted or upgraded to solar domestic hot water systems to do all of the following.

a. Maximise the useful energy gain from the solar collectors.
b. Minimise the accidental loss of stored energy.
c. Ensure that hot water produced by back-up sources is not used when adequate solar pre-heated water is available.
d. Provide a means to control the adverse effects of excessive temperatures and pressures.
e. Where a separate domestic hot water heating appliance is pre-heated by a solar system, the appliance should be controlled to add no extra heat if the target temperature is met from the solar pre-heated vessel.

6.41 The ratio of the storage volume of solar heated water to the area of the collector should be either of the following.

a. The dedicated solar storage volume should be a minimum of 25 litres per net square metre of the solar collector absorber area.
b. Alternatively, the dedicated solar storage volume should be a volume equivalent to at least 80 per cent of the daily hot water demand (as defined by the Standard Assessment Procedure).

Space and comfort cooling

6.42 The specification of space cooling systems should be based on an appropriate heat gain calculation for the building, based on **CIBSE Guide A** and by following the manufacturer's guidance. Systems should not be significantly oversized. In most circumstances this means that the cooling appliance should not be sized for more than 120% of the design cooling load.

6.43 The seasonal energy efficiency ratio of an air conditioner working in cooling mode should be a minimum of **4.0**.

6.44 Fixed air conditioners should have a minimum energy efficiency classification of Class C in Schedule 3 of the labelling scheme adopted under the Energy Information (Household Air Conditioners) (No 2) Regulations.

6.45 Comfort cooling/air-conditioning systems should have all of the following controls.

a. For each control zone and for each terminal unit, it should be possible to independently control both of the following:
    i. Timing control
    ii. Temperature control.
b. If both heating and cooling are provided in the same space, the controls should prevent them operating simultaneously.
c. For centralised cooling systems, follow the guidance in **Approved Document L, volume 2**.

6.46 Exposed refrigeration pipework should be both of the following.

a. Insulated.
b. Enclosed in protective trunking.

Mechanical ventilation

6.47 The specification of ventilation systems should be based on the ventilation needs of the building, in accordance with **Approved Document F**. Systems should be designed so that they can be commissioned to suitable ventilation rates so that spaces are not be significantly overventilated.

6.48 For new or existing dwellings, the specific fan power for mechanical ventilation systems should be a maximum of:

a. for intermittent extract ventilation systems: 0.5 W/(l.s)
b. for continuous extract ventilation systems: 0.7 W/(l.s)
c. for continuous supply ventilation systems: 0.5 W/(l.s)
d. for continuous supply and extract with heat recovery ventilation systems: 1.5 W/(l.s).

6.49 For new or existing dwellings, all ventilation systems providing both supply and extract ventilation should be fitted with all of the following.

a. *Heat recovery system.*
b. *Summer bypass (the possibility to bypass the heat exchanger or to control its heat recovery performance).*
c. *Variable speed controller.*

6.50 Ventilation heat recovery systems, where incorporated, should have a minimum efficiency of 73 per cent.

Lighting

6.51 Any fixed lighting should be designed to achieve lighting levels appropriate to the activity in the space, based on the **SLL Lighting Handbook** or an equivalent design guide. In many cases, it is likely that householders will be able to choose the lamp installed in the individual space, however, where fixed lighting is provided, spaces should be within an illuminance range

recommended in design guidance and should not be over-illuminated.

6.52 Where installed in a new or existing dwelling, each internal light fitting should have lamps with a minimum luminous efficacy of 60 lamp lumens per circuit-watt.

6.53 *Where installed in a new or existing dwelling, internal* light fittings should have local controls to allow for the separate control of lighting in each space or zone. Controls may be either manual, automatic or a combination of both.

6.54 *Where installed in a new or existing dwelling, external* light fittings should have *both of the following controls.*

a. *All external* light fittings should have automatic controls which switch luminaires off in response to daylight.

b. If the lamp efficacy is 60 lamp lumens or less, *external* light fittings should have automatic controls which switch luminaires off in response to occupancy. Otherwise manual control is acceptable.

Building Automation and Control Systems

6.55 Where a building automation and control system is installed in a new or existing dwelling, it should have appropriate control capabilities for the dwelling, based on the type of building, its expected use and potential energy savings. The system should be appropriately sized.

6.56 The system should be specified and installed according to the manufacturer's instructions to ensure the overall performance of the system meets a reasonable standard.

6.57 For large or complex buildings, the guidance in **Approved Document L, volume 2: *buildings other than dwellings*** should be followed.

On-site electricity generation

6.58 Where on-site electricity generation is installed, such as photovoltaics or battery storage, systems should be sized appropriately for the site, available infrastructure and on-site energy demand.

6.59 The system should be specified and installed according to the manufacturer's instructions to ensure the overall performance of the system meets a reasonable standard.

6.60 If the installation is replacing an existing system, the installed generation capacity of the new system should not be smaller than the existing system, except where it can be demonstrated that a smaller system would be more appropriate or effective (for example, replacing an existing system with one which is better matched to the building's energy demand).

6.61 On-site generation electricity generation should be provided with controls to allow proper operation of the system without the need for user intervention. This is particularly the case where electricity generation and storage systems are used, such as batteries.

Regulation 43: Pressure testing

This approved document deals with the requirements of regulation 43 of the Building Regulations 2010.

Regulation 43 - Pressure testing

(1) This regulation applies to the erection of a building in relation to which paragraph L1(a)(i) of Schedule 1 imposes a requirement.

(2) Where this regulation applies, the person carrying out the work shall, for the purpose of ensuring compliance with regulation 26 and paragraph L1(a)(i) of Schedule 1:

(a) ensure that:

i. pressure testing is carried out in such circumstances as are approved by the Secretary of State; and

ii. the testing is carried out in accordance with a procedure approved by the Secretary of State; and

(b) subject to paragraph (5), give notice of the results of the testing to the local authority.

(3) The notice referred to in paragraph (2)(b) shall:

(a) record the results and the data upon which they are based in a manner approved by the Secretary of State; and

(b) be given to the local authority not later than seven days after the final test is carried out.

(4) A local authority is authorised to accept, as evidence that the requirements of paragraph (2)(a)(ii) have been satisfied, a certificate to that effect by a person who is registered by the Independent Airtightness Testing Scheme Limited or the Air Tightness and Testing and Measuring Association in respect of pressure testing for the air tightness of buildings.

(5) Where such a certificate contains the information required by paragraph (3)(a), paragraph (2)(b) does not apply.

NOTE: Where the building control body is an approved inspector, see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

Performance

When a dwelling is erected, it must be demonstrated to comply with regulation 43 of the Building Regulations 2010 by carrying out pressure testing.

Section 7 of this document sets out how the pressure testing should be carried out.

Compliance with Regulation 43 of the Building Regulations 2010 may be demonstrated by pressure testing according to paragraphs 7.1 to 7.11.

Section 7: Air permeability and pressure testing

7.1 The minimum standard for air permeability of a new build dwelling is 8 m^3/ $h.m^2$ at 50Pa, as stated in **Section 4.**

7.2 The developer should provide a building control body with evidence that test equipment has been calibrated within the previous 12 months using a UKAS-accredited facility.

7.3 Building control bodies may accept a pressure test certificate as evidence that the building complies with Regulation 43 of the Building Regulations.

The building control body should be provided with evidence that the person who pressure-tested the building both

a. has received appropriate training

b. is registered to test the specific class of building.

7.4 An air pressure test should be carried out on every dwelling.

Showing compliance, and reporting pressure test results

7.5 The dwelling emission rate and the dwelling primary energy rate calculated using the measured air permeability must not be worse than the target emission rate and the target primary energy rate.

7.6 If the criteria in paragraphs 7.1 and 7.5 are not achieved, the dwelling air permeability should be improved. New tests should be carried out until the dwelling achieves the criteria in paragraphs 7.1 and 7.5.

7.7 The results of all pressure tests on dwellings should be reported to the building control body, including any test failures.

