Department of Finance
An Roinn Airgeadais
www.finance-ni.gov.uk

The Building Regulations (Northern Ireland) 2012

Public Consultation Document C.3

Amendments to Technical Booklet Guidance to Part F (Conservation of fuel and power)

Technical Booklet F1

Conservation of fuel and power in dwellings

Consultation version

October 2021

Consolidated version incorporating amendments 2014, 2016 and proposed 2021 amendments

Note:

Amendments from 2014 & 2016 are shown in blue.

Proposed 2021 amendments are shown in red.

Deleted text from 2014 & 2016 and proposed deletions for 2021 are shown with a ~~strike through~~.

Paragraph number, page numbers and consequential cross-referencing will be amended upon publication of final guidance.

Contents

Introduction

Technical Booklets

This Technical Booklet, which takes effect on ~~31st October 2012~~ XX XXXXXXXX 202X, is one of a series that has been prepared by the Department of Finance ~~and Personnel~~ (the Department) for the purpose of providing practical guidance with respect to the technical requirements of the Building Regulations (Northern Ireland) 2012 (the Building Regulations) as amended.

At the back of each Technical Booklet is a list of all the Technical Booklets that have been prepared and published by the Department for this purpose.

The guidance given in a Technical Booklet includes performance standards and design provisions relating to compliance with specific aspects of the Building Regulations for the more common building situations.

If the guidance in a Technical Booklet is followed there will be a presumption of compliance with the requirements of those Building Regulations covered by that guidance. However, this presumption can be overturned, so simply following the guidance does not guarantee compliance. For example, if a particular circumstance is not one of the more common building situations the design provisions given in the Technical Booklet may not be appropriate.

There are likely to be alternative ways of demonstrating compliance with the relevant requirements of the Building Regulations other than by following a design provision given in a Technical Booklet. There is therefore no obligation to adopt any particular provision set out in a Technical Booklet, should you decide to comply in some other way. However, you will have to demonstrate that your alternative solution meets the relevant requirements of the Building Regulations by those other means.

This Technical Booklet

Requirements

The guidance contained in this Technical Booklet relates only to the requirements of regulations 39, 40, 41, 42, 43, 43A, 43B and 47. The work will also have to comply with all other relevant requirements of the Building Regulations.

~~Regulation 43B "Nearly zero energy requirements for new buildings" will not come into operation until 1st January 2019. It is the intention of the Department that guidance on this matter will be provided nearer to the time that this regulation comes into operation.~~

Regulation 43B "Nearly zero-energy requirements for new buildings" (NZEB) came into operation for newly erected dwellings from the 31st December 2020. This booklet provides guidance on the relevant NZEB standards applicable to new plans applications made from XX XXXXXXXX 202X. For work arising from applications made prior to this refer to the previous editions of this Technical Booklet.

Materials and workmanship

Any building work which is subject to requirements imposed by Part A of the Building Regulations should be carried out in accordance with regulation 23 of those regulations. Guidance on meeting these requirements for materials and workmanship is given in Technical Booklet B which supports Part B.

The Building Regulations are made for specific purposes, primarily securing the health, safety, welfare and convenience of people and for the conservation of fuel and power. Standards and technical approvals are relevant guidance to the extent that they relate to these purposes. However, they may also address other aspects of performance such as serviceability, or aspects which although they relate to health and safety are not covered by the Building Regulations.

Named standards

Where this Technical Booklet makes reference to a named standard, the relevant version of the standard is the one listed in Appendix D. However, if this version has been replaced or updated by the issuing standards body, the new version may be used as a source of guidance provided that it continues to address the relevant requirements of the Building Regulations.

Diagrams

The diagrams in this Technical Booklet supplement the text. They do not show all the details of construction and are not intended to illustrate compliance with any other requirement of the Building Regulations. They are not necessarily to scale and should not be used as working details.

Protected buildings

District councils have a duty to take account of the desirability to preserve the character of protected buildings when carrying out their functions under Building Regulations. Therefore, where work is to be carried out to a protected building to comply with Part F or any other Part of the Building Regulations, special consideration may be given to the extent of such work for compliance where it would unacceptably alter the character or appearance of the building. Protected buildings are defined in Article 3A(2) of the Building Regulations (Northern Ireland) Order 1979 (as amended).

Other legislation

The provisions of this Technical Booklet relate to the requirements of Building Regulations and do not include measures which may be necessary to meet the requirements of other legislation. Such other legislation may operate during the design or construction stages or when a building is brought into use and can extend to cover aspects which are outside the scope of the Building Regulations.

The Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993

The Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993 (the Workplace Regulations) contain some requirements which affect building design. The main requirements are now covered by the Building Regulations, but for further information see – *The Workplace Regulations and the Workplace Health, Safety and Welfare Approved Code of Practice.*

The Workplace Regulations apply to the common parts of flats and similar buildings if people such as cleaners, wardens and caretakers are employed to work in these common parts. Where the requirements of the Building Regulations that are covered by Part F do not apply to dwellings, the provisions may still be required in the situations described above in order to satisfy the Workplace Regulations.

The Energy Performance of Buildings Directive

~~Part F implements Articles 3 to 6 of Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.~~

Part F implements aspects of Articles 2 to 9 of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings.

Other legislation, including the Energy Performance of Buildings (Certificates and Inspections) Regulations (Northern Ireland) 2008 (as amended), has the effect of implementing the remainder of this Directive.

Part F Regulations

Part F (comprising regulations 38 – 47) of the Building Regulations which sets out the requirements for conservation of fuel and power in buildings, has been replicated below for the convenience of the user of this Technical Booklet and is taken directly from the Building Regulations (Northern Ireland) 2012 (as amended at the date of publication of this Technical Booklet).

Any person who intends to demonstrate compliance with the Building Regulations by following the guidance given in this Technical Booklet is advised to ensure that the regulations below are current on the date when plans are deposited or notices given to the district council.

As Part A (comprising regulations 1 – 21) of the Building Regulations sets out the interpretation along with the procedural requirements relating to the application of the regulations, the Department advises that all Parts of the Building Regulations be read in conjunction with Part A of those regulations.

The Building Regulations (Northern Ireland) 2012 and any subsequent amendment may be viewed by following the links from the Department's website at "www.buildingregulationsni.gov.uk".

Part F

Conservation of fuel and power

~~**Application and interpretation**~~

~~38. (1) Subject to paragraphs (2) and (3) this Part shall apply to any building and where a building contains one or more dwellings to each dwelling separately.~~

~~(2) Regulation 40 shall apply to—~~

~~(a) the erection of a building; and~~

~~(b) the extension of a building other than a dwelling, where the extension has a total useful floor area that is both—~~

~~(i) greater than 100 m^2; and~~

~~(ii) greater than 25% of the total useful floor area of the existing building,~~

~~but shall not apply to a building with low energy demand such as an industrial building, workshop or non-residential building.~~

~~(3) Regulation 45 shall not apply to the provision or extension of any fixed building service where commissioning is not possible.~~

~~(4) In this Part—~~

~~"Change of energy status" means any change which results in a building becoming a building to which this Part applies where previously it did not;~~

~~"National calculation methodology" means—~~

~~(a) in relation to a dwelling, the Government's Standard Assessment Procedure (SAP) for Energy Rating of Dwellings; and~~

~~(b) in relation to a building other than a dwelling—~~

~~(i) the Simplified Building Energy Model (SBEM); or~~

~~(ii) a Dynamic Simulation Model (DSM),~~

~~that is implemented with Government approved software;~~

~~"Pipes, ducts and vessels" means any pipe, any duct and any vessel in a space heating or space cooling system that is intended to carry a heated or chilled liquid or gas and includes any associated fittings;~~

~~"Renovation of a thermal element" means the provision of a new layer to a thermal element or the replacement of an existing layer (other than where a partial replacement layer is provided solely as a means of patch repair to a flat roof) but does not include thin decorative surface finishes;~~

~~"Space cooling system" does not include a system or that part of a system which cools or stores water solely for a commercial or industrial process;~~

~~"Space heating system" does not include a system or that part of a system which heats or stores water solely for a commercial or industrial process;~~

~~"Target carbon dioxide emission rate" means the rate of carbon dioxide emission measured in kilograms of carbon dioxide per square metre of total useful floor area per year;~~

~~"Thermal element" means a wall, floor or roof (but does not include windows, doors, roof windows or rooflights) which separates a thermally 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) thermally unconditioned;~~

~~(ii) an extension falling within Class 8 of Schedule 2; or~~

~~(iii) in the case of a building other than a dwelling, 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; and~~

~~"Total useful floor area" means the total area of all enclosed spaces measured to the inside face of the external walls, that is, the gross floor area, and in the case of sloping surfaces such as staircases, galleries, raked auditoria and tiered terraces shall be taken as their area on plan but shall exclude areas that are not enclosed such as open floors, covered ways and balconies.~~

Application and interpretation

38.—(1) Subject to paragraphs (2), (3) and (4) this Part shall apply to any building and where a building contains one or more dwellings to each dwelling separately.

(2) The energy efficiency requirements shall not apply to—

(a) protected buildings, where compliance with the energy efficiency requirements would unacceptably alter their character or appearance;

(b) buildings used as places of worship and for religious activities;

(c) temporary buildings with a planned time of use of 2 years or less, industrial sites, workshops and non-residential agricultural buildings with a low energy demand; and

(d) stand-alone buildings other than dwellings, with a total useful floor area of less than 50 m^2.

(3) Regulation 40 shall not apply to—

(a) the extension of a dwelling; and

(b) the extension of a building other than a dwelling, unless the extension has a total useful floor area that is both—

(i) greater than 100 m^2; and

(ii) greater than 25% of the total useful floor area of the existing building.

(4) Regulation 45 shall not apply to the provision or extension of any fixed building service where commissioning is not possible.

(5) In this Part, the following terms have the same meaning as in European Parliament and the Council Directive 2010/31/EU of 19 May 2010 on the energy performance of buildings (recast)—

(i) "industrial sites";

(ii) "low energy demand";

(iii) "non-residential agricultural buildings";

(iv) "places of worship";

(v) "religious activities";

(vi) "stand-alone"; and

(vii) "workshops".

(6) In this Part—

"Building envelope" in relation to a building, means the walls, floor, roof, windows, doors, roof windows and rooflights;

"Change of 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;

"Cogeneration" means simultaneous generation in one process of thermal energy and one or both of the following—

(a) electrical energy;

(b) mechanical energy;

"District or block heating or cooling" means the distribution of thermal energy in the form of steam, hot water or chilled liquids, from a central source of production through a network to multiple buildings or sites, for the use of space or process heating or cooling;

"Energy efficiency requirements" means the requirements of regulations 39, 40, 41, 43, 43A, 43B and 47;

"Energy from renewable sources" means energy from renewable non-fossil sources, namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage treatment plant gas and biogases;

"Heat pump" means a machine, a device or installation that transfers heat from natural surroundings such as air, water or ground to buildings or industrial applications by reversing the natural flow of heat such that it flows from a lower to a higher temperature. (For reversible heat pumps, it may also move heat from the building to the natural surroundings.);

"High-efficiency alternative systems" include—

(a) decentralised energy supply systems based on energy from renewable sources;

(b) cogeneration;

(c) district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources; and

(d) heat pumps;

"Major renovation" means the renovation of a building where more than 25% of the surface area of the building envelope undergoes renovation;

"National calculation methodology" means—

(a) in relation to a dwelling, the Government's Standard Assessment Procedure (SAP) for Energy Rating of Dwellings; and

(b) in relation to a building other than dwelling—

(i) the Simplified Building Energy Model (SBEM); or

(ii) a Dynamic Simulation Model (DSM),

that is implemented with Government approved software;

"Nearly zero-energy building" means a building that has a very high energy performance, as determined in accordance with the National calculation methodology, where the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby;

"Pipes, ducts and vessels" means any pipe, any duct and any vessel in a space heating or space cooling system that is intended to carry a heated or chilled liquid or gas and includes any associated fittings;

"Protected building" has the same meaning as in Article 3A(2) of the Building Regulations (Northern Ireland) Order 1979;

"Renovation of a thermal element" means the provision of a new layer to a thermal element or the replacement of an existing layer (other than where a partial replacement layer is provided solely as a means of patch repair to a flat roof) but does not include thin decorative surface finishes;

"Space cooling system" does not include a system or that part of a system which cools or stores water solely for a commercial or industrial process;

"Space heating system" does not include a system or that part of a system which heats or stores water solely for a commercial or industrial process;

"Target carbon dioxide emission rate" means the rate of carbon dioxide emission measured in kilograms of carbon dioxide per square metre of total useful floor area per year;

"Thermal element" means a wall, floor or roof (but does not include windows, doors, roof windows or rooflights) which separates a thermally 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) thermally unconditioned;

(ii) an extension falling within Class 8 of Schedule 2; or

(iii) in the case of a building other than a dwelling, 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; and

"Total useful floor area" means the total area of all enclosed spaces measured to the inside face of the external walls, that is, the gross floor area, and in the case of sloping surfaces such as staircases, galleries, raked auditoria and tiered terraces shall be taken as their area on plan but shall exclude areas that are not enclosed such as open floors, covered ways and balconies.

Conservation measures

39. Reasonable provision shall be made for the conservation of fuel and power in any building 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;

(b) providing energy efficient fixed building services with effective controls; and

(c) commissioning the fixed building services.

Target carbon dioxide emission rate

40.—(1) Without prejudice to the requirements of regulation 39, where a building is to be erected, or a building other than a dwelling is extended as described in regulation 38(~~2~~3)(b), minimum energy performance requirements in the form of a target carbon dioxide emission rate for that building shall be calculated and expressed using a national calculation methodology.

(2) The building, or extension as described in regulation 38(~~2~~3)(b), shall be so designed and constructed as not to exceed its calculated target carbon dioxide emission rate with all carbon dioxide emission rates calculated and expressed using a national calculation methodology.