Air pressure testing procedure

7.8 Air pressure tests should be performed following the guidance set out in [the approved air tightness testing methodology – see consultation document]. The procedures set out in this document have been approved by the Welsh Ministers.

Requirement L1(b)(iii) and Regulation 44: Commissioning

This approved document deals with the requirements of Part L1 of Schedule 1 to the Building Regulations 2010 and Regulation 44.

[regulations will be amended as necessary in line with the intention sections below]

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:

(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.

Commissioning

44.—(1) This regulation applies to building work in relation to which paragraph F1(2) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed system for mechanical ventilation or any associated controls where testing and adjustment is not possible.

(2) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a requirement, but does not apply to the provision or extension of any fixed building service where testing and adjustment is not possible or would not affect the energy efficiency of that fixed building service.

(3) Where this regulation applies the person carrying out the work shall, for the purpose of complying with paragraph F1(2) or L1(b) of Schedule 1, give to the local authority a notice confirming that the fixed building services have been commissioned in accordance with a procedure approved by the Secretary of State.

(4) The notice shall be given to the local authority –

(a) not later than the date on which the notice required by regulation 16(4) is required to be given; or

(b) where the regulation does not apply, not more than 30 days after the completion of the work.

NOTE: Where the building control body is an approved inspector, see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

Performance

In the Welsh Minister's view, L1(b)(iii) and regulation 44 is met by commissioning any fixed building services, building automation and control systems and on-site electricity generation in accordance with **Section 8**.

Section 8: Commissioning

8.1 Fixed building services, building automation and control systems and on-site electricity generation must be commissioned to ensure that they use no more fuel and power than is reasonable in the circumstances. The commissioning process should involve testing and adjusting any fixed building service, building automation and control system and on-site electricity generation as necessary and in accordance with the manufacturer's instructions.

8.2 A commissioning plan should be produced, identifying both of the following.

a. Systems that need to be tested.
b. How these systems will be tested.

For new dwellings, the commissioning plan should be given to the building control body with the design stage emission rate and primary energy calculations.

8.3 A fixed building service, building automation and control system or on-site electricity generation that cannot be adjusted by design, or for which commissioning would not affect energy use, does not need to be commissioned.

Fixed building services, building automation and control systems and on-site electricity generation that do not require commissioning should be identified in the commissioning plan, along with the reason for them not requiring commissioning.

Notice of completion

8.4 A commissioning notice must be given to the relevant building control body and the building owner confirming that commissioning has been carried out for the installed fixed building services, building automation and control systems and on-site electricity generation according to a procedure approved by the Secretary of State. The notice should confirm that:

a. That the commissioning plan has been followed.
b. That every system has been inspected in an appropriate sequence and to a reasonable standard.
c. That the test results confirm that performance is reasonably in accordance with the design requirements.

8.5 The notice of completion of commissioning for regulation 44 should be given as follows.

a. If a building notice or full plans have been given to a local authority building control body, the notice should be given to that building control body within five days of the commissioning work being completed.
b. If the building control body is an approved inspector, the notice should generally be given to

the approved inspector within five days of the work being completed.

c. In other cases, for example, if the work is carried out by a person registered with a competent person scheme, the notice must be given to the building control body within 30 days.

Where any fixed building services, building automation and control systems and on-site electricity generation that require commissioning are installed by a person registered with a competent person scheme, that person may give the notice of commissioning.

System specific guidance

Hot water systems for space and domestic hot water heating

8.6 Before a new heating appliance is installed, all central heating and primary hot water circuits should be thoroughly cleaned and flushed out. A suitable chemical inhibitor should be added to the primary heating circuit to protect against scale and corrosion.

NOTE: The benchmark commissioning checklist can be used to show that commissioning has been carried out satisfactorily for gas-fired wet heating systems.

Community heating systems

8.7 For community heating systems, both of the following should be done.

a. Systems should be commissioned to optimise the use of energy for pumping.
b. Flow rates in individual heat emitters should be balanced by either of the following.
   i. Using appropriate return temperatures.
   ii. Using calibrated control valves.

Underfloor heating

8.8 All installed equipment in underfloor heating systems should be commissioned in accordance with **BS EN 1264-4**

Regulation 40: Providing information and the regulation for energy performance of technical building systems

This approved document deals with the requirements of regulation 40 and [the regulation for technical building systems] of the Building Regulations 2010.

[regulations will be amended as necessary in line with the intention sections below]

Information about use of fuel and power

40. (1) This regulation applies where paragraph L1 of Schedule 1 imposes a requirement relating to building work.

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

Technical building systems
[Regulation to transpose the requirement of Article 8(9) of the energy performance of buildings directive]:

[Member States shall ensure that, when a technical building system is installed, replaced or upgraded, the overall energy performance of the altered part, and where relevant, of the complete altered system, is assessed. The results shall be documented and passed on to the building owner, so that they remain available and can be used for the verification of compliance with the minimum requirements laid down pursuant to paragraph 1 of this Article and the issue of energy performance certificates. Without prejudice to Article 12, Member States shall decide whether to require the issuing of a new energy performance certificate.]

Performance

In the Welsh Minister's view, regulation 40 and [the regulation for energy performance of technical building systems] are met when a new building is erected by providing the owner with information about all of the following.

a. Operating and maintenance instructions for fixed building services in accordance with paragraph 9.1 to 9.2.
b. Other important documentation as detailed in paragraph 9.3.
c. Energy performance of building automation and control systems in accordance with paragraph 9.4.

In the Welsh Minister's view, regulation 40 and [the regulation for energy performance of technical building systems] are met for when work is carried out on an existing building by providing the owner with information about both of the following.

a. Operating and maintenance instructions for the work on any fixed building services (including building automation and control systems and on-site electricity generation) that has been carried out in accordance with paragraph 9.5.
b. Relevant information for work on existing systems as detailed in paragraphs 9.6 to 9.9.

Section 9: Providing information

Operating and Maintenance instructions for new dwellings

9.1 Operating and maintenance instructions should be provided to the occupiers of the dwelling. The instructions should contain sufficient information to help the occupiers achieve the expected level of energy efficiency, and to verify compliance with the energy performance requirements of the Building Regulations. The documentation should be all of the following.

a. easy to understand,

b. specific to the dwelling

c. durable

d. in an accessible format.

9.2 The operating and maintenance instructions should achieve all of the following for the heating, hot water, ventilation and any other technologies.

i. what they are
ii. what they are for
iii. where they are located, using a floor plan
iv. how to operate them
v. how to control them, including the location and operation of timers and sensors
vi. how to maintain them

9.3 The operating and maintenance instructions should also signpost other important documentation, which should include the following.

i. appliance manuals;

ii. data used in the emission rate and primary energy calculations;

iii. the Recommendations Report generated with the 'on-construction' energy performance certificate.

Building automation and control systems

9.4 For new dwellings where building automation and control systems are installed, information about the energy performance of these systems must also be given to the building owners.

Operating and Maintenance instructions for existing dwellings

9.5 The operating and maintenance instructions should satisfy paragraphs 9.1, 9.2 (with the exception of a floor plan for 9.2(iii)) and 9.3(i). This applies only in relation to the work that has actually been carried out.

9.6 When any building work is carried out, against which **Section 5** and/or **Section 6** of this document sets a standard, the energy performance of the fixed building services, building automation and control systems or on-site electricity generation affected by the work must be assessed and documented as given in paragraphs 9.7 to 9.9.

9.7 When installing a complete new or replacement system (for example, replacing a heating system including the heating appliance, pipework and heat emitters) the energy performance of the whole system must be assessed, and the results documented and handed over to the building owner. This documentation may be in any of the following forms, and should be accompanied by supporting manufacturers' literature.

a. Full commissioning records for the system, carried out according to **Section 8**.
b. A documented assessment using the Standard Assessment Procedure, such as a new Energy Performance Certificate.
c. A documented assessment of the installed system produced in accordance with the Energy Related Products Directive. For example, a heating system 'fiche'.
d. Another equivalent assessment carried out by a suitably qualified person.

9.8 When carrying out work on an existing system, such as installing or replacing components (for example, replacing a boiler but retaining the pipework and heat emitters) the energy performance of the new components must be assessed and documented and handed over to the building owner. This documentation may be in any of the following forms.

a. Product data sheets produced by the product manufacturer.
b. Other documented results of energy assessment of the product carried out in accordance with the relevant test standards.

9.9 If carrying out work on an existing system fundamentally alters the energy or CO_2 performance of the system, such as the following.

a. A change in heating fuel for a space heating or domestic hot water system.
b. Extending or expanding the capacity of a space heating, comfort cooling, or ventilation system by over 25% of its capacity before the work.

Then the complete altered system should be assessed and guidance for new or replacement systems in **paragraph 9.7** should be followed.

Requirement L1(a): Limiting heat gains and losses

This approved document deals with the requirements of Part L1 of Schedule 1 to the Building Regulations 2010.

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;**	

Performance

Requirements for the conservation of fuel and power are given in Part L of Schedule 1 of the Building Regulations 2010.

In the Welsh Ministers view, Regulation L1(a) for existing dwellings will be met by meeting the standards in sections 9, 10 and 11

Section 10: New elements in existing dwellings, including extensions

General

10.1 This section covers the following building works.

a. For extensions – follow paragraphs 10.2 to 10.7

b. For new and replacement windows and doors – following paragraphs 10.8 to 10.14 (for extensions) and 10.18 to 10.26 (for windows in an existing dwelling)

c. For conservatories and porches - follow paragraphs 10.27 to 10.34

d. For indoor swimming pools – follow paragraphs 10.35 to 10.37

Extensions

Introduction

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

10.3 Adding an extension to increase the habitable volume of an existing dwelling triggers a requirement for additional energy efficiency improvements – consequential improvements – that are set out in Section 12.

10.4 Two alternative optional approaches to the guidance below, that offer more design flexibility by allowing some elements of the design to be relaxed if compensated for elsewhere, are set out in Section 13.

Building Fabric

10.5 New thermal elements constructed as part of an extension should achieve or better the U-values set out in the final column of Table 4.1.

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

10.7 If an extension incorporates a part of the existing structure, which previously was not subject to the energy efficiency requirements, for example if the extension is built against a garage, this part should be treated as a retained thermal element and follow the guidance set out in Section 11, paragraphs 11.7-11.10.

Windows and Doors

10.8 New windows and doors installed as part of an extension should be draughtproofed units that achieve or better the U-values set out in the column (a) of Table 10.1. Insulated cavity closers should be installed around the windows and doors where appropriate.

Table 10.1 Windows and doors

Controlled fittings	(a) Maximum Uvalues[1] for new and replacement windows and doors	(b) Alternative maximum U-values[1] for replacement windows	(c) Threshold U-values[20] for retained windows and doors
Windows, roof windows	1.4 or WER Band B	1.2 centre pane or low-e secondary glazing	3.3
Rooflight	2.2		
Doors	1.4 or DSER Band [TBC]	1.2 centre pane	3.3

[Note – Doors: The appropriate DSER rating is to be confirmed to align with a U-value of 1.4 W/(m².K)]

NOTES:

1. U-values should be calculated as in paragraphs 4.5 to 4.7.

10.9 In this Approved Document, windows and doors refers to windows and external doors that separate a heated space from the external environment, the ground, and any parts of the building which are not heated or, where another part of the building which is not a dwelling, is heated to a different temperature. Windows and doors are described as controlled fittings in the Building Regulations, i.e. windows and doors on which various parts of the Building Regulations impose a requirement.

10.10 In the case of dwellings of architectural and historic interest where special consideration applies or in other cases where there is a need to maintain the character of a façade, if the windows or doors are unable to achieve the U-values set out in column (a) of Table 10.1, then they should achieve or better the lesser U-values set out in column (b) of Table 10.1.

10.11 The total area of windows and doors in the extension should not exceed the sum of:
a. 25 per cent of the internal floor area of the extension; plus
b. the total area of any windows and doors which, as a result of the new extension, no longer exist or are no longer exposed.

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

10.13 In the case of dwellings of architectural and historic interest where special consideration applies, a greater total area of windows and doors may be acceptable. For example, there may be a need for the extension to be consistent with the character of the existing building. In such cases, where practicable, the performance of the windows and doors should be improved or other compensating improvements undertaken following either of the alternative approaches set out in Section 13.

10.14 Where low-e secondary glazing is installed, the edge of the secondary glazing element should be fully air sealed to the existing window frame or reveal to minimise the risk of condensation forming between the primary and secondary glazing.

Building Services

10.15 Where an extension to an existing dwelling includes the provision, extension, alteration or replacement of any fixed building services systems, those systems should comply with the appropriate standards in Sections 5, 6 and paragraphs 4.13 to 4.21, and commissioned according to Section 8.

Design and Installation Standards

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

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

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

10.17 Thermal bridges are instances where heat loss is worse than through the main building fabric. They allow heat to flow between the outer and inner skins of a wall, floor or roof by bridging the insulation.

Windows and doors

Introduction

10.18 This Section of the Approved Document gives guidance for the following building works to an existing dwelling:
a. installing replacement windows and doors; and/or
b. enlarging existing windows and doors; and/or
c. creating new windows and doors.

10.19 In this Approved Document, windows and doors refers to windows and external doors that separate a heated space from the external environment, the ground, and any parts of the building which are not heated or, where another part of the building which is not a dwelling, is heated to a different temperature. Windows and doors are described as controlled fittings in the Building Regulations, i.e. windows and doors on which various parts of the Building Regulations impose a requirement.

10.20 Separate guidance is given in other parts of Section 10 and in Section 11 for windows and doors in extensions, conversions (also known as a change of energy status), material changes of use and conservatories and porches.

10.21 Two alternative optional approaches to the guidance below, that offer more design flexibility by allowing some elements of the design to be relaxed if compensated for elsewhere, are set out in Section 13.

Window and Door standards

10.22 New or replacement windows and doors should be draughtproofed units that achieve or better the U-values set out in column (a) of Table 10.1. Insulated cavity closers should be installed around the windows and doors where appropriate.

10.23 Windows and doors refer to the whole units, i.e. including the frames. Consequently replacing just the glazing or door leaf while retaining an existing frame is not building work and so does not have to meet the energy efficiency requirements. However, in such cases it would be sensible to upgrade the window or door to as close to the U-values set out in column (a) of Table 10.1 as is practicably possible.

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

10.25 In the case of dwellings of architectural and historic interest where special consideration applies or in other cases where there is a need to maintain the character of a façade, if the windows or doors are unable to achieve the U-values set out in column (a) of Table 10.1, then they should achieve or better the lesser U-values set out in column (b) of Table 10.1.

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

Conservatories and porches

Introduction

10.27 Conservatories and porches are exempt from the energy efficiency requirements if they fulfil all of the following requirements:

a. be at ground level; and
b. have an internal floor area that is less than 30 m^2; and
c. be thermally separate from the heated area of the dwelling, and
d. the conservatory or porch contains no fixed heating appliance or the buildings heating system is not extended into the conservatory or porch.

New conservatories or porches

10.28 A conservatory or porch is considered as thermally separate where the existing walls, windows and doors between the dwelling and the conservatory or porch are left in place or if they are removed, they are replaced by walls that achieve or better U-values given in column (a) of Table 10.1. The U-values for windows and doors should be calculated as Paragraphs 4.5 to 4.7.

10.29 Where a conservatory or porch is not exempt, it should fulfil the following requirements:

a. Glazed and opaque elements should meet the standards set out in the final column of Table 4.1 (The limitations on the total area of windows, roof windows and doors as set out in paragraph 10.11 of Extensions do not apply here); and

b. be thermally separate from the heated area of the dwelling (see paragraph 10.28); and

c. any fixed space heating installed in the conservatory or porch should comply with Sections 5, 6 and 8.

10.30 Adding a non-exempt conservatory to increase the habitable volume of an existing dwelling triggers a requirement for additional energy efficiency improvements – consequential improvements – that are set out in Section 12.