Consequential improvements

41. Where it is proposed to execute building work in relation to any existing building with a total useful floor area greater than 1000 m^2 and that work consists of or includes—

(a) an extension;

(b) the initial provision of any fixed building service; or

(c) an increase in the capacity of any fixed building service,

consequential improvements to the existing building shall be carried out to ensure that the building complies with the requirements of regulation 39 so far as this is technically, functionally and economically feasible.

Change of energy status

42. Where there is a change of energy status such work shall be carried out as is necessary to ensure that the building complies with the requirements of regulation 39.

~~**Renovation of thermal elements**~~

~~43. Where a thermal element is renovated such work shall be carried out as is necessary to ensure that the whole thermal element complies with the requirement of regulation 39(a)(i).~~

Renovation of thermal elements

43.—(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 surface area of the thermal element,

the renovation shall be carried out so as to ensure that the whole of the thermal element complies with the requirement of regulation 39(a)(i) in so far that it is technically, functionally and economically feasible.

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

(a) constitutes a major renovation; or

(b) in the case of part replacement, amounts to the renovation of more than 50% of the surface area of the thermal element,

the whole of the thermal element shall be replaced to comply with the requirement of regulation 39(a)(i) in so far that it is technically, functionally and economically feasible.

Consideration of high-efficiency alternative systems

43A.—(1) Where a building is to be erected, the person carrying out the work shall, before construction begins, undertake an analysis of and give consideration to the use of available high-efficiency alternative systems in the work. Such systems include—

(a) decentralised energy supply systems based on energy from renewable sources;

(b) cogeneration;

(c) district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources; and

(d) heat pumps.

(2) The analysis referred to in paragraph (1)—

(a) shall be documented and take into account the technical, environmental and economic feasibility of using high-efficiency alternative systems;

(b) may be carried out for individual buildings or for groups of similar buildings or for common typologies of buildings in the same area; and

(c) in so far as it relates to collective heating and cooling systems, may be carried out for all buildings connected to the system in the same area.

Nearly zero-energy requirements for new buildings

43B.—(1) Where a building is erected, it must be a nearly zero-energy building.

(2) For the purposes of paragraph (1)—

(a) in respect of new buildings occupied and owned by public authorities, this regulation shall apply from 1st January 2019; and

(b) in respect of all new buildings, this regulation shall apply from 31st December 2020.

Notice of air pressure test

44. Where an air pressure test is undertaken for the purposes of demonstrating compliance with regulation 40(2), the person carrying out the work shall give, not more than 5 days after completion of the testing, a notice in writing to the district council stating the result of the air pressure test.

Notice of commissioning

45. Where this regulation applies, the person carrying out the work, for the purpose of ensuring compliance with regulation 39(b) and (c), shall give, not more than 5 days after completion of the commissioning, a notice in writing to—

(a) the building owner stating that the fixed building services have been commissioned; and

(b) the district council stating that the requirements of sub-paragraph (a) have been met.

Notice of emission rate

46. Where a calculation is carried out for the purpose of demonstrating compliance with regulation 40(2), a notice in writing that states—

(a) the target carbon dioxide emission rate for the building;

(b) the calculated carbon dioxide emission rate for the building as constructed; and

(c) the list of specifications to which the building is constructed where these differ significantly from the design specifications used for the calculation of the design-stage carbon dioxide emission rate,

shall be given to the district council not more than 5 days after completion of the building work, by the person carrying out the work..

Provision of information

47. Where regulation 39 applies, the person carrying out the work shall give, not more than 5 days after completion of the work, a notice in writing to—

(a) the building owner giving sufficient information about the building, its fixed building services, and their ongoing maintenance requirements, so that the building can be operated and maintained to conserve fuel and power; and

(b) the district council stating that the requirements of sub-paragraph (a) have been met.

Relevant definitions in regulation 2 in Part A of the Building Regulations.

"Building work"

"Conservatory"

"District council"

"Dwelling"

"Extension"

"Fixed building service"

"Window"

Guidance - Performance and introduction to provisions

Performance - Regulation 39 Conservation measures

0.1 It is the view of the Department that the requirements of regulation 39 will be met when –

(a) provisions are made to limit heat gains and losses through thermal elements and other parts of the building fabric;

(b) provisions are made to limit heat gains and losses from pipes, ducts and vessels in a space heating system or space cooling system including associated fittings;

(c) effective controls are provided to energy efficient fixed building services; and

(d) fixed building services are commissioned.

Performance - Regulation 40 Target carbon dioxide Emission Rate

0.2 It is the view of the Department that the requirements of regulation 40 will be met when a building is designed and constructed so as not to exceed its Target carbon dioxide Emission Rate (TER). The TER must be calculated using a National Calculation Methodology which in relation to a dwelling is the Government's Standard Assessment Procedure (SAP) for Energy Rating of Dwellings.

~~(Regulation 40 implements Articles 3 and 4 of Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.)~~

Regulation 40 implements Articles 3 and 4 of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings.

Performance - Regulation 41 Consequential improvements

0.3 It is the view of the Department that the requirements of regulation 41 will be met when work, referred to as consequential improvements, is carried out to enhance an existing building's conservation of fuel and power. The requirement to carry out consequential improvements is limited to existing buildings with a total useful floor area greater than 1000 m^2 where the work consists of or includes an extension, or the initial provision of any fixed building service, or an increase in the capacity of any fixed building service. Such work should also be technically, functionally and economically feasible.

Performance - Regulation 42 Change of energy status

0.4 It is the view of the Department that the requirements of regulation 42 will be met where a previously unconditioned building, or part of a building, becomes conditioned i.e. by heating or cooling and where the work is undertaken to meet the performance requirements of regulation 39.

Performance - Regulation 43 Renovation of thermal elements

~~0.5~~ ~~It is the view of the Department that the requirements of regulation 43 will be met when a thermal element is renovated i.e. a thermal element is provided with a new layer or has an existing layer replaced and work is undertaken to limit heat gains and losses through the whole thermal element.~~

~~Renovation of a thermal element does not include a partial replacement layer provided solely as a means of patch repair to a flat roof and does not include thin decorative surface finishes.~~

0.5 It is the view of the Department that when renovation and/or replacement work to an individual thermal element constitutes a major renovation or the renovation amounts to more than 50% of the surface of the element, the requirements of regulation 43 will be met when work is undertaken to limit heat gains and losses as required by regulation 39(a)(i).

Renovation of a thermal element does not include a partial replacement layer provided solely as a means of patch repair to a flat roof and does not include thin decorative surface finishes.

Performance – Regulation 43A Consideration of high-efficiency alternative systems

0.5A It is the view of the Department that the requirements of regulation 43A will be met when the person carrying out the work undertakes analysis of and gives consideration to incorporating high-efficiency alternative systems in the building.

Note – Part A of the Building Regulations requires a notice to be given to the district council stating that such consideration has been given and that the analysis is available for verification.

Performance - Regulation 43B Nearly zero-energy requirements for new buildings

0.5B It is the view of the Department that the requirements of regulation 43B will be met for new dwellings when the DER of a dwelling house is significantly better than the TER figure calculated using the SAP software, such that a significant proportion of the dwelling's energy requirement is likely to be provided by renewable sources and the energy requirements for the dwelling are very low or nearly zero.

Introduction to provisions in Section 2

0.6 The guidance in Section 2 gives Criterion in relation to –

(a) achieving the TER;

(b) minimum acceptable standards;

(c) limiting the effects of solar gain;

(d) quality of construction and commissioning; and

(e) operating and maintenance instructions.

It also gives the methodology and limiting values used by the national

calculation software (SAP) to calculate the Target carbon dioxide Emission Rate (TER) and the Dwelling carbon dioxide Emission Rate (DER).

Introduction to provisions in Section 3

0.7 The guidance in Section 3 gives provisions to enhance the conservation of fuel and power when altering or extending existing dwellings where there is a material change of use, or a change of energy status, or where there are consequential improvements.

Section 1 General

1.1 Any reference to a building includes a reference to part of a building.

Definitions

1.2 In this Technical Booklet the following definitions apply –

Air permeability – the air leakage rate in cubic metres per hour per square metre of envelope area $m^3/(h.m^2)$ at a pressure difference of 50 Pascals.

Building work – is defined in regulation 2 in Part A of the Building Regulations.

Building envelope – is defined in regulation 38 in Part F of the Building Regulations.

Change of energy status – is defined in regulation 38 in Part F of the Building Regulations.

Cogeneration – is defined in regulation 38 in Part F of the Building Regulations.

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

Conservatory – is defined in regulation 2 in Part A of the Building Regulations.

Controlled service or fitting – any service or fitting to which the Building Regulations apply.

DER – the Dwelling carbon dioxide Emission Rate measured in kilograms of carbon dioxide per square metre of total useful floor area per year.

Design air permeability – the value for air permeability selected by the designer to calculate the DER or BER before commencement of work.

District council – is defined in regulation 2 in Part A of the Building Regulations.

District or block heating or cooling – is defined in regulation 38 in Part F of the Building Regulations.

Dwelling – is defined in regulation 2 in Part A of the Building Regulations.

Note – buildings exclusively containing rooms for residential purposes (see definition) are not dwellings, and Technical Booklet F2 applies to them.

Dwelling type – for the purposes of air tightness testing, is the allocation of each dwelling on a development to a generic dwelling type by the person carrying out the air tightness testing. To be classed as of the same dwelling type the dwelling should comply with all of the following –

(a) be of the same generic form (i.e. detached, semi-detached, end terrace, mid-terrace, ground floor flat (inc. ground floor maisonette), mid-floor flat, top-floor flat (inc. top-floor maisonette));

(b) be of the same number of storeys;

(c) be of the same design air permeability;

(d) have similar adjacency to unheated spaces such as stairwells, integral garages, etc.;

(e) have the same principal construction details (as identified by Accredited Construction Details or bespoke construction detail reference codes);

(f) have a similar (±1) total number of significant penetrations, (i.e. windows, doors, flues/chimneys, supply/exhaust terminals and waste water pipes); and

(g) have envelope areas that do not differ by more than 10%.

Energy efficiency requirements – is defined in regulation 38 in Part F of the Building Regulations.

Energy from renewable sources – is defined in regulation 38 in Part F of the Building Regulations.

Envelope area – the total area of all wall, floor and ceiling elements that enclose the internal volume subject to an air permeability test. This includes walls and floors below external ground level. Overall internal dimensions are used to calculate this area. No subtractions are made for the area at junctions of internal elements (partitions and intermediate floors) with external elements (exterior walls, floors and ceilings).

The envelope area of a terraced building includes the party walls. The envelope area of a flat in a multiple storey building includes the floors, walls and ceilings that are shared with adjacent flats.

Exempted building – is defined in regulation 2 in Part A of the Building Regulations.

Extension – is defined in regulation 2 in Part A of the Building Regulations.

Fixed building service – is defined in regulation 2 in Part A of the Building Regulations.

Flat – is defined in regulation 2 in Part A of the Building Regulations.

Floor area – is defined in regulation 2 in Part A of the Building Regulations.

Heat pump – is defined in regulation 38 in Part F of the Building Regulations.

High-efficiency alternative systems – is defined in regulation 38 in Part F of the Building Regulations.

Low or zero carbon energy sources (LZC) – include biofuels, heat pumps,

microCHP, micro-hydro, photovoltaics, solar hot water and wind power.

Material change of use – is defined in regulation 2 in Part A of the Building Regulations.

Major renovation – is defined in regulation 38 in Part F of the Building Regulations.

National Calculation Methodology – is defined in regulation 38 in Part F of the Building Regulations.

NZEB (Nearly zero-energy building) – is defined in regulation 38 in Part F of the Building Regulations.

Pipes, ducts and vessels – is defined in regulation 38 in Part F of the Building Regulations.

Porch – is defined in regulation 2 in Part A of the Building Regulations.

Protected building – is defined in Article 3A(2) of the Building Regulations (Northern Ireland) Order 1979.

Provision of a service or fitting – is defined in regulation 2 in Part A of the Building Regulations.

Renovation of a thermal element – is defined in regulation 38 in Part F of the Building Regulations.

Room for residential purposes – means a room or suite of rooms which is not a dwelling, and which is used by one or more persons to live and sleep and includes a room in a hostel, hotel, boarding house, hall of residence or a residential home, whether or not the room is separated from or arranged in a cluster group with other rooms. It excludes a room in a hospital or similar establishment used for patient accommodation.

For the purposes of this definition, a cluster is a group of rooms for residential purposes which is not designed to be occupied by a single household and which is separated from the rest of the building by a door which is designed to be locked.

SAP – the Government's Standard Assessment Procedure for Energy Rating of Dwellings: 2009 edition, or any later edition approved by the Department.

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

Space cooling system – is defined in regulation 38 in Part F of the Building Regulations.

Space heating system – is defined in regulation 38 in Part F of the Building Regulations.

TER (Target carbon dioxide Emission Rate) – is defined in regulation 38 in Part F of the Building Regulations.

Thermal element – is defined in regulation 38 in Part F of the Building Regulations.

Thermal separation – any wall, floor, window or door that is intended to reduce heat loss from a heated part of a building into another part of the building designed to be unheated or only occasionally heated. The thermal separation should have U-values and airtightness provisions of at least the same standard as the building's thermal envelope.

Total useful floor area – is defined in regulation 38 in Part F of the Building Regulations.

Note – this equates to the gross floor area as measured in accordance with the guidance issued to surveyors by the RICS.

Window – is defined in regulation 2 in Part A of the Building Regulations.

General rules

Area of elements

1.3 The area of a building element is that of its internal surface measured between the finished internal faces of the enclosing fabric of the building and, in the case of a roof, is measured in the plane of the ceiling. The area includes the areas where internal elements abut the internal surface of the wall, floor or roof.

Area of windows, doors and rooflights

1.4 The area of window, door and rooflight openings in a wall or roof is measured internally between reveals and from head to sill.

Service openings in walls and roofs

1.5 An opening in a wall to accommodate building services, such as a waste pipe or ventilator, should be regarded as part of the wall and assumed to have the same U-value as the wall.

1.6 An opening in a roof to accommodate building services, such as a flue pipe or passive stack ventilator, should be regarded as part of the roof and assumed to have the same U-value as the roof.

Technical risks

1.7 Building work should satisfy all of the requirements of the Building Regulations, however the requirements of Part C (Site preparation and resistance to contaminants and moisture), Part G (Resistance to the passage of sound), Part K (Ventilation) and Part L (Combustion appliances and fuel storage systems) are particularly interrelated in the whole building approach adopted by Part F.

1.8 The incorrect application of energy efficiency measures can cause technical problems such as an increased risk of rain penetration or interstitial condensation. Measures to avoid the risks that might arise are given in BRE Report BR 262: *Thermal insulation: avoiding risks.*

Calculation of U-values

1.9 U-values should be calculated in accordance with the methods and conventions given in BRE Report BR 443: *Conventions for U-value calculations* except where stated otherwise.

Use of England & Wales documents

1.10 Where the *Domestic Building Services Compliance Guide* refers to Part L (Conservation of fuel and power) of the building regulations for England & Wales and associated Approved Documents L1A and L1B, it should be read as referring to the corresponding references in Part F (Conservation of fuel and power) of the Building Regulations (Northern Ireland) 2012 and this Technical Booklet.

Section 2 New dwellings

GENERAL

2.1 This Section gives the methodology and limiting values used by the national calculation software (SAP) to calculate the Target carbon dioxide Emission Rate (TER) and Dwelling carbon dioxide Emission Rate (DER). In practice, designers are unlikely to find it necessary to refer to all of this Section as the calculation software will automatically calculate the TER and DER when the details of a dwelling are input into the SAP software. Current editions of ~~the~~ SAP software will automatically flag ~~out-of-range~~ values out of range with the previous guidance standards and check that the DER is no greater than the TER as designed.

However, until revised software is developed, additional manual checks will be required. These include –

(a) confirmation that the design and as-built constructions align with the requirements of paragraphs 2.31-2.34, which provide revised limiting U-values and a glazing area assessment;

(b) confirmation that the air-tightness limit (see paragraph 2.35) has been achieved and that previously acceptable default values of 15$m^3/(h.m^2)$ have not been entered;

(c) where the building is subject to regulation 43B (nearly zero-energy requirements for new buildings), confirmation that the betterment of the TER required by paragraph 2.35A has been achieved; and

In addition, where on-site renewable generating technologies are included in the design, confirmation of the nature of the grid connection should be provided. In cases of a non-export grid connection, a report should be provided in accordance with paragraphs 2.16E and 2.16F.

Note – These new and additional factors have been developed to provide an updated and more robust NZEB standard, pending future adoption of revised software and National Calculation Methodology.

2.2 On completion of the dwelling, details of the dwelling as built should be re-entered into the software to confirm that the DER for the dwelling as built is no greater than the required emissions standard (see paragraph 2.35A).~~as built is no greater than the TER~~

2.3 Whilst the software covers the calculation aspects of compliance it will still be necessary to demonstrate that Criteria 2 to 5 in this Section are met.

Types of work covered by this Section

2.4 This Section provides guidance for the erection of a new dwelling.

2.5 Buildings containing rooms for residential purposes, such as a nursing home, student accommodation and similar are not considered, for the purposes of Part F, as dwellings and, in such cases, the provisions in Technical Booklet F2 apply.

2.6 Where a building contains living accommodation and also contains space to be used for professional, industrial or commercial purposes (e.g. a doctor's surgery, a workshop or office), the whole building should be treated as a dwelling if the business part could revert to domestic use.

Consequently it should be designed and constructed in accordance with the provisions in this Technical Booklet.

This would be the case where all of the following apply –

(a) there is direct access between the living accommodation and the business part;

(b) both are contained within the same thermal envelope; and

(c) the living accommodation occupies the greater proportion of the total floor area of the building.

Sub-paragraph (c) means that a small flat for a manager in a large non-domestic building would not mean the whole building should be treated as a dwelling. Similarly, the existence of a room used as an office or utility space within a dwelling would not mean that the building should be treated as a non-domestic building.

2.7 When constructing a dwelling as part of a larger building that contains other types of accommodation, this Technical Booklet applies solely to the dwelling. Technical Booklet F2 applies to the non-dwelling parts of the building such as heated common areas and, in the case of mixed-use developments, the commercial or retail space.

Areas requiring specific consideration

Common areas in buildings with multiple dwellings

2.8 The common areas of buildings containing multiple dwellings are not classified as dwellings. These common areas should –

(a) where they are not heated, comply with the fabric standard provisions of paragraphs 2.31 to 2.34; and

(b) where they are heated, comply with the provisions of Technical Booklet F2.

Conservatories and similar highly glazed spaces

2.9 Where a new dwelling incorporates a conservatory or similar highly glazed space which does not have thermal separation from the rest of the dwelling, it should be regarded as an integral part of the dwelling and be included in the calculation of the TER and DER and in the air pressure test.

2.10 Where a conservatory, constructed as part of a new dwelling, has thermal separation from the dwelling, the TER and DER for the dwelling may be calculated as if the conservatory is not present and the air pressure test should not include this space. However, irrespective of the conservatory being ignored for the purposes of calculating the TER and DER, where the conservatory is heated or cooled by a fixed building service either taken from the main system or provided solely in the conservatory, it should have –

(a) controlled fittings that comply with the guidance in paragraphs 3.41 to 3.48;

(b) thermal elements that comply with the guidance in paragraphs 3.50 to 3.54;

(c) where fixed building services are provided these should comply with the guidance in paragraphs 3.29 to 3.40; and

(d) where the conservatory or similar highly glazed space is heated, independent temperature and on/off controls.

Swimming pool basins

2.11 Where a swimming pool basin is constructed as part of a new dwelling, provisions should be made to limit the heat loss from the pool basin by achieving a U-value of not more than 0.25 W/m^2.K, calculated in accordance with BS EN ISO 13370.

2.12 When assessing the dwelling under Criterion 1, the dwelling should be assessed as if the pool basin was not there, but the room enclosing the swimming pool should be included in the TER/DER calculations. The area covered by the pool should be assumed to have the same U-value as the pool surround.

Target carbon dioxide Emission Rate (TER)

2.13 The Target carbon dioxide Emission Rate (TER) is ~~the minimum acceptable energy performance for a new dwelling. It is~~ expressed in terms of the mass of carbon dioxide (CO_2) in units of kg per m^2 of total useful floor area per year emitted as the result of the provision of fixed building services for a standardised household as defined by SAP.

2.14 The TER is calculated in two stages –

(a) Firstly, calculate the CO_2 emissions for a notional dwelling of the same shape and size as the proposed dwelling using the reference values given in Appendix R of SAP 2009 and the emission factors given in SAP 2005.

No values may be varied from these reference values when establishing the TER.

The SAP software will output the CO_2 emissions resulting from –

(i) the provision of heating and hot water (C_H), (which will include the energy used by pumps and fans); and

(ii) the provision of fixed internal lighting (C_L).

(b) Secondly, calculate the TER using the appropriate formula –

For mains gas, B30K, renewable energy, solid multi-fuels and any fuel with a CO_2 emission factor less than that of mains gas –

$$TER_{2012} = \{(C_H \times FF \times EFA_H)+(C_L \times EFA_L)\}x(1 – 0.2)x(1 – 0.25)$$

For all other fuels –

$$TER_{2012} = \{(1.14 \times CH \times FF \times EFA_H)+(CL \times EFA_L)\}x(1 – 0.2)x(1 – 0.25)$$

Where FF is the fuel factor taken from Table 2.1 in accordance with the guidance given in paragraph 2.15.

Where EFA is the Emission Factor Adjustment with separate values for heating and lighting. EFA is the ratio of the CO_2 emission

factor for the relevant fuel in 2009 (see Table 12 in SAP 2009) divided by the value used in the 2006 edition of Part F (see Table 12 in SAP 2005). For those fuels with a fuel factor of 1.0 the EFA should always be based on mains gas.

~~Note — the notional dwelling used to determine C_H has a party wall heat loss of zero. This means that the target improvement of 25% in this version of Part F is in addition to treating the party wall heat loss (see paragraphs 2.44 to 2.50).~~

2.15 The fuel factor used to calculate the TER should be taken from Table 2.1 as follows –

(a) where all space heating appliances and domestic hot water heating appliances are served by the same fuel, the fuel used in those appliances;

(b) where the dwelling has more than one appliance for space heating and/or hot water and these are served by different fuels, the fuel should be taken to be mains gas if any of the appliances are served by mains gas. In any other circumstances, the fuel used should be taken to be the fuel used by the main space heating system; and

(c) where the dwelling is served by a community heating scheme, the fuel should be taken to be mains gas if the community heating scheme uses mains gas for any purpose. In any other circumstances the fuel should be taken to be the fuel that provides the most heat to the community scheme.

Table 2.1 Fuel factors

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

Note:

(1) The specific fuel factor should be used for those appliances that can only burn that particular fuel. Where an appliance is classed as multi-fuel, the multi-fuel factor should be used except where the dwelling is in a Smoke Control Zone. In such cases the solid mineral fuel factor should be used unless the specific multi-fuel appliance has been approved for use in a Smoke Control Zone.

Buildings containing multiple dwellings

2.16 Where a building contains more than one dwelling (such as in a terrace of houses or in a block of flats), an average TER may be calculated for all the dwellings in the building. In such cases, the average TER is the floor area weighted average of all the individual TERs calculated using the following formula –

$$TER_{av} = \frac{(TER_1 \times \text{Floor area}_1) + (TER_2 \times \text{Floor area}_2) + \ldots}{\text{Floor area}_1 + \text{Floor area}_2 + \ldots}$$

The area weighted average TER may be compared against the floor area weighted average DER.

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

Electricity generated by renewable technologies

2.16A The betterment standards of paragraph 2.35A are expected to lead to a greater use of renewable generation technologies.

Note – Designers and installers of these systems should take care to ensure any such technology complies with other parts of the building regulations, notably Part E (Fire safety), Part K (Ventilation) and Part L (Combustion appliances) in particular and any other statutory requirements.

2.16B Where renewable generation technologies are used to produce electricity, designers are encouraged to engage at an early stage with Northern Ireland Electricity Networks (NIE) to confirm that an export connection can be provided.

2.16C Where renewable generation technologies producing electricity are specified, confirmation that an export capable connection has been designed and installed should be provided to the district council in relevant design and as-built submissions.

Non-export connections

2.16D Where an export connection is not provided, the current SAP software will assume that the full generation capacity of any renewable generation technology is being used and the reduced performance due to the inability to export will not be taken into account.

Designers should note that a performance gap is likely in non-export connection situations. Future versions of software are being developed which may take into account any performance losses.

In non-export situations, designers may wish to consider alternative routes to compliance, which avoid a non-export connection. Where a renewable generation technology with a non-export connection is retained, designers should consider options such as appropriately sizing any renewable generation technologies, providing appropriate battery storage capacity or other diverter technologies in order to maximise the extent that the energy generating capacity can be beneficially used in practice and minimize the

likely performance gap.

Designers should explain any limitation or potential performance gap to the building owner and are encouraged to do this at an early stage in the design development.

2.16E Where paragraph 2.16D applies and the non-export connection is retained, designers should provide a detailed report on the proposed system to the district council. This should be prepared by a suitably qualified person with experience in electrical energy demand profiles of buildings and the performance of the particular renewable generation technology involved.

While no explicit performance improvement is required, the report should be provided at plans application stage and show –

a) how the issues raised in paragraph 2.16D have been considered; and

b) any specific plans or outcomes that can be expected to further improve utilisation of the system in future.

Calculations should be provided to show the extent of the likely improvements provided under items 'a' and 'b' above.

2.16F A similar statement should be provided to the district council on completion of any building with on-site renewable electrical generation where a non-export connection is provided to take into account any adjustments in the as-built construction. This should include confirmation that the nature and limitations in performance have been notified in the as-built information provided to the building owner in the operating and maintenance instruction manual (see paragraphs 2.75 & 2.78).

Note – These provisions accept a performance gap in the assessment of non-exporting renewable generation technologies. This is accepted on the basis that electrical energy requirements may increase or that future export or on-site storage solutions may become increasingly viable, and this gap may, therefore, narrow over time.

CRITERION 1 – ACHIEVING THE TER

Calculating the DER for the dwelling as constructed

General

2.17 The DER should be calculated using the same version of SAP software used to calculate the TER.

2.18 On completion of the dwelling, the DER for the dwelling as constructed should be re-calculated to demonstrate that the TER has been ~~achieved or~~ bettered in accordance with paragraph 2.35A . In calculating the DER for the dwelling as constructed the following should be incorporated –

(a) any changes to the list of specifications that have been made during construction; and

(b) the assessed air permeability. The assessed air permeability should be determined as follows –

(i) where the dwelling has been pressure tested, the assessed air permeability is the measured air permeability; or

(ii) where the dwelling has not been pressure tested, the assessed air permeability is the average result obtained from pressure tests on other dwellings of the same type on the development increased by a margin of + 2 $m^3/(h.m^2)$ at 50 Pa.~~;~~ ~~or~~ ~~(~~see para 2.62-2.64 for details of batch testing)

~~(iii) on small developments (see paragraph 2.69), where the person carrying out the work has opted to avoid testing the assessed air permeability is 15 $m^3/(h.m^2)$ at 50 Pa.~~

2.19 ~~The person carrying out the works can test a greater proportion of their dwellings than required and benefit from the increased robustness of the test data, compared with paragraph 2.18(b)(ii), where the assessed air permeability is taken as the average of other test results plus a safety margin. This margin has been taken as approximately one standard deviation as derived from the analysis of a large sample of data from post 2006 dwellings in England & Wales.~~

~~The outcome of this change is~~ This means that the design air permeability should be at most 8.0 $m^3/(h.m^2)$ at 50 Pa, so that untested dwellings ~~should~~ achieve an assessed air permeability less than the limiting value of 10 $m^3/(h.m^2)$ at 50 Pa. If the design is aiming to achieve a low design air permeability, then the margin added under paragraph 2.18(b)(ii) will have a significant impact on the calculated DER. In such cases, the person carrying out the work should consider testing the dwelling so that the measured permeability can be included in the calculation.