10.31 Two alternative optional approaches that offer more design flexibility by allowing some elements of the design to be relaxed if compensated for elsewhere are set out in Section 13.

10.32 If the proposed addition is not thermally separated from the dwelling and therefore does not meet all of the requirements in paragraphs 10.27 and 10.28, it should be treated as an extension and follow the guidance set out in paragraphs 10.2 to 10.17 including the limitation on the total area of windows and doors.

Existing conservatories or porches

10.33 An existing conservatory or porch ceases to be exempt if:

a. any or all of the walls, windows and doors that thermally separate an existing exempt conservatory or porch from the dwelling are removed (and not replaced); or

b. the conservatory or porch is provided with a fixed heating appliance or the buildings heating system is extended into the conservatory or porch.

10.34 In such situations, this constitutes a change in energy status and the previously exempt conservatory or porch should be treated as a conversion and the guidance set out in Section 11 paragraphs 11.2-11.11 should be followed.

Indoor Swimming Pools

Introduction

10.35 New indoor swimming pool basins (walls and floors) should achieve or better a U-value of 0.25 W/m^2.K.

10.36 Two alternative optional approaches that offer more design flexibility by allowing some elements of the design to be relaxed if compensated for elsewhere are set out in Section 13.

10.37 Design consideration should be taken with regards to compressive creep, insulation boards not 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.

Regulation 23: Renovation or replacement of thermal elements

This approved document deals with the requirements of regulation 23 to the Building Regulations 2010.

Regulation 23 - Requirements for the renovation or replacement of thermal elements

(1) Where the renovation of an individual thermal element—

(a) constitutes a major renovation; or

(b) amounts to the renovation of more than 50% of the element's surface area;

the renovation must be carried out so as to ensure that the whole of the element complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible.

(2) Where the whole or any part of an individual thermal element is proposed to be replaced and the replacement—

(a) constitutes a major renovation; or

(b) (in the case of part replacement) amounts to the replacement of more than 50% of the element's surface area;

the whole of the element must be replaced so as to ensure that it complies with paragraph L1(a)(i) of Schedule 1, in so far as that is technically, functionally and economically feasible."

[Note for consultation: This consultation does not set out the requirements for work in buildings other than dwellings]

Regulations 2(1) and 22: Change of energy status

Regulation 2(1) - Interpretation

"change to a building's energy status" means any change which results in a building becoming a building to which the energy efficiency requirements of these Regulations apply, where previously it was not

Regulation 22 - Requirements relating to a change to energy status

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

Performance

When an existing dwelling has a renovation or replacement of a thermal element it must be comply with regulation 23 of the Building Regulations.

Section 11 of this document sets out guidance for renovation or replacement of a thermal element.

When an existing dwelling has a change of energy status it must comply with regulation 22 of the Building Regulations.

Section 11 of this document sets out guidance for a change of energy status.

Section 11: Work to elements in existing buildings

[Note for consultation: This consultation does not set out the requirements for work in buildings other than dwellings]

General

11.1 This section covers the following building works.

a. For conversions (change of energy status) – follow paragraphs 11.2 to 11.11

b. For renovations – following paragraphs 11.12 to 11.22

c. For material change of use - follow paragraphs 11.23 to 11.39

Conversions (change of energy status)

Introduction

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

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

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

11.5 Converting part of an existing dwelling to increase the habitable volume triggers a requirement for additional energy efficiency improvements – consequential improvements – that are set out in Section 12.

11.6 Two alternative optional approaches to the guidance below, that offer more design flexibility by allowing some elements of the design to be relaxed if compensated for elsewhere, are set out in Section 13.

Building Fabric

11.7 Retained thermal elements should be upgraded to achieve or better U-values set out in column (a) of Table 11.1.

Table 11.1: Standards for retained fabric elements

Elements[1]	(a) Maximum U-values for retained fabric[2]	(b) Limiting U-values for retained fabric[2]
Walls – cavity insulation[3, 4]	0.55	0.70
Walls – internal[5] or external[6] insulation	0.30[3]	0.70
Floors[7]	0.25	0.70
Pitched roofs – insulation at ceiling level	0.16	0.35
Pitched roofs – insulation between the rafters	0.16	0.35
Flat roofs or roofs with integral insulation	0.16	0.35

[1] 'Roofs' include the roofs of dormer windows and 'walls' include the walls or cheeks of dormer windows
[2] U- values should be calculated using the methods set out in Table 4.1
[3] Where existing wall cavities are unfilled, they should be insulated (where suitable) to achieve the maximum U-value in column (a). Prior to installing cavity wall insulation, the wall should be assessed to ensure its condition, construction type, and location are suitable for insulating by this method. Where the assessment identifies a significant risk (e.g. for sites exposed to driving rain) the wall is exempt from meeting the maximum U-value in column (a) using only this method. In such cases, other methods of insulation should be considered, e.g. internal or external wall insulation.
[4] Where existing wall cavities are partially insulated, they are exempt from meeting the maximum U-value in column (a). The air gap on the cold side of the existing insulation should not be compromised through the application of additional insulation (unless expert advice is sought) as this may present a moisture risk.
[5] Where internal wall insulation is intended, the maximum U-value in column (a) should be achieved. The wall should be assessed to ensure it is suitable for insulating by this method, which should include a moisture risk assessment.
[6] If a wall is suitable for the application of external wall insulation, the maximum U-value in column (a) should be achieved provided suitable specifications have been followed, such as those published by SWIGA (Solid Wall Insulation Guarantee Agency): External wall insulation specification for weathering and thermal bridge control. A wall may be suitable to receive external wall insulation if it is of solid construction or has fully filled and insulated cavities. Cavity walls that are uninsulated or partially insulated should be assumed as not suitable for the application of external wall insulation (unless expert advice is sought).
[7] The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged dwelling.

11.8 Where the U-value set out in column (a) of Table 11.1 is not economically, functionally or technically feasible, the thermal element should be upgraded to as close to the maximum U-value as is practicably possible. Generally, the U-value of the thermal element should not be worse than the limiting U-values set out in column (b) of Table 11.1 to minimise the risk of surface condensation and mould growth.

Note: *Where the suitability of an element needs to be assessed prior to the application of insulation, or where it is recommended that expert advice be sought, the person carrying out this work should be appropriately trained in risk assessment and management (e.g. a Retrofit Coordinator as identified in PAS 2035), and follow the procedures given in PAS 2030/2035: 2019 - Retrofitting dwellings for improved energy efficiency. Specification and guidance*.

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

11.10 An energy efficiency measure is not deemed to be functionally or technically feasible if the thickness of insulation needed to achieve the U-values set out in column (a) of Table 11.1 would:

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

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

11.11 If any new or replacement thermal elements are constructed as part of a conversion the guidance for new thermal elements set out in Section 10, paragraphs 10.5-10.6, should be followed.

Renovations

Introduction

11.12 Work on existing thermal elements must comply with regulation – requirements for the renovation or replacement of thermal elements.

11.13 In this Approved Document, where a thermal element is subject to a renovation the performance of the whole of the thermal element should be improved provided the area to be renovated is greater than 50% of the surface of the individual thermal element or constitutes a major renovation where more than 25% of the surface area of the building envelope undergoes renovation.

When a building undergoes a major renovation this may represent an opportunity to consider and take into account the technical, environmental and economic feasibility of installing high-efficiency alternative systems (see section 3).

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

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

11.16 When assessing the proportion of the area to be renovated in paragraph 11.13, the area of the element to be renovated should be taken as that of the individual element, not all the elements of that type in the building. For example, if stripping down the roof of an extension the area of the element is the area of the extension roof, not the total roof area of the dwelling. The area of the element also differs whether the element is being renovated from the inside or the outside. For example, if removing all the plaster finish from the inside of a wall, the area of the element is the area of the wall in the room, however, if removing the external render, it is the area of the elevation in which that wall sits.

11.17 Two alternative optional approaches to the guidance below, that offer more design flexibility by allowing some elements of the design to be relaxed if compensated for elsewhere, are set out in Section 13.

Building Fabric

11.18 Where a thermal element is renovated through the provision of a new layer or the replacement of an existing layer, as described in paragraph 11.15, the performance of the whole element should be improved to achieve or better the U-values set out in column (a) of Table 11.1 including any risk assessments are undertaken as specified in the table.

11.19 Where the U-value set out in column (a) of Table 11.1 is not economically, functionally or technically feasible, then the thermal element should be upgraded to the best standard that is economically, functionally and technically feasible. Generally, the U-value of the thermal element should not be worse than the limiting U-values set out in column (b) of Table 11.1 to minimise the risk of surface condensation and mould growth.

Note: *Where the suitability of an element needs to be assessed prior to the application of insulation, or where it is recommended that expert advice be sought, the person carrying out this work should be appropriately trained in risk assessment and management (e.g. a Retrofit Coordinator as identified in PAS 2035), and follow the procedures given in PAS 2030/2035: 2019 - Retrofitting dwellings for improved energy efficiency. Specification and guidance*.

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

Design and Installation Standards

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

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

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

11.22 Thermal bridges are instances where heat loss is worse than through the main building fabric. They allow heat to flow between the outer and inner skins of a wall, floor or roof by bridging the insulation.

Material Change of Use

Introduction

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

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

Where a previously unheated building is converted into a dwelling, it is described as a "change in energy status" in the Building Regulations and Section 3 should be followed.

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

11.25 Two alternative optional approaches to the guidance below, that offer more design flexibility by allowing some elements of the design to be relaxed if compensated for elsewhere, are set out in Section 13.

Building Fabric

11.26 Existing thermal elements in a building subject to a material change of use should be upgraded to achieve or better the U-values set out in column (a) of Table 11.1 including any risks assessments are undertaken as specified in the table.

11.27 Where the U-value set out in column (a) of Table 11.1 is not economically, functionally or technically feasible, then the thermal element should be upgraded to as close to the maximum U-value as is practicably possible. Generally, the U-value of the thermal element should not be worse than the limiting U-values set out in column (b) of Table 11.1 to minimise the risk of surface condensation and mould growth.

Note: *Where the suitability of an element needs to be assessed prior to the application of insulation, or where it is recommended that expert advice be sought, the person carrying out this work should be appropriately trained in risk assessment and management (e.g. a Retrofit Coordinator as identified in PAS 2035), and follow the procedures given in PAS 2030/2035: 2019 - Retrofitting dwellings for improved energy efficiency. Specification and guidance*.
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11.28 The test of the economic feasibility of an energy efficiency measure is to calculate if the measure achieves a payback of the initial cost within 15 years through energy savings. This is calculated by dividing the cost of implementing the measure (not the whole cost of the project) by the annual energy saving achieved by that measure, estimated using the latest version of SAP, taking account of VAT in both the cost and the saving.

11.29 An energy efficiency measure is not deemed to be functionally or technically feasible if the thickness of insulation needed to achieve the U-values in column (a) of Table 11.1 would:

a. reduce the internal floor area of a room by more than 5 per cent; or
b. cause significant problems with adjoining floor levels; or

c. create insufficient headroom; or
d. could not be supported by the existing structure.

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

11.30 If any new or replacement thermal elements are constructed as part of a material change of use, the guidance for new thermal elements set out in paragraphs 10.5-10.6 should be followed.

Windows and Doors

11.31 If an existing window or door has a U-value worse than the threshold U-values set out in column (c) of Table 10.1, then it should be replaced with draught-proofed units that achieve or better the U-values set out in column (a) of Table 10.1. Insulated cavity closers should be installed around the windows and doors, where appropriate.

11.32 New and replacement windows and doors should be draught-proofed units that achieve or better the U-values set out in column (a) of Table 10.1. Insulated cavity closers should be installed around the windows and doors, where appropriate.

11.33 In this Approved Document, windows and doors refers to windows and external doors that separate a heated space from the external environment, the ground, and any parts of the building which are not heated or, where another part of the building which is not a dwelling, is heated to a different temperature. Windows and doors refer to the whole units, i.e. including the frames. Consequently replacing just the glazing or door leaf while retaining an existing frame is not building work and so does not have to meet the energy efficiency requirements. However, in such cases it would be sensible to upgrade the window or door to as close to the U-values set out in column (a) of Table 10.1 as is practicably possible. Windows and doors are described as controlled fittings in the Building Regulations, i.e. windows and doors on which various parts of the Building Regulations impose a requirement.

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

11.35 In the case of dwellings of architectural and historic interest where special consideration applies or in other cases where there is a need to maintain the character of a façade, if replacement windows or doors are unable to achieve the U-values set out in column (a) of Table 10.1, then they should achieve or better the lesser U-values set out in column (b) of Table 10.1.

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

Building Services

11.37 Where a material change of use of a building to become a dwelling includes the provision, extension, alteration or replacement of any fixed building services systems, those systems should comply with the appropriate standards in Sections 5, 6 and paragraphs 4.13 to 4.21, and commissioned according to Section 8.

Design and Installation Standards

11.38 When undertaking a change of use, the building fabric should be carefully designed, detailed and constructed to:

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

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

11.39 Thermal bridges are instances where heat loss is worse than through the main building fabric. They allow heat to flow between the outer and inner skins of a wall, floor or roof by bridging the insulation.

Regulation 28: Consequential improvements

This approved document deals with the requirements of regulation 28 of the Building Regulations 2010 (as amended).

Regulation 28 - Consequential improvements to energy performance

(1) Paragraph (3) applies to an existing building with a total useful floor area over 1000m^2 where the proposed building work consists of or includes—
(a) the initial provision of any fixed building services; or
(b) an increase to the installed capacity of any fixed building services.

(2) Paragraph (3) applies to an existing building where the proposed building work consists of or includes--
(a) an extension; or
(b) the extension of the building's heating system or the provision of a fixed heating appliance, to heat a previously unheated space.

(3) Subject to paragraph (4), where this paragraph applies, such work, if any, shall be carried out as is necessary to ensure that the building complies with the requirements of Part L of Schedule 1.

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

NOTE: Where the building control body is an approved inspector, see regulation 20 of the Building (Approved Inspectors etc.) Regulations 2010 (as amended).

[Note for consultation: This consultation does not set out the requirements for work in buildings other than dwellings]

Section 12: Consequential improvements

[**Note for consultation:** This consultation does not set out the requirements for work in buildings other than dwellings]

What are consequential improvements?

12.1 Consequential improvements (see regulation 28) describe additional energy efficiency improvements that should be undertaken where an existing dwelling is extended or part of the dwelling is converted increasing the habitable volume. The dwelling could be extended by means of a conventional extension or a non-exempt conservatory or porch. A conversion (also known as a change of energy status) is where there is an extension of the building's heating system or the provision of a fixed heating appliance in a previously unheated space, e.g. a garage or loft conversion.

12.2 Where consequential improvements are triggered by extensions (including non-exempt conservatories or porches) and conversions, the work should still comply with the relevant guidance: see Section 10 for guidance on extensions; see Section 11 for guidance on conversions and on conservatories and porches.

12.3 Where consequential improvements are undertaken they should only be undertaken where they are technically, functionally or economically feasible. Those improvement measures identified here should typically be feasible.

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

Consequential improvement measures

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

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

a. if the dwelling has uninsulated ~~or partially insulated~~ cavity walls, fill with insulation where suitable (cavity wall insulation may not be suitable for sites exposed to driving rain)[1]; and

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

c. upgrade any hot water cylinder insulation as follows:

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

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

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

[1]. A wall cavity should be assessed prior to the application of cavity wall insulation by a person competent to do so, following the Path A procedures identified in PAS 2035/2030: 2019, Retrofitting dwellings for improved energy efficiency (specification and guidance).

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

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

Section 13: Optional approaches for more Design Flexibility

Introduction

13.1 This Section of the Approved Document outlines two optional alternative approaches to the standards based approach set out in the preceding Sections of this Approved Document: the 'U-value trade-off approach' and 'equivalent primary energy target approach', which offer more design flexibility by allowing some elements of the design to be relaxed if compensated for elsewhere. Consequential improvements set out in Section 12 and standards for fixed building services set out in Sections 5, 6 and paragraphs 4.13 to 4.21 may not be relaxed.