Calculation before commencement of work

2.20 A calculation should be carried out that demonstrates that the DER of the dwelling as designed is ~~no greater~~ better than the TER by at least the margin provided in paragraph 2.35A. This design based calculation and list of specifications of the building envelope and the fixed building services used in calculating the DER is required to be given to the district council with the building control application. This specification should be as given in Appendix B.

This design-stage calculation and provision of a list of specifications will assist the district council to confirm that what is being built aligns with the claimed performance. ~~It is expected that~~ ~~s~~Software implementations of SAP 2009 will ~~be used to~~ produce the list of specifications and highlight those features of the design that are critical to achieving compliance, subject to the additional manual checks noted in paragraph 2.1. These “key features” can be used to prioritise the risk based inspection of the dwelling as part of confirming compliance. ~~If a provisional energy rating is calculated at this stage and an interim recommendations report is therefore available, the recommendations should be reviewed by the developer to see if further carbon mitigation measures might be incorporated in a cost-effective manner.~~

Calculation after completion of work

2.21 A calculation should be carried out that demonstrates that the DER of the dwelling as constructed is ~~no greater~~ better than the TER by the margin provided in paragraph 2.35A ~~than the TER~~. Not more than 5 days after completion of the work, the person carrying out the work should give

a notice in writing to the district council of the TER and DER and whether the building has been constructed in accordance with the list of specifications given to the district council before work started. If not, a list of any changes to the design stage list of specifications is required to be given to the district council. As evidence of compliance, a certificate stating that the TER and DER calculations are based on the list of specifications and any changes notified by the person carrying out the work to the district council, should be signed off by a suitably qualified person.

It would be useful in demonstrating compliance to provide additional information to support the values used in the DER calculation and the list of specifications. For example, U-values might be determined from a specific calculation, in which case the details should be provided, or from an accredited source, in which case a reference to that source would be sufficient. For example, for a boiler, the model reference and fuel type is sufficient evidence to allow the claimed performance to be checked against the SEDBUK (Seasonal Efficiency of Domestic Boilers in the UK) database. Evidence should also be provided to demonstrate that the dwelling as designed satisfies the provisions in Criteria 2, 3, and 4.

Secondary heating

2.22 A secondary heating appliance may meet part of the space heating demand. When calculating the DER, the fraction provided by the secondary heating system should be as defined by SAP 2009 for the particular combination of primary heating system and secondary heating appliance.

2.23 One of the following assumptions, in relation to secondary heating appliances, should be made when calculating the DER –

(a) where a secondary heating appliance is installed, the efficiency of the installed appliance with its appropriate fuel should be used in calculating the DER;

(b) where a chimney or flue is provided but no appliance is installed, the presence of the following appliances should be assumed –

(i) where a gas point is located adjacent to a hearth, a decorative fuel effect gas fire open to the chimney or flue, with an efficiency of 20%; or

(ii) where there is no gas point, an open multi-fuel fire with an efficiency of 37%, unless the dwelling is in a Smoke Control Zone when the fuel should be taken as smokeless solid mineral fuel; or

(c) where neither of the above are provided it should be assumed that the dwelling has no secondary heating.

Internal lighting

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

2.25 The number of low-energy lamps that would be reasonable is given in the *Domestic Building Services Compliance Guide*.

Buildings containing multiple dwellings

2.26 Where a building contains more than one dwelling (such as in a terrace of houses or in a block of flats), either each individual

dwelling should have a DER that is ~~equal to or~~ less than its TER by at least the margin provided in paragraph 2.35A, or the average DER is ~~equal to or~~ less than the average TER by at least the margin provided in paragraph 2.35A. These are floor area weighted averages.

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

Low or zero carbon energy sources (LZC)

2.27 Provided that the dwelling satisfies the limits on design flexibility as given in Criterion 2, the compliance procedure allows the designer full flexibility to achieve the betterment of the TER required under paragraph 2.35A utilising fabric and system measures and the integration of LZC technologies in whatever mix is appropriate to the scheme. SAP includes appropriate algorithms that enable the designer to assess the role LZC technologies can play ~~in achieving the TER~~.

2.28 Where a dwelling is connected to a community energy system, the same percentage reduction in CO_2 emissions should be attributed to each connected dwelling and the submission to the district council should demonstrate that the community energy system has sufficient capacity to deliver the percentage assumed.

2.29 To facilitate incorporation of improvements in system efficiencies and the future integration of LZC, the designer should consider –

(a) adopting heating system designs that use low distribution temperatures; and

(b) where multiple systems serve the same end use, organise the control strategies so that priority is given to the least carbon intensive option (e.g. where a solar hot water system is available), the controls should be arranged so that the best use is made of the available solar energy.

2.30 The designer should consider making the dwelling easily adaptable by facilitating the integration of additional LZC technologies at a later date. Providing appropriate facilities at the construction stage can make subsequent enhancements much easier and cheaper (e.g. by providing capped off connections that are ready to link in to a planned community heating scheme).

Consideration of high-efficiency alternative systems

2.30A The installation of high-efficiency alternative systems or other low or zero carbon systems is not a requirement of building regulations but must be considered when a building is to be erected.

The person carrying out the work should, before construction starts, analyse and take into account the technical, environmental and economic feasibility of using high-efficiency alternative systems (such as the following systems) in the construction, if available –

(a) decentralised energy supply systems based on energy from renewable sources;

(b) cogeneration;

(c) district or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources;

(d) heat pumps.

The analysis should state whether high-efficiency alternative systems have or have not been included in the building design. The requirement relates to considering using high-efficiency alternative systems, taking into account their technical, environmental and economic feasibility and documenting the analysis.

2.30B The analysis may be carried out for individual dwellings, groups of similar dwellings or for common types of dwellings in the same area. Where a number of dwellings are connected to a community energy system, a single analysis may be carried out for all of the dwellings connected to the system in the same area as the building to be constructed.

2.30C Procedural regulations require the person carrying out the work to give the district council, at the time of deposit of plans, a notice which states that the analysis has been undertaken, is documented and is available to the district council for verification purposes. The district council may require the deposit of the above analysis to verify compliance with regulation 43A.

2.30D The documentation of the analysis may contain the following information –

(a) identity of Applicant/Agent;

(b) location of site;

(c) use of building;

(d) if high-efficiency alternative systems are specified;

(e) the proposed systems;

(f) the rationale influencing the decision to incorporate, or not incorporate, high-efficiency alternative systems.

CRITERION 2 – MINIMUM ACCEPTABLE STANDARDS

U-values

2.31 The maximum U-values for each of the elements of the building fabric that separate a normally conditioned space from an unconditioned space or the external environment are given in Table 2.2. The value is the area-weighted average U-value for all elements of that type. In general, ~~achievement of the~~ betterment of the TER is likely to require better fabric performance than is given in Table 2.2 and/or additional measures, such as LZC technologies.

2.32 The U-values should be calculated using the methods and conventions given in BRE Report BR 443 Conventions for U-value calculations, and should be based on the whole unit (e.g. in the case of a window, the combined performance of the glazing and the frame).

The U-value of windows can be taken as the value for –

(a) the smaller of the two standard windows defined in BS EN 14351-1; or

(b) the standard configuration given in BR 443; or

(c) the specific size and configuration of the actual unit.

Table 2.2 Limiting U-values (W/m².K)		
Elements	**(a) Area-weighted average U-value**	**(b) Maximum U-value at any point**
Wall	~~0.30~~0.18	~~0.70~~0.6
Floor (1)	~~0.25~~0.18	~~0.70~~0.6
Roof	~~0.20~~0.16	~~0.35~~0.3
Party wall	~~0.20~~0.0	~~0.70~~0.6
Windows, roof windows, glazed rooflights, curtain walling and pedestrian doors	~~2.00~~1.4	~~3.30~~3.0
Note (1) Where the source of space heating is underfloor heating, the maximum floor U-value should be 0.15 W/m²K.		

2.32A To reduce heat losses and help limit excessive heat gain, the limiting extent of external doors and glazed openings in a dwelling should be no greater than 25% of the floor area of the dwelling.

2.32B As an alternative to the requirements of Table 2.2 column (a) and paragraph 2.32A, fabric standards and the extent of openings may be varied by adopting a whole building calculated trade-off approach (see calculation provided in paragraph 3.12). The area-weighted average U-value of all the elements in the dwelling should be no greater than that of a dwelling of the same shape and size that complies with Table 2.2 column (a) and paragraph 2.32A.

However, in all cases, the values of column (b) of Table 2.2 must still be obtained and any exposed or ground floors provided with underfloor heating should still obtain a U-value of no greater than 0.15 W/m²K.

2.33 The U-values for roof windows and rooflights given in this Technical Booklet are based on the U-value having been assessed with the roof window or rooflight in the vertical position. Where a unit has been assessed in a plane other than the vertical, the U-value given in this Technical Booklet should be modified by making a U-value adjustment in accordance with BR 443.

2.34 SAP 2009 Table 6e gives U-values for different window configurations that may be used in the absence of test data or calculated values.

Air permeability

2.35 The maximum permissible air permeability is 10 m³/(h.m²) at 50 Pa ~~(except where paragraph 2.69 applies)~~ however, it is expected that dwellings will normally have an assessed air permeability of 5 m³/(h.m²) at 50 Pa or less.

Where an air permeability of less than 3 m³/(h.m²) at 50 Pa is a likely outcome, consideration should be given to alternatives to natural ventilation, such as a continuous mechanical extract ventilation system, or to seek specialist advice in order to ensure adequate indoor air quality. Heat recovery will further improve energy performance on mechanical

systems. Guidance on these systems is provided in Technical Booklet K.

Betterment of the TER

2.35A For the purposes of regulation 43B (Nearly zero-energy requirements for new buildings) –

a) the DER for dwelling houses should better the TER by a minimum of 40%; and

$$DER_{(nzeb\ house)} \leq 0.6 \times TER$$

b) the DER for flats should better the TER by a minimum of 25%.

$$DER_{(nzeb\ flat)} \leq 0.75 \times TER$$

This means that if, for example, the TER provided by SAP is 20 $kgCO_{2e}/m^2/yr$, then a new dwelling house would require a DER of 12 $kgCO_{2e}/m^2/yr$ and a new flat would require a DER of 15 $kgCO_{2e}/m^2/yr$.

[Consultation Note: the above figures represent the Department's current preferred option and may vary under final proposals]

[Consultation Note - Regulation 2 of Part A of the Building Regulations defines "Flat" as "a dwelling on one or more storeys forming part of a building from some other part of which it is divided horizontally and includes a maisonette;"]

Fixed building service systems

2.36 Every fixed building service, including its controls and installation, should be at least as efficient as the minimum acceptable efficiency for that particular type of appliance or fitting given in the *Domestic Building Services Compliance Guide.*

This guide recommends that central heating systems should be provided with a minimum of two independent heating zones. It should be noted that each zone should be controlled by a room thermostat, with thermostatic radiator valves on all the radiators in the rooms without a thermostat except bathrooms. For example, one room thermostat could be in the lounge and a second one in a home study. If the floor area is greater than 150 m^2, each zone should in addition have separate timing controls.

2.37 A boiler should have a seasonal efficiency of not less than –

(a) 88% (SEDBUK 2009) or 90% (SEDBUK 2005) if fired by oil, mains gas or LPG; or

(b) 86% (SEDBUK 2009) or 86% (SEDBUK 2005) if an oil-fired combi boiler.

If the SEDBUK efficiency given in the boiler manufacturer's literature does not state whether it is SEDBUK 2005 or SEDBUK 2009, it should be assumed to be SEDBUK 2005.

2.38 The efficiency claimed for the fixed building service should be based on the appropriate test standard given in the *Domestic Building Services Compliance Guide* and the test data should be certified by an appropriate independent body.

Where a particular technology is not covered by this guide, it should be demonstrated that the proposed technology has a performance

that is equivalent to a reference system of the same type whose details are given in this guide.

CRITERION 3 – LIMITING THE EFFECTS OF SOLAR GAINS

2.39 Provisions should be made to limit high internal temperatures due to excessive solar gains. This can be achieved by an appropriate combination of window size and orientation, solar protection through shading and other solar control measures, ventilation (day and night) and high thermal capacity. Where ventilation is provided using a balanced mechanical system, consideration should be given to providing a summer bypass function during warm weather (or allow the dwelling to operate via natural ventilation) so that the ventilation is more effective in reducing overheating.

2.40 SAP 2009 Appendix P contains a procedure to enable designers to check whether solar gains are excessive. The designer should ensure that the calculation does not indicate a high risk of high internal temperatures. This assessment should be done whether or not the dwelling has mechanical cooling. Where the dwelling has mechanical cooling the assessment should be based on the design without the cooling system operating but with a realistic assumption about the effective air change rate through openable windows.

2.41 When seeking to limit solar gains consideration should be given to the provision of adequate levels of daylight. BS 8206-2 gives guidance on maintaining adequate levels of daylight.

The Building Regulations do not require any minimum daylighting provisions. However, reducing window area produces conflicting impacts on the predicted CO_2 emissions: reduced solar gains but increased use of internal lighting. As a general guide, if the area of glazing is significantly less than 20% of the total floor area, some parts of the dwelling may have poor levels of daylight resulting in the increased use of electric lighting.

CRITERION 4 – QUALITY OF CONSTRUCTION AND COMMISSIONING

General

2.42 Every dwelling should be constructed such that the thermal and air permeability properties of the building envelope and the fixed building services and controls achieve a calculated Dwelling carbon dioxide Emission Rate (DER) ~~no greater~~ less than the Target carbon dioxide Emission Rate (TER) by the margin provided in paragraph 2.35A.