13.2 The 'U-value trade-off approach' requires the calculation of an area-weighted average U-value and the 'equivalent primary energy target approach' requires SAP 10 energy rating assessment to calculate primary energy use. Both approaches require two comparable calculations: the proposal should be gauged by a benchmark proposal that complies with the relevant requirements set out in the preceding Sections of this Approved Document.

U-value trade-off Approach

13.3 The 'U-value trade-off approach' allows some of the U-value standards and/or limit on the total area of windows and doors, set out in the relevant preceding Sections of this Approved Document, to be relaxed if other U-values are improved to compensate. For example: in an extension poor performance of one wall may be traded for better performance of another wall; in a conversion poor performance of one wall may be traded for a compensatory insulation improvement elsewhere in the existing dwelling; exceeding the limit on the total area of windows and doors may be traded for better performance of the additional windows.

13.4 The area-weighted average U-value for all of the fabric, windows and doors in the proposal should be no greater than that of a fully compliant benchmark. Note that using the area-weighted average U-value of the existing dwelling as a benchmark does not demonstrate compliance.

The area-weighted average U-value shall be calculated using the following equation:

$$\{(U1 \times A1) + (U2 \times A2) + (U3 \times A3) + \ldots\} \div \{A1 + A2 + A3 + \ldots\}$$

Where:
U = the U-value of each individual thermal element in $W/m^2.K$
A = the area of each individual thermal element in m^2

13.5 The benchmark should comply with the relevant U-value standards and limit on the area of window and doors where work to the existing dwelling/building is proposed as set out in Sections 10-

11. If there are other parts of the existing dwelling where work is not proposed, the U-values for the existing fabric, windows and doors should be used in the area-weighted average U-value calculation.

13.6 In the case of an extension or a conversion: the benchmark extension/conversion should be of the same size and shape as the proposed extension/conversion. If compensatory insulation improvements to the existing dwelling are not proposed, the area-weighted average U-value should be calculated for the proposed extension/conversion and the benchmark extension/conversion only; if compensatory insulation improvements to the existing dwelling are proposed, the average U-values should be calculated for the proposed extension/conversion plus the dwelling including improvements and the benchmark extension/conversion plus the existing dwelling (including any consequential improvements).

13.7 In all cases except extensions: if the proposal does not exceed the limit on the total area of window and doors of 25 per cent of the total floor area of the dwelling, the total area of windows and doors in the benchmark should be equal to that in the proposal. If the proposal does exceed the limit on the total area of windows and doors, the total area of windows and doors in the benchmark should be 25 per cent of the total floor area of the dwelling.

13.8 In the case of an extension: if the proposal does not exceed the limit on the total area of window and doors set out in paragraph 10.11, the total area of windows and doors in the benchmark should be equal to that in the proposal. If the proposal does exceed the limit on the total area of windows and doors, the total area of windows and doors in the benchmark should be 25 per cent of the total floor area of the dwelling plus the total area of any windows and doors which, as a result of the new extension, no longer exist or are no longer exposed.

13.9 Although U-value requirements may be relaxed, the U-value of any individual thermal element (wall, floor or roof) should not be worse than the limiting U-values set out in column (b) of Table 11.1 to ensure resistance to surface condensation and mould growth.

13.10 If compensatory insulation improvements are proposed to other parts of the dwelling fabric, windows or doors, such improvements should achieve or better the U-value standards set out in the relevant Sections of this Approved Document. This means that the area-weighted average U-value of the proposal may be better that of the benchmark.

Equivalent Primary Energy Target Approach

13.11 The ‘Equivalent Primary Energy Target’ approach allows some of the U-value standards and/or limit on the total area of windows and doors, set out in the preceding Sections of this Approved Document, to be relaxed if other U-values and/or the performances of fixed building services are improved to compensate. For example: in a renovation poor performance of one wall may be traded for better efficiency of a heating boiler.

13.12 The primary energy rate, calculated using SAP 10, from the proposal should be no greater than that of a fully compliant benchmark. Note that using the calculated carbon emissions from the existing dwelling as a benchmark does not demonstrate compliance.

13.13 The benchmark should comply with the relevant U-value and fixed building services standards and limit on the area of window and doors where work to the existing dwelling/building is proposed as set out in Sections 10-11. If there are other parts of the existing house where work is not proposed, the U-values for the existing fabric, windows and doors and building service efficiencies should be used in the SAP assessment.

13.14 In the cases of an extension or a conversion: the benchmark extension/conversion should be of the same size and shape as the proposed extension/conversion. If compensatory insulation improvements to the existing dwelling are not proposed, the area-weighted average U-value should be calculated for the proposed extension/conversion and the benchmark extension/conversion only; if compensatory insulation improvements to the existing dwelling are proposed, the average U-values should be calculated for the proposed extension/conversion plus the dwelling including improvements and the benchmark extension/conversion plus the existing dwelling (including consequential improvements).

13.15 In all cases except extensions: if the proposal does not exceed the limit on the total area of window and doors of 25 per cent of the total floor area of the dwelling, the total area of windows and doors in the benchmark should be equal to that in the proposal. If the proposal does exceed the limit on the total area of windows and doors, the total area of windows and doors in the benchmark should be 25 per cent of the total floor area of the dwelling.

13.16 In the case of an extension: if the proposal does not exceed the limit on the total area of window and doors set out in paragraph 10.11, the total area of windows and doors in the benchmark should be equal to that in the proposal. If the proposal does exceed the limit on the total area of windows and doors, the total area of windows and doors in the benchmark should be 25 per cent of the total floor area of the dwelling plus the total area of any windows and doors which, as a result of the new extension, no longer exist or are no longer exposed.

13.17 Although U-value requirements may be relaxed, the U-value of any individual thermal element (wall, floor or roof) should not be worse than the limiting U-values set out in column (b) of Table 11.1 to ensure resistance to surface condensation and mould growth.

13.18 If compensatory insulation improvements are proposed to other parts of the dwelling fabric, windows or doors, such improvements should achieve or better the U-value standards set out in the relevant Sections of this Approved Document. This means that the primary energy target of the proposal may be better that of the benchmark.

13.19 SAP 10 energy rating assessments should be carried out by a qualified On Construction Domestic Energy Assessor (OCDEA). Where the thermal characteristics of elements of the existing building are unknown, the data in SAP 10 Appendix S should be used in both assessments. The two assessments should only differ in as much as the proposal differs from the benchmark – all other SAP variables (for example, air permeability, thermal bridging factors, etc.) should be the same in both assessments, in order to provide a fair comparison.

Appendix A: Key terms

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 the test reference pressure differential of 50 pascals (50 N/m^2).

The limiting air permeability is the worst allowable air permeability.

The design air permeability is the target value set at the design stage.

The assessed air permeability is the value used in establishing the dwelling emission rate and the dwelling primary energy rate. The assessed air permeability is based on a measurement of the air permeability of the dwelling concerned

Automation means a control function which automatically adjusts time and temperature settings based on occupancy detection and/or stored data from user adjustments over time.

Building automation and control system means a system comprising all products, software and engineering services that can support energy efficient, economical and safe operation of technical building systems through automatic controls and by facilitating the manual management of those building systems.

Building control body means a local authority building control department or an approved inspector.

Circuit-watt refers to the power consumed in lighting circuits by lamps and, where applicable, their associated control gear (including transformers and drivers) and power factor correction equipment.

Coefficient of performance (COP) is a measure of the efficiency of a heat pump at specified source and sink temperatures, measured using the procedures in **BS EN 14511**:

Heating COP = heat output / power input

% COP (COP×100) is the heat generator efficiency.

Commissioning is the advancement of a fixed building service after all or part of the system has been installed, replaced or altered. The system is taken from a state of static completion to working order. Testing and adjusting, as necessary, ensure that the whole system uses no more fuel and power than is reasonable in the circumstances, without compromising the need to comply with health and safety requirements.

For each system, commissioning includes the following: setting-to-work; regulation (that is, testing and adjusting repetitively) to achieve the specified performance; calibration, setting up and testing of the associated automatic control systems; and recording the system settings and the performance test results that have been accepted as satisfactory.

Consequential improvements means those energy efficiency improvements required by regulation 28.

Controlled service or fitting is defined in Regulation 2(1) as:

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

Dwelling emission rate is the dwelling CO_2 emission rate expressed as $kgCO_2/(m^2 \cdot year)$ and determined using the Standard Assessment Procedure.

Dwelling primary energy rate is expressed as $kWh/(m^2 \cdot year)$ and determined using the Standard Assessment Procedure.

Dwelling means a self-contained unit designed to accommodate a single household.

NOTE: Buildings exclusively containing rooms for residential purposes, such as nursing homes, student accommodation and similar, are not dwellings. In such cases, Approved Document L volume 2 applies.

Dwelling type is the particular group allocated to each dwelling on a development 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 should comply with all of the following:

i. be of the same generic form (e.g. detached, semi-detached, end terrace, mid-terrace, ground-floor flat (including ground-floor maisonette), mid-floor flat, top-floor flat (including top-floor maisonette);
ii. include the same number of storeys;
iii. have 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;
vi. have a similar (i.e. ±1) number of significant penetrations, e.g. for windows, doors, flues/chimneys, supply/exhaust terminals, waste water pipes;
    i. have envelope areas that do not differ by more than 10 per cent (see air permeability for a definition of envelope area).

Energy efficiency rating is a cost rating calculated using the Standard Assessment Procedure.

Energy efficiency requirements are defined in Regulation 2(1) as:

> the requirements of regulations 23, 25A, 25B, 26, 26A, 26B, 28 and 40 and Part L of schedule 1.

Energy performance certificate is defined in the Energy Performance of Buildings Directive as:

> a certificate which—
>
> (a) in the case of a certificate entered on the register before 9th January 2013 complied

> with
> the requirements of regulation 11(1) of the Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations 2007(d);
> (b) in the case of a certificate entered on the register on or after 9th January 2013 complies
> with the requirements of regulation 9(1) of these Regulations; or
> (c) complies with the requirements of regulation 29(e) of the Building Regulations 2010;

Fixed building services are defined in Regulation 2(1) as:

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

Fixed external lighting means lighting fixed to an external surface of the dwelling and supplied from the occupier's electrical system. It excludes lighting in common areas of blocks of flats and in other communal accessways.

Flue gas heat recovery means a device which pre-heats the domestic hot water supply by recovering heat from the boiler's flue emissions.

A heating zone is a conditioned area of a building which is on a single floor and has the same thermal characteristics and temperature control requirements throughout.

Householder affordability rating: (to be determined – subject to consultation)

Light fitting means a fixed light or a lighting unit, which can comprise one or more lamps and lampholders, control gear and an appropriate housing. The control gear may be integrated in the lamp or located elsewhere, in or near the fixed light.

Load compensation means a control function which maintains internal temperatures by varying the flow temperature through direct modulation of the heat generator relative to the measured response of the heating system

Low-emissivity glazing (or Low-e glazing) is a type of glass which is designed to reduce energy lost through the glazing in winter by infrared radiation.

Optimisation means a control function which starts the boiler operation at the optimum time to achieve the setpoint temperature at the start of the occupancy period.

Primary energy means energy from renewable and non-renewable sources which has not undergone any conversion or transformation process.

Renovation in relation to a thermal element means either:

- providing a new layer in the thermal element (other than where that new layer is provided solely as a means of repair to a flat roof)
- replacing an existing layer

Renovation does not apply to decorative finishes.

Room for residential purposes is defined in Regulation 2(1) as:

> a room, or a suite of rooms, which is not a dwelling-house or a flat and which is used by one or more persons to live and sleep and includes a room in a hostel, an hotel, a boarding house, a hall of residence or a residential home, but does not include a room in a hospital, or other similar establishment, used for patient accommodation.

Seasonal coefficient of performance (SCOP) is a measure of the efficiency of a heat pump over the designated heating season, measured using the procedures in **BS EN 14825**.

Secondary heating means a space heating appliance or system which operates separately to the main heating system in the dwelling, and does not provide the majority of heating in the dwelling. For example, a decorative fuel-effect fire in a room which also contains radiators for a central heating system.

Self-regulating device means a device or system that automatically controls the output of heating and/or cooling emitters to independently control the temperature in each room or, (where justified, a heating zone) where heating and/or cooling is provided by a fixed building service.

The Standard Assessment Procedure calculations use SPF – either measured values for products listed in the Product Characteristics Database, or default values in Table 4a of the Standard Assessment Procedure for products not listed in the database. Seasonal primary energy efficiency ratio (SPEER) is a measure of the use of primary energy for all types of heat pump, fossil fuel boiler and gas-driven cogeneration technologies, as well as hybrid systems where solar heating or a heat pump is backed up with electric heating or a fossil fuel boiler.

Energy labelling with the SPEER is mandatory under the Energy Labelling Directive.

Testing and rating for SPEER is in accordance with **BS EN 14825**, as for SCOP.

SEDBUK 2009 (Seasonal Efficiency of Domestic Boilers in the UK) is the methodology for determining boiler efficiency defined in the Standard Assessment Procedure, Appendix D.

Simple payback means the amount of time it will take to recover the initial investment through energy savings. Simple payback is calculated by dividing the marginal additional cost of implementing an energy efficiency measure by the value of the annual energy savings achieved by that measure, taking no account of VAT.

When making this calculation, the following guidance should be used:

a. the marginal additional cost is the additional cost (materials and labour) of incorporating, for example, additional insulation, not the whole cost of the work;

b. the cost of implementing the measure should be based on current prices at the time the building control body is told of the proposals, and be confirmed in a report signed by a suitably qualified person;

c. the annual energy savings should be estimated using the Standard Assessment Procedure;

d. for the purposes of this Approved Document, the current energy prices at the time the building control body is told o the proposals should be used when evaluating the annual energy savings. Current energy prices can be obtained from the following website:

www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics#energy-price-statistics.

Standard Assessment Procedure is the current approved procedure for assessing the performance of dwellings in line with this document. The Standard Assessment Procedure is detailed in The Government's Standard Assessment Procedure for Energy Rating of Dwellings, version 10.1.

Target emission rate is the maximum CO_2 emission rate for the dwelling, expressed as $kgCO_2/(m^2 \cdot year)$, and determined using the Standard Assessment Procedure.

Target fabric efficiency is the maximum permissible heat loss through the building fabric, expressed as $kWh/(m^2 \cdot year)$, and determined using the Standard Assessment Procedure.

Target primary energy rate is the maximum primary energy use for the dwelling, expressed as $KWh_{PE}/(m^2/year)$ and determined using the Standard Assessment Procedure.

Technical Building Systems means any of the following systems:

a. Space heating
b. Space cooling
c. Ventilation
d. Domestic hot water
e. Lighting
f. Building Automation and control Systems
g. On-site electricity generation

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

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

a. the external environment (including the ground); or

b. in the case of floors and walls, another part of the building which is:

i. unconditioned;

ii. an extension falling within class VII in Schedule 2; or

iii. where this paragraph applies, conditioned to a different temperature,

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

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

Thermal envelope is the combination of thermal elements of a building which enclose a particular conditioned indoor space or groups of indoor spaces.

U-value is a measure of the ability of a building element or component to conduct heat from a warmer environment to a cooler environment. It is expressed as the quantity of heat (in watts) that will flow through one square metre of area divided by the difference in temperature (in degrees K) between the internal and external environment, and the unit is $W/m^2.K$.

Weather compensation means a control function which maintains internal temperatures which varying the flow temperature from the heat generator relative to the measured outside temperature.

Appendix B: Reporting evidence of compliance

B.1 To aid communication between the builder and building control body, it helps to use a standardised report format to present the evidence that demonstrates compliance with the energy efficiency requirements.