As stated in paragraph 2.21, a recalculation of the DER is required to be given to the district council not more than 5 days after completion of the dwelling taking into account any changes in performance between design and construction and the achieved air permeability and to demonstrate that the DER for the dwelling as constructed ~~meets~~ has bettered its TER by the margin provided in paragraph 2.35A.

Building envelope

2.43 The building envelope should be constructed to a reasonable standard such that the insulation is reasonably continuous over the

whole building envelope and the actual air permeability is within the set limits.

Party walls separating dwellings and other thermal bypasses

2.44 ~~Contrary to previous assumptions,~~ ~~c~~Cavity walls separating dwellings (hereafter referred to as party walls) may not have zero heat loss because a thermal bypass is created where there is air movement in the cavity. ~~A party wall with an unfilled cavity and no effective edge sealing is likely to have a U-value of around 0.5 W/m^2.K.~~

~~2.45 Where outside air is able to flow into a party wall a cold zone is created which results in heat flux through the wall sections on both sides of the cavity. The extent of air flow and heat flux depends on external conditions such as wind and temperature and on the setting up of a ventilation stack effect caused by the warmed air rising in the cavity to be replaced by cooler air drawn in from outside. The air movements involved can be significant and, if measures are not taken to restrict them, the resulting heat losses can be large.~~

~~2.46 The heat loss can be reduced by introducing measures that restrict air flow into the cavity such as by effectively sealing around all exposed edges of the cavity in line with the insulating layers in abutting elements. Alternatively, the heat loss can be prevented by effectively sealing all exposed edges of the cavity in line with the insulating layers in abutting elements in combination with fully filling the cavity with insulation~~.

Fully filling the cavity may have implications for sound transmission through the party wall.

2.47 When calculating the DER for a dwelling, the appropriate party wall U-value should be taken from Table 2.3 ~~unless independent scientific field evidence can be produced to support an alternative U-value~~.

2.48 Where edge sealing is adopted to address the party wall bypass it is essential that the edge sealing is effective in restricting air flow into the cavity and that it is aligned with the thermal envelope. Sealing is required at the top, the bottom and vertically. Although effective edge sealing may be incorporated as part of a cavity barrier which is provided as a fire stop, a cavity barrier on its own may not be effective in restricting air flow into the cavity. ~~Therefore in~~ In order to use the reduced cavity wall U-values in Table 2.3 (0.2 or 0.0 W/m^2.K) it will be necessary to demonstrate that the design adopted is likely to be robust under normal site conditions.

For example, in a room-in-the-roof design, the insulation layer is likely to follow the sloping roof to a horizontal ceiling and then continue at ceiling level. In such a case it is important that the party wall cavity seal follows the line of the insulation in the sloping roof and horizontal ceiling sections. In the case of flats, the sealing system should follow the line of party floors and other party structures as well as the main thermal envelope.

Table 2.3 U-values to be used for party walls(1) (W/m².K)	
Type of party wall(1)	**U-value**
Solid	0.00
Unfilled cavity with effective edge sealing around all exposed edges and in line with insulation layers in abutting elements	0.20
Fully filled cavity with effective edge sealing around all exposed edges and in line with insulation layers in abutting elements	0.00

Note:

(1) These U-values only apply to the separating walls between dwellings and not to thermal elements such as walls separating a dwelling from the unheated common area in buildings with multiple dwellings.

2.49 In considering heat losses via party walls it is important to be aware that wherever the wall penetrates an insulation layer, such as when the blockwork of a masonry party wall penetrates insulation at ceiling level, a thermal bridge is likely to occur. This will be the case even when the party wall U-value is zero. The evaluation of thermal bridges should ensure that any bridging at the party wall is taken into account along with other thermal bridges.

2.50 It is important also to be satisfied that any solution to the party wall bypass does not contravene other parts of the regulations, in particular Part G (Resistance to the passage of sound) and Part E (Fire safety).

Thermal bridges

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

2.52 To determine the value for heat loss arising from non-repeating thermal bridging for the proposed dwelling, designers should identify the presence of junctions listed in Appendix K of SAP 2009 and assign Ψ (psi) values to each junction based upon the following options –:

a) input of default Ψ values for each junction listed within the default column of Appendix K of SAP 2009;

b) where construction of a junction follows substantiated approved design details, published by a government or a third party accredited source (such as BRE *Certified Thermal Details and Products Scheme*), input Ψ values of the relevant junction from that document. Where this option is used, the U-value of each thermal element should be within + or – 20% of the values indicated on the detail for any given location. Reference should also be made to any other relevant supporting sections of the document, such as the relevant introductions and principles, to ensure correct application;

c) input of Ψ values calculated by a person with suitable expertise and experience following the guidance set out in BRE Report BR 497 *Conventions for calculating linear thermal transmittance and temperature factors*. In these cases, it should be demonstrated

that the specified details achieve a temperature factor that is no worse than the performance given in BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings*. Evidence of suitable expertise and experience for calculating linear thermal transmittance would be to demonstrate that the person has been trained in the software used to carry out the calculation, has applied that model to the example calculations set out in BR 497 and has achieved results that are within the stated tolerances.

2.53 The approaches above are not mutually exclusive. For example, a designer could use Appendix K defaults for the majority of the junctions, but use a calculated bespoke detail at a window head. Where design details via paragraph 2.52 (b) or (c) are used for some, but not all junctions, the linear thermal transmittance values in the 'default' column of Table K1 in SAP 2009 should be used for the other junctions.

2.54 In support of the approaches given in paragraphs 2.52 (b) and (c), the person carrying out the work should demonstrate that an appropriate system of site inspection is in place to ensure that the construction processes achieve the required standards of consistency.

2.55 An alternative option to paragraph 2.52 is to accept a conservative default Y-value of 0.15 W/(m^{2}K). This applies a 15% penalty to the U-values of elements, rather than calculate linear transmittance values for each construction joint in the DER rate calculation.

2.56 The effect of using linear transmittance values that are poorer than those in the notional dwelling specification should be compensated for by improved standards elsewhere in the dwelling design. When default linear transmittance values from Table K1 in SAP 2009 are used for the majority of the construction joints in a dwelling, or when the conservative default Y-value is used, the notional dwelling values elsewhere in the design will require significant improvement to meet the TER and the betterment required by paragraph 2.35A.

~~Significant reductions in thermal performance can occur where the air barrier and the insulation layer are not in contact with one another and there is a cavity between them that is subject to air movement. There is not a problem where the space between the air barrier and the insulation layer is filled with solid material such as in a masonry wall.~~

~~2.53 Where calculated in support of the approaches given in paragraphs 2.55 and 2.62, linear thermal transmittances and temperature factors should be calculated using the methods and conventions given in BRE Report BR 497 *Conventions for calculating linear thermal transmittance and temperature factors*. It should be demonstrated that the specified details achieve a temperature factor that is no worse than the performance given in BRE Information Paper IP 1/06 *Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings*.~~

~~2.54 Similarly, in support of the approaches given in paragraphs 2.55 and 2.56, the person carrying out the work should demonstrate that an appropriate system of site inspection is in place to ensure that the construction processes achieve the required standards of consistency.~~

~~Dwellings constructed to quality assured accredited construction details~~

~~2.55 Where a dwelling is to be constructed using quality assured accredited construction details the calculated linear thermal transmittance can be used directly in the calculation of the DER.~~

~~Schemes that provide such construction details also accredit and quality assure the calculation of the linear thermal transmittance, accredit the details in terms of buildability and have an associated quality assurance regime that inspects a sample of sites to confirm that the details are being used correctly.~~

~~Dwellings NOT constructed to quality assured accredited construction details~~

~~2.56 Where a dwelling is constructed to details that have NOT been subject to independent quality assurance and accreditation, the linear thermal transmittance should be calculated by a person who has suitable expertise and experience in using the methods and conventions given in BR 497. This value should then be used in the calculation of the DER. When following this route a process flow sequence should be given to the district council to show the way in which the relevant detail should be constructed.~~

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

~~2.57 Where the dwelling is constructed to unaccredited details, with no specific quantification of the thermal bridge values, a conservative default y-value of 0.15 should be used in the calculation of the DER.~~

~~2.58 The approaches given in paragraphs 2.56 and 2.57 are not mutually exclusive. For example, a person carrying out the work may use the quality assured accredited construction detail approach for the majority of junctions, but use a bespoke detail for a window head.~~

Air permeability and pressure testing

2.59 The procedure for air pressure testing is given in the Air Tightness Testing and Measurement Association (ATTMA) publication *Measuring air permeability of building envelopes (dwellings).* The manner approved for recording the results and the data on which they are based is given in Section 4 of that document. Trickle ventilators should be temporarily sealed rather than just closed.

2.60 The district council should be provided with evidence that the test equipment has been calibrated within the previous 12 months using a UKAS accredited facility and that the tests have been carried out by a person who has received appropriate training and who is registered to test the specific class of building concerned.

2.61 ~~It would not be reasonable to test all dwellings in a development.~~

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

2.62 On each development, an air pressure test should be carried out on three units of each dwelling type or 50% of all instances of that dwelling type, ~~whichever is less~~; and at least one of each type should be tested. The dwellings to be tested should be taken from the first completed batch of units of each dwelling type to confirm the robustness of the designs and the construction procedures.

2.63 Each block of flats should be treated as a separate development irrespective of the number of blocks of flats on the site.

2.64 The dwellings selected for test should be chosen by the district council in consultation with the pressure tester. They should be selected so that about half of the tests on each dwelling type are carried out during the construction of the first 25% of the dwellings of that type. All tests on dwellings in the sample should be reported to the district council including any test failures (see paragraphs 2.65 to 2.68).

Demonstrating air permeability compliance

2.65 Compliance would be demonstrated where –

(a) the measured air permeability is not greater than 10 $m^3/(h.m^2)$ at 50 Pa; and

(b) the DER, calculated on completion using the measured air permeability, ~~is not greater than~~ betters the TER by the margin provided in paragraph 2.35A.

2.66 The person carrying out the work is required to give, not more than 5 days after completion of the testing, a notice in writing to the district council stating the result of the air pressure test.

2.67 Where a dwelling fails to achieve the provisions of paragraph 2.65, remedial measures should be carried out such that the dwelling complies with the provisions of paragraph 2.65.

If the measured air permeability is greater than the design air permeability but less than the limiting value of 10 $m^3/(h.m^2)$ then air-tightness remediation and/or other improvements may be required to achieve the TER. ~~This means that the person carrying out the works should not claim a design air permeability better than 10 $m^3/(h.m^2)$ unless they are confident of achieving the improved value.~~

2.68 In addition to the remedial work on the dwelling that failed to achieve its design air permeability –

(a) one additional dwelling of the same type should be tested to increase the overall sample size; and

(b) other dwellings of the same dwelling type that have not been tested should be examined and, where appropriate, similar remedial measures should be applied.

Alternative to pressure testing on small developments

2.69 Where a development contains not more than two dwellings, the developer may avoid pressure testing by

~~(a)~~ demonstrating that a similar dwelling constructed by the same builder in Northern Ireland within the preceding 12 month period had been pressure tested and had achieved its design air permeability.~~; or~~

~~(b) using a value of 15 $m^3/(h.m^2)$ at 50 Pa for the air permeability when calculating the DER, in which case compensating measures will be necessary to achieve the TER.~~

Commissioning of fixed building services

2.70 The fixed building services should be commissioned by testing and adjustment as necessary to ensure that, for the purposes of the conservation of fuel and power, the system and its controls are handed over in efficient working order.

2.71 It would be useful to prepare a Commissioning Plan identifying the fixed building services that need to be tested and the tests that will be carried out. This Commissioning Plan should be sent to the district council at plans submission stage to enable the district council to check the commissioning as it is carried out.

The use of the templates in the BSRIA *Model Commissioning Plan* provides a means of documenting the commissioning process in an appropriate manner.

2.72 Some fixed building services will not need to be commissioned. With some systems adjustment is not possible because the only controls are “on/off” switches. In some other cases commissioning would be possible but would have no effect on energy use. Fixed building services that do not require commissioning should be identified in the Commissioning Plan and the reason for not requiring commissioning should be stated.

2.73 Where commissioning is carried out it should be done in accordance with the following procedures –

(a) for heating and hot water systems the procedures given in the *Domestic Building Services Compliance Guide*; and

(b) for ventilation systems the procedures given in the *Domestic Ventilation Compliance Guide*.

2.74 A notice in writing confirming that all fixed building services have been properly commissioned is required to be given to the building owner not more than 5 days after completion of the commissioning. The notice should be signed by a suitably qualified person.

The notice should confirm that the Commissioning Plan has been followed and that every system has been inspected in an appropriate sequence and to a reasonable standard and that the test results confirm that performance is reasonably in accordance with the design requirements.

The district council is required to be notified in writing that the provision in paragraph 2.74 has been met.

CRITERION 5 – OPERATING AND MAINTENANCE INSTRUCTIONS

2.75 The person carrying out the work shall give, not more than 5 days after completion of the work, a notice in writing to the building owner giving sufficient information, including operational and maintenance requirements, to enable the dwelling and its fixed building services to be operated and maintained in an energy efficient manner. The instructions should be

directly related to the specific system installed in the dwelling and should be readily understandable by the occupier. They should include any relevant information regarding non-export connection considerations, see paragraph 2.16D. They should be in a durable format that can be kept and referred to over the service life of the system.

2.76 The district council is required to be notified in writing that the provision in paragraph 2.75 has been met.

2.77 Without compromising health and safety requirements, the instructions should explain to the occupier of the dwelling how to operate the systems efficiently. These should include –

(a) how to make adjustments to the timing and temperature control settings; and

(b) what routine maintenance is necessary to enable the systems to be maintained at a reasonable efficiency throughout their service life.

2.78 The TER and DER for the dwelling should be included with the operating and maintenance instructions together with the data used to calculate them.

This should include an electronic copy of the TER/DER data input file for the dwelling to facilitate any future analysis that may be required by the owner when altering or improving the dwelling.

Section 3 Existing dwellings

GENERAL

Types of work covered by this section

3.1 This Section gives provisions for altering or extending a dwelling, creating a dwelling through a material change of use or where there is a change of energy status.

3.2 This Section gives guidance where one or more of the following building works are carried out –

(a) the construction of an extension (see paragraphs 3.6 to 3.18);

(b) where a dwelling is created through a material change of use (see paragraphs 3.19 to 3.26);

(c) where there is a change of energy status (see paragraphs 3.19 to 3.28;

(d) the provision or extension of a controlled service (see paragraphs 3.29 to 3.40);

(e) the provision or extension of a controlled fitting (see paragraphs 3.41 to 3.48);

(f) the replacement or renovation of a thermal element (see paragraphs 3.49 to 3.60); and

(g) consequential improvements (see paragraphs 3.61 to 3.63).

Dwellings which are protected buildings and those that have historic or architectural merit

Protected buildings

3.2A Building work to an existing dwelling is exempt from the energy efficiency requirements (i.e. regulations 39, 40, 41, 43, 43A, 43B and 47 of the Building Regulations) if the dwelling is a protected building and where compliance with the energy efficiency requirements would unacceptably alter its character or appearance.

The case for a protected building to be exempt from the energy efficiency requirements of the building regulations must be supported by evidence e.g. by restrictions imposed by the Planning ~~Service~~ Authority, advice from ~~the NIEA~~ Department for Communities Historic Environment Division, advice from a qualified conservation specialist, etc.

A protected building is defined in the Building Regulations (NI) Order to mean –

(a) a listed building within the meaning of the Planning (Northern Ireland) ~~Order 1991~~ Act 2011; and

(b) buildings situated in conservation areas within the meaning of that ~~Order~~ Act.

In the case where a protected building is not exempt from the energy efficiency requirements of Part F guidance is given in paragraphs 3.4 and 3.5.

Buildings of historic or architectural merit

~~3.3~~ ~~Special considerations may apply where the building to which the work is to be carried out has historic or architectural merit and compliance with Part F of the Building Regulations would unacceptably alter the character or appearance of the building.~~

3.3 Special considerations may apply where the building to which the work is to be carried out is not a protected building but has historic or architectural merit and compliance with the energy efficiency requirements of part F would unacceptably alter the character or appearance of the building.

3.4 When undertaking work to or in connection with a building of historic or architectural merit, the aim should be to follow the guidance in this Technical Booklet to the extent that it is practicable. Particular issues in relation to work to buildings that warrant sympathetic treatment and where specialist advice from conservation experts would be beneficial include –

(a) restoring the historic character of a building that has been subject to inappropriate alteration (e.g. replacement windows, doors and rooflights);

(b) rebuilding a building (e.g. following a fire or filling in a gap site in an historic terrace); and

(c) making provisions for the fabric of historic buildings to "breathe" to control moisture and long term decay problems.

3.5 The guidance given in the DOE Northern Ireland Environment Agency (NIEA): Built Heritage publication "Historic buildings and energy efficiency. A guide to Part F of the Northern Ireland Building Regulations" should be taken into account in determining appropriate energy efficiency improvements.

Electricity generated by renewable technologies

3.5A Where a renewable generation technology is installed in an existing dwelling, the relevant provisions of paragraph 2.16A-2.16F should apply.

EXTENSIONS

General

3.6 Where a dwelling is extended there are three approaches –

(a) the Standards Based Approach (see paragraphs 3.8 to 3.11);

(b) the Calculated Trade-off Approach (see paragraph 3.12); or

(c) the Equivalent Carbon Target Approach (see paragraphs 3.13 and 3.14).

3.7 The Standards Based Approach is restrictive. The alternative approaches are more flexible and allow some elements of the design to be relaxed through compensating measures elsewhere.

Standards Based Approach

Fabric standards

3.8 An extension to a dwelling should achieve the following performance standards –

(a) area of glazing that comply with paragraph 3.9;

(b) doors, windows, roof windows and rooflights that meet the standards given in paragraphs 3.41 to 3.48;

(c) newly constructed thermal elements that meet the standards given in paragraphs 3.49 to 3.54; and

(d) existing opaque fabric that becomes part of the thermal envelope, where previously it was not, that meets the standards given in paragraphs 3.59 to 3.60.

Areas of windows, roof windows, rooflights and doors

3.9 The total area of windows, roof windows, rooflights and doors in an extension should be limited so that it does not exceed the sum of –

(a) 25% of the floor area of the extension; plus

(b) the area of any windows, roof windows, rooflights or doors which, as a result of the extension, no longer exist or are no longer exposed.

Note – As a general guide, if the area of glazing is significantly less than 20% of the total floor area, some parts of the extension and especially the part of the dwelling it covers may have poor levels of daylight resulting in the increased use of electric lighting.

3.10 Areas of glazing greater than 25% may be acceptable, especially where this is required to make the extension consistent with the external appearance or character of the building being extended. In such cases, compensating measures should be provided to make up for the otherwise increased heat loss.

Fixed building services

3.11 Where a fixed building service is provided or extended as part of constructing the extension, it should comply with the guidance given in paragraphs 3.29 to 3.40.

Calculated Trade-off Approach

3.12 The fabric standards referred to in paragraph 3.8 and the glazed areas given in paragraph 3.9 may be varied provided that –

(a) the area-weighted U-value of all the elements in the extension is no greater than that of an extension of the same shape and size that complies with the U-value standards referred to in paragraph 3.8 and the glazed areas standards in paragraph 3.9; and

(b) any fixed building service provided or extended as part of constructing the extension should comply with the standards given in paragraphs 3.29 to 3.40.

The average area-weighted U-value is calculated using the following formula –

$$U_{av} = \frac{(U_1 \times A_1) + (U_2 \times A_2) + (U_3 \times A_3) + \ldots\ldots\ldots}{A_1 + A_2 + A_3 + \ldots\ldots\ldots}$$

where A is the area and U is the U-value of each particular thermal element.

Equivalent Carbon Target Approach

3.13 SAP should be used to demonstrate that the calculated carbon dioxide emission rate from the existing dwelling with its proposed extension is no greater than for the dwelling with a notional extension of the same shape and size complying with the standards referred to in paragraphs 3.8 to 3.11. The glazed areas in the notional extension should conform with paragraph 3.9 with the door area set equal to the door area of the proposed extension and with the remainder of the openings being regarded as windows. The procedures in SAP Appendix S should be used to estimate the performance of the elements of the existing building that are unknown.

3.14 Where upgrades to the existing fabric of the original dwelling are proposed to compensate for lower performance in the extension, those parts of the existing fabric should be treated as retained thermal elements and as such should be upgraded to the standards given in Table 3.3 later in this Section.

Where it is proposed to upgrade the existing dwelling, the standards given in this Section are cost-effective and should be implemented in full. Because they are cost effective, consideration should be given to implementing them even if the improvement is greater than required to achieve compliance. In some cases, therefore, the standard of the extended dwelling may be better than that required by paragraph 3.13. Paragraph 3.14 sets limits on design flexibility and ensures that no cost effective improvement opportunities are traded away.

Highly glazed extensions

Conservatories exempt from the Building Regulations

3.15 Some conservatories built as extensions are exempt from the Building Regulations – see Class 8 of Schedule 2 to the Building Regulations.

3.16 Where a previously exempt conservatory becomes no longer exempt and energy is used to condition the indoor climate this is a change of energy status and the guidance in paragraphs 3.27 and 3.28 should be followed.

Conservatories, sun-rooms and other highly glazed spaces

3.17 Where a dwelling is extended by a non-exempt conservatory or by a sun room or other highly glazed spaces, the extension should have –

(a) thermal separation;

(b) new controlled fittings that comply with the guidance in paragraphs 3.41 to 3.48;

(c) no limit on the area of glazing (i.e. paragraph 3.9 does not apply);

(d) new thermal elements that comply with the guidance in paragraphs 3.50 and 3.54;

(e) retained thermal elements, if any, that comply with the guidance in paragraphs 3.59 and 3.60; and

(f) where the extension is heated or cooled by a fixed building service either taken from the main system or provided solely for the extension, independent temperature and on/off controls.

3.18 Alternatively, the extension may be constructed in accordance with one of the approaches given in paragraph 3.6.

MATERIAL CHANGE OF USE OR CHANGE OF ENERGY STATUS

General

3.19 Where there is a material change of use to create a dwelling or a change of energy status to part of a dwelling, there are two approaches –

(a) the Standards Based Approach; or

(b) the Equivalent Carbon Target Approach.

3.20 Where a previously thermally unconditioned part of a dwelling is to be conditioned this is a change of energy status.

Standards Based Approach

Common provisions

3.21 Where the work involves the provision of a new or replacement thermal element it should comply with the provisions in paragraphs 3.50 to 3.54.

3.22 Where a thermal element is to be retained, it should comply with the provisions of paragraphs 3.59 to 3.60. This guidance also applies to an existing element that becomes part of the thermal envelope of the building where previously it was not.

3.23 Where controlled fittings or services are being provided or extended, they should comply with the provisions of paragraphs 3.29 to 3.48.

3.24 Where any existing window (including roof windows or rooflights) or door that separates a conditioned space from an unconditioned space (or the external environment) has a U-value greater than 3.3 W/m^2.K it should be replaced in accordance with the provisions given in paragraphs 3.41 to 3.48.

Additional provision for a material change of use

3.25 In a dwelling newly created by a material change of use, where the area of glazing is more than 25% of the total floor area of the dwelling, either the area of glazing should be reduced to no greater than 25%, or the larger area should be compensated for using the procedure described in paragraph 3.26.

Equivalent Carbon Target Approach

3.26 SAP may be used to demonstrate that the carbon dioxide emission rate from the dwelling as it will be constructed is no greater than that of a notional dwelling of the same shape and size complying with the Standards Based Approach.

This procedure may also be applied to all the dwellings in the building such that the total carbon dioxide emissions from all the dwellings should not be greater than if each individual dwelling complied with the Standards Based Approach.

Previously exempt conservatories and porches

3.27 Where a previously exempt conservatory or porch is no longer exempt and energy is used to condition the indoor climate this is a change of energy status. This is the case where –

(a) the thermal performance of the dwelling is not retained (e.g. if any part of the thermal separation between the dwelling and the extension is removed and not replaced);

(b) the dwelling's heating or cooling system is extended into the extension; or

(c) a fixed combustion appliance or a fixed cooling appliance is installed in the extension.

3.28 In such cases, the previously exempt conservatory or porch should have –

(a) controlled fittings whose performance is no worse than that given in Table 3.1;

(b) thermal elements that have U-values no greater than that given in Table 3.2; and

(c) where the conservatory or porch is heated or cooled, independent temperature and on/off controls.

Where any of the above does not meet these standards it should be replaced or upgraded. Alternatively compensating provisions should be made in accordance with Equivalent Carbon Target Approach in paragraph 3.26.

CONTROLLED SERVICES

General

3.29 Where the work involves the provision, replacement or extension of a fixed building service, the service should be provided and installed in accordance with the provisions and standards given in the *Domestic Building Services Compliance Guide.*

3.30 A boiler should have a seasonal efficiency of not less than –

(a) 88% (SEDBUK 2009) or 90% (SEDBUK 2005) if fired by oil, mains gas or LPG; or

(b) 86% (SEDBUK 2009) or 86% (SEDBUK 2005) if an oil-fired combi boiler.

3.31 When replacing an existing appliance, the efficiency of the replacement appliance should be not less than that stated in paragraph 3.30 and not more than two percentage points lower than the efficiency of the appliance being replaced, whichever is the greater. Where the replacement involves a fuel switch the relative carbon emissions associated with the new and existing fuels should be considered when assessing the reasonableness of the proposed new appliance. These assessments should be made in accordance with the procedures given in the *Domestic Building Services Compliance Guide.*

3.32 In exceptional circumstances, where the CLG Guide to condensing boiler installation assessment procedure for dwellings shows that the installation of a non-condensing boiler is appropriate, the seasonal efficiency of the boiler should be not less than –

(a) 84% (SEDBUK 2009) or 85% (SEDBUK 2005) if an oil fired regular boiler;

(b) 78% (SEDBUK 2009 or SEDBUK 2005) if a mains gas or LPG fired boiler; or

(c) 82% (SEDBUK 2009 or SEDBUK 2005) if an oil fired combi boiler.

3.33 If the SEDBUK efficiency given in the boiler manufacturer's literature does not state whether it is SEDBUK 2005 or SEDBUK 2009, it should be assumed to be SEDBUK 2005.

3.34 The efficiency claimed for the fixed building service should be based on the appropriate test standard given in the *Domestic Building Services Compliance Guide* and the test data should be independently certified by an accredited body.

Where a particular technology is not covered by this guide, it should be demonstrated that the proposed technology has a performance that is equivalent to a reference system of the same type whose details are given in this guide.

3.35 Where a renewable energy generator attached to a building (such as a wind turbine or photovoltaic array) is being replaced, the new system should have an electrical output that is not less than that of the original installation.

3.36 When replacing a heating appliance, consideration should be given to connecting to any existing local heat networks. Where the work involves pipework changes, it would be advisable to provide capped off connections to facilitate a link up to any local heat network that becomes available in the future.

Commissioning of fixed building services

3.37 The fixed building services should be commissioned by testing and adjustment as necessary to ensure that they use no more fuel and power than is reasonable in the circumstances.

3.38 It would be useful to prepare a Commissioning Plan identifying the fixed building services that need to be tested and the tests that will be carried out. This Commissioning Plan should be sent to the district council at plans submission stage to enable the district council to check the commissioning as it is carried out.

Some fixed building services will not need to be commissioned. With some systems adjustment is not possible because the only controls are “on/off” switches. In other cases commissioning would be possible but would have no effect on energy use. Fixed building services that do not require commissioning should be identified in the Commissioning Plan and the reason for not requiring commissioning should be stated.