B.2 Compliance software should produce this report as a standard output option.

B.3 Two versions of the standardised report may be produced by the compliance software.

- the first, before commencement of works, to include all of the following.
  - the emission rate
  - primary energy rate calculations
  - a supporting list of specifications
- the second, after completion, to include all of the following.
  - the as-built emission rate
  - primary energy rate calculations
  - any changes to the list of specifications.

These reports can then be used by the building control body to assist checking that what has been designed is actually built.

A standardised report should indicate the source of the evidence, and state the credentials of those submitting the evidence.

B.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 wall construction delivers the claimed U-value?).

Examples of how compliance software might provide this link are as follows.

a. By giving each data input a unique reference code. In a separate submission, the builder/developer then details the specification that corresponds to each reference code.

b. By providing a free-text entry facility along with each input parameter that has a unique reference code, thereby allowing the software to capture the specification of each item and so include the full details in an integrated output report.

c. By including one or more utility programs that derive the data input from the specification, e.g. a U-value calculator that conforms to BRE's **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 in sub-paragraph b.

It also helps the building control body if the software includes a facility to compare the 'as

designed' and 'as constructed' data input files and automatically produce a schedule of changes.

B.5 The report should highlight any items whose specification is better than typically expected values. The building control body should check any aspects where the claimed specification delivers an energy efficiency standard better than that of Table B.1.

Table B.1 Threshold values for high performance specification items

Wall U-value	0.15 W/(m²·K)
Roof U-value	0.13 W/(m²·K)
Floor U-value	0.13 W/(m²·K)
Window/door U-value	1.20 W/(m²·K)
Party wall U-value	0.20 W/(m²·K)
Thermal bridging value	0.04 W/(m²·K)
Design air permeability	4.0 m³/(h·m²) at 50 Pa
Any secondary heating appliance	No threshold value
Any item involving the Standard Assessment Procedure Appendix Q	No threshold value
Use of any low-carbon or renewable energy technology	No threshold value

Note: if the design of solutions that use electric resistance heating does not include a significant element of renewable energy, the solutions may have to exceed several of these fabric parameters.

Appendix C: Documents referred to

[Placeholder for any further documents that will be provided at implementation stage]

Legislation

The Building Regulations 2010, SI 2010/2214

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

Energy Information (Household Air Conditioners) (No 2) Regulations, SI 2005/1726

Documents

BRE

BR 443 Conventions for U-value calculations [2019].

BRE Report BR 497 Conventions for calculating linear thermal transmittance and temperature factors [2007 and 2010 amendment and conventions]. ISBN 978 1 86081 986 5

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

Department for Business, Energy and Industrial Strategy (BEIS)

The Government's Standard Assessment Procedure for energy rating of dwellings [as amended for Part L 2020]

Glass and Glazing Federation (GGF) *Guide to the Calculation of Energy Ratings for Windows, Roof Windows and Doors* [2013]

HETAS

The Official Guide to HETAS Approved Products and Services [2017]

Hot Water Association

Performance Specification for Thermal Stores [2010]

National Association of Rooflight Manufacturers (NARM)

Technical Document NTD 2 Assessment of thermal performance of out-of-plane rooflights [2010].

OFTEC

OFS A102:2004 Applied Standard A102 Room heaters with atomising or vapourising burners with or without boilers, heat output up to 25kW

Appendix D: Standards referred to

[Placeholder for any further standards that will be provided at implementation stage]

BS 3198 Specification for copper hot water storage combination units for domestic purposes [1981]

BS 5422 Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C [2009]

BS EN 253 District heating pipes. Preinsulated bonded pipe systems for directly buried hot water networks. Pipe assembly of steel service pipe, polyurethane thermal insulation and outer casing of polyethylene [2009+A2:2015]

BS EN 1264-4 Water based surface embedded heating and cooling systems. Installation [2009]

BS EN 12897 Water supply. Specification for indirectly heated unvented (closed) storage water heaters [2016]

BS EN 12975-1 Thermal solar systems and components. Solar collectors. General requirements [2006+A1:2010]

BS EN 14511 Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling [2013]

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

BS EN 14825 Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling. Testing and rating at part load conditions and calculation of seasonal performance [2016]

Appendix E – Elemental specification for the TPER/TER

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

2. Note that the elemental specification states an airtightness of 5.0 $m^3/h.m^2$ at 50Pa. The elemental specification is not prescriptive and alternative specifications (including air tightness and associated ventilation provisions) can be adopted as long as they meet the requirements set out in this document.

Table E1 Elemental Specification

Element or system	**Specification** *(Part L 2020 – consultation stage 1 Option 1)*
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area [1]
External Wall U-value (W/m²K)	0.13
Corridor Wall U-value (W/m²K)	0.18
Party Wall U-value (W/m²K)	0
Roof U-value (W/m²K)	0.11
Floor U-value (W/m²K)	0.11
Windows, Roof Windows and Glazed Door U-value (W/m²K)	1.3 (whole window u-value)
Rooflight U-value (W/m²K)	1.6 (whole window u-value)
Windows, Roof Windows, Glazed Rooflights and Glazed Door g-value	0.63 [3]
Opaque and Semi-glazed Door U-value (W/m²K)	1.0
y-value (W/m²K)	Based on the 'Option 2' psi values in Table R2 of SAP 10.1 except use of y=0.05 W/m^2K if the default value of y=0.20 W/m^2K is used in the actual building
Ventilation System Type	Intermittent extract fans with trickle vents
Air Permeability ($m^3/h \cdot m^2$ at 50 Pa)	5
Air Conditioning	None
Heating system	Mains Gas
	If gas or oil combi boiler performing space heating in actual dwelling, instantaneous combi boiler; otherwise regular boiler

	Low temperature radiators (design flow temperature = 55°C)
	Room sealed
	Fan flue
	SEDBUK 2009 89.5% efficient
Space Heating Controls	1. For a single storey dwelling in which the living area is greater than 70% of total floor area, programmer and room thermostat; 2. For any other dwelling, time and temperature zone control, TRVs; And in all cases: Modulating burner control Boiler interlock ErP Class V
Hot Water System	Heated by boiler (regular or combi as above)
	Separate time control for space and water heating
	If cylinder specified in actual dwelling: volume of cylinder in actual dwelling If combi boiler: no cylinder Otherwise: 150 litres
	If cylinder, declared loss factor = 0.85 x (0.2 + 0.051 $V^{2/3}$) kWh/day, where V is the volume of the cylinder in litres Cylinder in heated space Thermostat controlled Fully insulated primary pipework
Shower Flow Rate	8 l/min
Waste Water Heat Recovery (WWHR)	Efficiency of 55% Utilisation of 0.98
Secondary Space Heating	None
Fixed Lighting Capacity (lm)	185 x Total Floor Area
Lighting Efficacy (lm/W)	80
Thermal Mass Parameter	Same as actual dwelling
PV System	For houses kWp = 40% of ground floor area / 6.5 For flats kWp = 40% of dwelling floor area / (6.5 * number of storeys in block) SE/SW facing, 45° pitch No/very little overshading
[1] The Building Regulations do not specify minimum daylight requirements. However, reducing window area produces conflicting impacts on the predicted CO2 emissions: reduced solar gain but	

increased use of electric lighting. As a general guide, if the area of glazing is much less than 20 per cent of the total floor area, some parts of the dwelling may experience poor levels of daylight, resulting in increased use of electric lighting.

[2] The orientation of the elemental building is the same as the actual building. See SAP 10 Appendix R for treatment of curtain wailing (an allowance of +0.1W/m^{2}K is made on the window U-value for thermal bridging within the curtain wall). The treatment of roof windows is also detailed in SAP 10 Appendix R (an adjustment factor of +0.3W/m^{2}K is applied).

[3] Higher g-values would also comply with the recipe as increasing solar gains reduced the space heat load. However, designers should be aware of the impact of g-value on the risk of overheating and optimise their choice accordingly.

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[Note for consultation: The index will be provided at implementation stage]