3.39 Where commissioning is carried out it should be done in accordance with the following procedures –

(a) for heating and hot water systems the procedures given in the *Domestic Building Services Compliance Guide*; and

(b) for ventilation systems the procedures given in the *Domestic Ventilation Compliance Guide*.

3.40 A notice in writing confirming that all fixed building services have been properly commissioned is required to be given to the district council and the building owner not more than 5 days after completion of the commissioning works. The notice should be signed by a suitably qualified person.

The notice should confirm that the Commissioning Plan has been followed and that every system has been inspected in an appropriate sequence and to a reasonable standard and that the test results confirm that the performance is reasonably in accordance with the design requirements.

Failure to provide the commissioning notice may mean that the district council is unable to issue a completion certificate.

CONTROLLED FITTINGS

General

3.41 The term "controlled fitting" in relation to a window, roof window, rooflight or door means the unit as a whole (i.e. it includes the frame). Consequently, the replacement of a broken window pane is not the provision of a controlled fitting.

3.42 Where windows, roof windows, rooflights or doors are to be provided, they should be draught proofed units whose area-weighted average performance should be no worse than that given in Table 3.1. When replacing controlled fittings, insulated cavity closers should be provided where appropriate.

3.43 Where, because of the need to maintain the external appearance of a building, replacement windows are unable to meet the standards given in Table 3.1, the replacement windows should have a centre pane U-value of not more than 1.2 W/m^2.K. Alternatively, single glazing may be used in combination with low-E secondary glazing with the weather stripping on the secondary glazing to minimise condensation risk between the primary and secondary glazing.

Table 3.1 Standards for controlled fittings

Fitting	Standard
Window, roof window or rooflight	WER Band C or better (see paragraph 3.46); or U-value = 1.6 W/m^2.K
Doors with > 50% of internal face glazed	U-value = 1.8 W/m^2.K
Other doors	U-value = 1.8 W/m^2.K
Note: Window Energy Rating (WER)	

3.44 U-values should be calculated using the methods and conventions given in BRE Report BR 443 *Conventions for U-value calculations*, and should be based on the whole unit (e.g. in the case of a window, the combined performance of the glazing and frame).

The U-value of windows can be taken as the value for –

(a) the smaller of the two standard windows defined in BS EN 14351-1; or

(b) the standard configuration given in BR 443; or

(c) the specific size and configuration of the actual unit.

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

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

3.46 The Window Energy Rating (WER) is given by the following equation –

$$WER = 196.7 \times \{(1 - f) \times g_{glass}\} - 68.5 \times \{U + (0.0165 \times AL)\}$$

where –

f is the frame factor (i.e. the percentage of the window obscured by frame and gaskets);

g_{glass} is the normal total solar energy transmittance of the glass as determined by BS EN 410;

U is the whole window U-value as given in paragraphs 3.44 to 3.45.

AL is the air leakage through the window in $m^3/(h.m^2)$ at 50 Pa pressure difference based on testing to BS 6375-1.

Note – AL is based on the whole window area, not per unit length of opening light.

The following window rating bands define the window energy rating label –

Band A	WER ≥ 0
Band B	0 > WER ≥ -10
Band C	-10 > WER ≥ -20
Band D	-20 > WER ≥ -30
Band E	-30 > WER ≥ -50
Band F	-50 > WER ≥ -70
Band G	-70 > WER

3.47 As evidence of compliance, a WER declaration from a certification scheme that provides a quality assured process and supporting audit trail from calculating the performance of the window to installation, may be given to the district council.

3.48 Where a window is enlarged or a new window opening is created, the total area of windows, roof windows, rooflights and doors should not exceed 25% of the total floor area of the dwelling unless compensating measures are made elsewhere in the dwelling.

NEW, RENOVATED AND RETAINED THERMAL ELEMENTS

General

3.49 Where thermal elements are newly constructed, replaced or renovated, provision should be made to limit heat gains and losses through those elements.

New thermal elements

3.50 New thermal elements, or thermal elements constructed as replacements for existing elements, should have a U-value not greater than that given in Table 3.2.

Table 3.2 U-values for new thermal elements (W/m^2.K)

Element[1]	U-value[2]
Wall	0.28
Pitched roof with insulation at ceiling level	0.16
Pitched roof with insulation at rafter level	0.18
Flat roof or roof with integral insulation	0.18
Floor	0.22
Swimming pool basin (walls and floor)[3]	0.25

Notes:

(1) "Roof" includes the roof parts of dormer windows and "Wall" includes the wall parts (dormer cheeks) of dormer windows.

(2) Area-weighted average value.

(3) As calculated according to BS EN ISO 13370.

Continuity to limit thermal bridging and air leakage

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

3.52 The building fabric should be constructed to minimise air leakage through the new or replacement parts of the thermal envelope.

3.53 Significant reductions in thermal performance can occur where the air barrier and the insulation layer are not touching and there is a cavity between them that is subject to air movement. There is not a problem where the space between the air barrier and the insulation layer is filled with solid material such as in a masonry wall.

3.54 A reasonable approach to demonstrating compliance with the above would be to adopt the Accredited Construction Details or certified details from a government or a third party accreditation scheme, such as the BRE *Certified Thermal Details and Products Scheme*.

Renovated thermal elements

3.55 Major Renovation means the renovation of a building where more than 25% of the surface area of the building envelope undergoes renovation. When assessing whether the area proportion constitutes a major renovation of a building, the surface area of the whole of the external building envelope should be taken into account i.e. external walls, floor, roof, windows, doors, roof windows and rooflights.

The renovation of a thermal element is defined as "the provision of a new layer to a thermal element or the replacement of an existing layer (other than where a partial replacement layer is provided solely as a means of patch repair to a flat roof) but does not include thin decorative surface finishes". However, ~~only~~ the following renovation works require the thermal element to be upgraded in accordance with paragraphs 3.56 to 3.58 –

(a) cladding or rendering the external surface of a thermal element;

(b) dry lining the internal surface of a thermal element;

(c) stripping down the element to expose the basic structure (brick/blockwork, timber/metal frame, joists, rafters, etc.) and rebuilding; or

(d) replacing the waterproof membrane on a flat roof.

Note – windows and doors are excluded from the definition of a thermal element.

~~3.56~~ ~~When undertaking the renovation of thermal elements, special considerations apply to buildings of historical or architectural value and to buildings of traditional construction that need to "breathe". See paragraphs 3.3 to 3.5.~~

3.56 When undertaking the renovation of thermal elements, special considerations apply to protected buildings, buildings of historic or architectural merit and to buildings of traditional construction that need to "breathe". See paragraphs 3.2A to 3.5.

~~3.57~~ ~~Where more than 50% of the surface area of an individual thermal element or more than 25% of the total building envelope is being renovated (through undertaking an activity listed in paragraph 3.55), the whole of that element should be upgraded to the improved U-value given in column (b) of Table 3.3.~~

~~When assessing this area proportion, the area of the element should be taken as that of the individual element, not the area of all the elements of that type in the building. The area of an element should be taken in the context of whether the element is being renovated from inside or outside. For example, if the renovation involves stripping plaster from the inside of a solid brick wall, the area of the element is the area of the external wall in that room; however, if the renovation is stripping external render the area is the area of the elevation of which that wall is part.~~

~~This means that if all the roofing on the pitched roof of an annex to a dwelling is being stripped down, the area of the element is the roof area of the annex, not the total roof area of the dwelling. Similarly, if the rear wall of a single storey extension was being re-rendered, it should be upgraded to the standards of Table 3.3 column (b), even if it was less than 50% of the total area of the building elevation when viewed from the rear.~~

~~If plaster is being removed from a bedroom wall, the relevant area is the area of the external wall in the room, not the area of the external elevation which contains that wall section. This is because the marginal cost of dry lining with insulated plasterboard rather than plain plasterboard is small.~~

3.57 Where an individual thermal element is being renovated through undertaking an activity listed in paragraph 3.55, and the renovation –

(a) constitutes a major renovation; or

(b) is greater than 50% of the surface of the individual thermal element;

the whole of that thermal element should be upgraded to the improved U-value given in column (b) of Table 3.3.

When assessing this area proportion, the area of the element should be taken as that of the individual element, not the area of all the elements of that type in the building. The area of each individual thermal element should be taken in the context of whether the element is being renovated from inside or outside. For example, if the renovation involves stripping plaster from the inside of a solid brick wall, the area of the element is the area of the external wall in that room; however, if the renovation is stripping external render the area is the area of the elevation of which that wall is part.

This means that if all the roofing on the pitched roof of an annex to a dwelling is being stripped down, the area of the element is the roof area of the annex, not the total roof area of the dwelling. Similarly, if the rear wall of a single storey extension was being re-rendered, it should be upgraded to the standards of Table 3.3 column (b), even if it was less than 50% of the total area of the building elevation when viewed from the rear.

If plaster is being removed from a bedroom wall, the relevant area is the area of the external wall in the room, not the area of the external elevation which contains that wall section. This is because the marginal cost of dry lining with insulated plasterboard rather than plain plasterboard is small.

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.

Table 3.3 Upgrading of renovated or retained thermal elements

Element(1)	**U-value** (W/m^2.K)(2)	
	(a) Threshold	**(b) Upgraded**
Cavity wall – cavity insulation(3)	0.70	0.55
Wall – external or internal insulation(4)	0.70	0.30
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation at or between rafters(5)	0.35	0.18
Flat roof or roof with integral insulation(6)	0.35	0.18
Floors(7)(8)	0.70	0.25

Notes:

(1) "Roof" includes the roof parts of dormer windows, and "Wall" includes the wall parts (dormer cheeks) of dormer windows.

(2) Area-weighted average value.

(3) This applies only in the case of a wall suitable for the installation of cavity insulation. Where this is not the case it should be treated as for "Wall – external or internal insulation".

(4) A lesser provision may be appropriate where meeting such a standard would result in a reduction of more than 5% in the internal floor area of the room bounded by the wall.

(5) A lesser provision may be appropriate where meeting such a standard would create limitations on head room. In such cases, the depth of the insulation plus any required air gap should be at least the depth of the rafters, and the thermal performance of the chosen insulant should be such as to achieve the best practicable U-value.

(6) A lesser provision may be appropriate if there are particular problems associated with the loadbearing capacity of the frame or upstand height.

(7) The U-value of the floor of an extension can be calculated using the exposed perimeter and floor area of the whole enlarged building.

(8) A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.

3.58 Where upgrading to the above standards is not technically or functionally feasible or would not achieve a simple payback of 15 years or less, the element should be upgraded to the best practicable standard that is technically and functionally feasible which can be achieved within a simple payback period of 15 years. Guidance on this approach is given in Appendix C.

Retained thermal elements

3.59 Where an existing thermal element being part of a building subject to a material change of use or a change of energy status, or an existing element becomes part of the thermal envelope where previously it was not, and where it has a U-value greater than the threshold value given in column (a) of Table 3.3, the element should be upgraded to the standard given in column (b) of Table 3.3 provided that this is technically, functionally and economically feasible. A reasonable test of economically feasible is to achieve a simple payback period of 15 years or less.

3.60 Where upgrading to the standards required by the preceding paragraph is not technically, functionally or economically feasible, the element should be upgraded to the best practicable standard that is technically and functionally feasible that can be achieved within a simple payback period of 15 years. Guidance on this approach is given in Appendix C. However, this lesser standard should have a U-value not greater than 0.7 W/m^2.K.

Examples of where a lesser provision than column (b) of Table 3.3 might apply are, where the thickness of the additional insulation would reduce the usable floor area by more than 5%, or where the additional insulation would create difficulties with adjoining floor levels, or where the additional insulation could not be supported by the existing structure.

CONSEQUENTIAL IMPROVEMENTS

General

3.61 Consequential improvements should be made to any existing building having a total useful floor area greater than 1000 m^2, where any of the following apply –

(a) it is extended; or

(b) any fixed building service (other than a renewable energy generator) is installed for the first time; or

(c) an existing fixed building service (other than a renewable energy generator) is increased in capacity.

3.62 Consequential improvements need only be carried out where they are technically, functionally and economically feasible.

3.63 Only a very small number of existing dwellings will exceed 1000 m^2 in size. Where consequential improvements are required, suitable guidance is given in Technical Booklet F2: Conservation of fuel and power in buildings other than dwellings.

OPERATING AND MAINTENANCE INSTRUCTIONS

General

3.64 Not more than 5 days after completion of the work, the owner of the dwelling is required to be given sufficient information about the dwelling, including details of the installed building services and controls, and other details so that the dwelling can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

3.65 The regulations require the district council to be notified in writing that the provision in paragraph 3.64 has been met.

3.66 Where work involves the provision of fixed building services, this information should include operational and maintenance instructions which should be directly related to the specific system installed in the dwelling and should be readily understandable by the occupier. The instructions should be provided in a durable format that can be kept and referred to over the service life of the system.

This provision applies only to the work that has actually been carried out (e.g. if the work involves replacing windows, there is no obligation on the person carrying out this work to provide details on the operation of the heating system).

3.67 Without compromising health and safety requirements, the instructions should explain to the occupier of the dwelling how to operate the systems efficiently. These should include –

(a) how to make adjustments to the timing, temperature and flow control settings; and

(b) what routine maintenance is necessary to enable the systems to be maintained at a reasonable efficiency throughout their

service life.

~~Appendix A Model designs~~

~~A1 The person carrying out the work may prefer to adopt model design solutions rather than develop their own. These model packages of fabric U-values, boiler seasonal efficiencies, window opening allowances, etc. will have been shown to achieve overall compliance within certain parameters.~~

~~The construction industry may develop model designs for this purpose and provisions have been made to register the designs on the internet at "www.modeldesigns.info".~~

~~A2 It will still be necessary to demonstrate compliance with the TER in each individual case by complying with the procedures described in paragraphs 2.17 to 2.26 and to follow the rest of the guidance in this Technical Booklet.~~

[Consultation Note: It is proposed to remove this Appendix- Appendix B and C would be re-numbered accordingly]

Appendix B Reporting evidence of compliance

B1 To facilitate effective communication between the person carrying out the work and the district council, it would be beneficial to adopt a standardised format for presenting the evidence that demonstrates compliance with Part F (see paragraph 2.20).

Other than the CO_2 target, which is mandatory, the other compliance criteria represent reasonable provisions in normal circumstances. In unusual circumstances, alternative limits may represent reasonable provision, but this would have to be demonstrated for that particular case.

B2 ~~Since t~~The data in SAP 2009 and the results they calculate can provide a substantial proportion of the evidence in support of the compliance demonstration. ~~it is anticipated that s~~Software implementations of SAP 2009 will produce ~~this~~ a report as a standard output option, but as further changes are anticipated soon to include other software revisions, some additional manual checks will normally be required. These include –

(a) checking the as-built constructions align with the requirements of paragraphs 2.31-2.34, which provide revised U-values and a glazing area assessment;

(b) confirmation that the air-tightness limit (see paragraph 2.35) has been achieved in all circumstances and that previously acceptable default values of 15$m^3/(h.m^2)$ have not been entered;

(c) where the building is subject to regulation 43B (nearly zero-energy requirements for new buildings), confirmation that the betterment of the TER required in paragraph 2.35A has been achieved; and

In addition, where on-site renewable generating technologies are included in the design, confirmation of the nature of the grid connection should be provided. In cases of a non-export grid connection, a report should be provided in accordance with paragraphs 2.16E and 2.16F.

B3 Two versions of the standardised report should be produced by software implementations of SAP 2009: the first before commencement of works to include the TER/DER calculation plus supporting list of specifications and the second after completion to include the as built TER/DER calculation plus any changes to the list of specifications. The first design stage report and accompanying list of specifications can then be used by the district council to assist checking that what has been designed is actually built. A standardised report should enable the source of the evidence to be indicated, and allow the credentials of those submitting the evidence to be declared.

B4 An important part of demonstrating compliance is to make a clear connection between the product specifications and the data inputs required by the compliance software (e.g. what is the wall construction that delivers the claimed U-value?). Examples as to how compliance software might provide this link are –

(a) by giving each data input a reference code that can be mapped

against a separate submission by the person carrying out the work that details the specification corresponding to each unique reference code in the data input;

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

(c) by including one or more utility programs that derive the data input from the specification (e.g. a U-value calculator that conforms to BR 443 and that calculates the U-value based on the layer thicknesses and conductivities, repeating thermal bridge effects, etc.). Outputs from such a utility program could then automatically generate the type of integrated report described at (b) above. It would also help the district council if the software included a facility to compare the "as designed" and "as constructed" data input files and automatically produce a schedule of changes.

B5 The report should highlight any items whose specification is better than typically expected values. The district council can then give particular attention to such "key features", as their appropriate installation will be critical in achieving the TER. The district council should give particular attention to those aspects where the claimed specification delivers an energy efficiency standard better than that defined in the following schedule.

Parameter	**U-value** ($W/m^2.K$)
Wall	~~0.20~~0.15
Roof	0.13
Floor	~~0.20~~ 0.13
Window/door	~~1.50~~ 1.20
Party wall	0.20
Thermal bridging value	0.04
Design air permeability – 5.00 $m^3/(h.m^2)$ at 50 pa	
Any secondary heating appliance	
Any item involving SAP Appendix Q	
Use of any low carbon or renewable energy technology	
Note: Solutions ~~using electric resistance heating~~ may have to better several of these fabric parameters, particularly if the design does not include an element of renewable energy provision.	

Appendix C Work to thermal element

C1 Where the renovation of an individual thermal element constitutes a major renovation; or amounts to the renovation of more than 50% of the element's surface, an opportunity exists for cost-effective insulation improvements to be undertaken at marginal additional cost.

~~Where work involves the renovation of a thermal element, an opportunity arises for cost-effective insulation improvements at marginal additional cost.~~ This Appendix provides guidance on the cost-effectiveness of insulation measures when applied to the renovation of various types of thermal elements.

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

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

(b) the cost of implementing the measure should be based on prices current at the date the proposals are given to the district council and be confirmed in a report signed by a suitably qualified person;

(c) the annual energy savings should be estimated using an approved energy calculation tool; and

(d) for the purposes of this Technical Booklet, the energy prices that are current at the time of the application to the district council should be used when evaluating the annual energy savings. Current energy prices can be obtained from the Department of Energy and Climate Change (DECC).

C2 Table C1 gives the circumstances and level of performance that should be reasonable in normal circumstances. However, each scheme needs to be considered individually and some flexibility in the application of the standards will be necessary to suit particular cases. Where it is not reasonable in the context of the works project to achieve the performance set out in Table C1 the level of performance achieved should be as close to this as practically possible. Table C1 incorporates, in outline form, examples of construction that would achieve the proposed performance, but designers are free to use any appropriate construction that satisfies the energy performance standard, so long as they do not compromise performance with respect to any other part of the Building Regulations.

C3 When modifying a thermal element (such as insulating a roof space or filling the cavity in a wall) it is essential to consider the technical risks that may arise. For example, condensation is a major risk in insulated roof spaces and roof ventilation may be essential. When filling the cavity in a wall, the main risk is likely to be rain penetration. BR 262 *Thermal insulation: avoiding risks*, gives useful guidance on minimising or avoiding risks due to the provision of thermal insulation.

C4 When undertaking the renovation of thermal elements, special considerations apply to buildings of historical or architectural value and to buildings of traditional construction that need to "breathe" (see paragraphs 3.3 to 3.5).

Table C1 Cost-effective U-value targets when undertaking renovation works to thermal elements

Proposed works	Target U-value W/m².K	Typical construction	Comments (reasonableness, practicability and cost effectiveness)
Pitched roof constructions (Specification of thickness of insulation is based on lambda values (conductivity) of 0.04 W/m.K)			
Renewal of roof covering – no living accommodation in the roof void – existing insulation (if any) at ceiling level. No existing insulation, existing insulation less than 50 mm, in poor condition, and/or likely to be significantly disturbed or removed as part of the planned work	0.16	Provide 270 mm loft insulation such as mineral or cellulose fibre laid between and over the ceiling joists	Impact on boarded walkways or boarded roof spaces. Condensation risks- consider ventilation Impact of new insulation on access to and the insulation of services Consider combustibility of insulation (if relevant) or other fire safety risks
Renewal of roof covering – existing insulation in good condition and will not be significantly disturbed by proposed works. Existing insulation thickness 50 mm or more but less than 100 mm	0.16	Top up insulation to at least 200 mm with insulation such as mineral or cellulose fibre laid between and over the ceiling joists	Impact on boarded walkways or boarded roof spaces. Condensation risks- consider ventilation. Impact of new insulation on access to and the insulation of services Consider combustibility of insulation (if relevant) or other fire safety risks- ref Part E
Renewal of the ceiling immediately below a cold loft space. Existing insulation removed as part of the works	0.16	Provide 270 mm loft insulation such as mineral or cellulose fibre laid between and over the ceiling joists	Impact on boarded walkways or boarded roof spaces. Condensation risks- consider ventilation.. Impact of new insulation on access to and the insulation of services Consider combustibility of insulation (if relevant) or other fire safety risks- ref Part E

Renewal of roof covering – living accommodation in roof space (room-in-the-roof)	0.18	Cold structure – insulation between and below rafters. Warm structure – insulation between and above rafters	Condensation risks. Practical considerations in relation to the thickness of insulation involved Consider combustibility of insulation (if relevant) or other fire safety risks- ref Part E
Dormer window constructions			
Renewal of cladding to side walls	0.30	Insulation (thickness dependent on material) placed between and/or fixed to outside of wall studs. Or fully external to existing structure depending on construction	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C External fire spread and combustibility- ref Part E
Renewal of roof covering	–	Follow guidance on improvement to pitched or flat roofs as appropriate	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C

Table C1 Cost-effective U-value targets when undertaking renovation works to thermal elements (continued)

Proposed works	Target U-value W/m².K	Typical construction	Comments (reasonableness, practicability and cost effectiveness)
Flat roof constructions			
Renewal of roof covering – existing insulation, if any, less than 100 mm, mineral fibre (or equivalent resistance) or in poor condition and likely to be significantly disturbed or removed as part of the planned work	0.18	Warm structure – insulation placed between and over joists as required to achieve the target U-value	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C. Also see BS 6229 for design guidance Consider combustibility of insulation (if relevant) or other fire safety risks- ref Part E
Renewal of the ceiling to flat roof area. Existing insulation removed as part of the works	0.18	Insulation placed between and to underside of joists to achieve target U-value	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C. Also see BS 6229: for design guidance. Where ceiling height would be adversely affected, a lower performance target may be appropriate
Solid wall constructions			

Renewal of internal finish to external wall or applying a finish for the first time	0.30	Dry lining to inner face of wall – insulation between studs fixed to wall to achieve target U-value – thickness dependent on insulation and stud material used Insulated wall board fixed to internal wall surface to achieve the required U-value – thickness dependent on material used	Assess the impact on internal floor area. In general it would be reasonable to accept a reduction of no more than 5% in the area of a room. However, the use of the room and the space requirements for movement and arrangements of fixtures, fittings and furniture should be assessed In situations where acoustic attenuation issues are particularly important (e.g. where insulation is returned at party walls) a less demanding U-value may be more appropriate. In such cases, the U-value target may have to be increased to 0.35 or above depending on the circumstances Assess condensation and other moisture risks and make appropriate provision in accordance with the requirements of Part C. This will ~~usually~~ often require the provision of a vapour control and damp protection to components. Guidance on the risks involved is provided in BR 262 and, on the technical options, in Energy Saving Trust publications. Consider 'breathability' and hydroscopicity of wall construction ref Part C
Renewal of finish or cladding to external wall area or elevation (render or other cladding) or applying a finish or cladding for the first time	0.30	External insulation system with rendered finish or cladding to give required U-value	Assess technical risk and impact of increased wall thickness on adjoining buildings Consider 'breathability' and hydroscopicity of wall construction ref Part C
Ground floor constructions			
Renovation of a solid or suspended floor involving the replacement of screed or a timber floor deck	See comment	Solid floor – replace screed with an insulated floor deck to maintain existing floor level Suspended timber floor – fit insulation between floor joists prior to replacement of floor deck	The cost effectiveness of floor insulation is complicated by the impact of the size and shape of the floor (perimeter/area ratio). In many cases existing un-insulated floor U-values are already relatively low when compared with wall and roof U-values. Where the existing floor U-value is greater than 0.70 W/m^2.K, then the addition of insulation is likely to be cost effective. Analysis shows that the cost benefit curve for the thickness of added insulation is very flat, and so a target U-value of 0.25 W/m^2.K is appropriate subject to other technical constraints (adjoining floor levels, etc.)

Appendix D Publications referred to

British Standards (BS)

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

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

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

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

BS 5250: 2011 Code of practice for control of condensation in buildings.

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

BS 6375-1: 2009 Performance of windows and doors. Classification for weathertightness and guidance on selection and specification.

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

Air Tightness Testing and Measurement Association (ATTMA)

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

Building Research Establishment (BRE)

BR 262 Thermal insulation: avoiding risks, 2001.

BRE Report BR 443 Conventions for U-value calculations, 2006.

BRE Report BR 497 Convention for Calculating Linear Thermal Transmittance and Temperature Factors 2007.

Information Paper IP1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, 2006.

Building Services Research and Information Association (BSRIA)

BSRIA BG 8/2009 Model Commissioning Plan.

Department for Communities and Local Government (CLG)

Accredited Construction Details for Part L.

Domestic Building Services Compliance Guide, 2010.

Domestic Ventilation Compliance Guide, 2010.

Guide to condensing boiler installation assessment procedure for dwellings, 2005.

Department for Energy and Climate Change (DECC)

The Government's Standard Assessment Procedure for Energy Rating of dwellings, SAP 2009.

SEDBUK Boiler Efficiency Database.

Department ~~of the Environment (DOE)~~ for Infrastructure (DfI)

The Planning (Northern Ireland) ~~Order 1991~~ Act 2011.

Energy Saving Trust (EST)

Energy Efficient Glazing – guidance.

Northern Ireland Environment Agency: Built Heritage

Historic Buildings & Energy Efficiency. A guide to Part F of the Northern Ireland Building Regulations.

Other publications

Technical Booklet B: 2012 – Materials and workmanship

Technical Booklet E: 2012 – Fire safety

Technical Booklet K: 2012 – Ventilation

Technical Booklet L: 2012 – Combustion appliances and fuel storage systems

Technical Booklets

The following list comprises the series of Technical Booklets prepared by the Department for the purpose of providing practical guidance with respect to the technical requirements of the Building Regulations (Northern Ireland) 2012 (as amended).

Technical Booklet B	Materials and workmanship
Technical Booklet C	Site preparation and resistance to contaminants and moisture
Technical Booklet D	Structure
Technical Booklet E	Fire safety
Technical Booklet F1	Conservation of fuel and power in dwellings
Technical Booklet F2	Conservation of fuel and power in buildings other than dwellings
Technical Booklet G	Resistance to the passage of sound
Technical Booklet H	Stairs, ramps, guarding and protection from impact
Technical Booklet J	Solid waste in buildings
Technical Booklet K	Ventilation
Technical Booklet L	Combustion appliances and fuel storage systems
Technical Booklet M	Physical infrastructure for high-speed communications networks
Technical Booklet N	Drainage
Technical Booklet P	Sanitary appliances, unvented hot water storage systems and reducing the risk of scalding
Technical Booklet R	Access to and use of buildings
Technical Booklet V	Glazing

Any person who intends to demonstrate compliance with the Building Regulations by following the guidance given in a Technical Booklet is advised to ensure that the guidance is current on the date when the plans are deposited or notice given to the district council.