Introduction

General

This Technical Booklet has been prepared by the Department of Finance and Personnel and provides for certain methods and standards of building which, if followed, will satisfy the requirements of the Building Regulations (Northern Ireland) 2000 ("the Building Regulations").

There is no obligation to follow the methods or comply with the standards set out in this Technical Booklet.

If you prefer you may adopt another way of meeting the requirements of the Building Regulations but you will have to demonstrate that you have satisfied those requirements by other means.

Other regulations

This Technical Booklet relates only to the requirements of regulations F2, F3 and F4. The work will also have to comply with all other relevant Building Regulations.

British Standards and European Technical Specifications

In this introduction and throughout this Technical Booklet any reference to a British Standard shall be construed as a reference to –

(a) a British Standard or British Standard Code of Practice;

(b) a harmonised standard or other relevant standard of a national standards body of any Member State of the European Economic Area;

(c) an international standard recognised for use in any Member State of the European Economic Area;

(d) any appropriate, traditional procedure of manufacture of a Member State of the European Economic Area which has a technical description sufficiently detailed to permit an assessment of the goods or materials for the use specified; or

(e) a European Technical Approval issued in accordance with the Construction Products Directive,

provided that the proposed standard, code of practice, specification, technical description or European Technical Approval provides, in use, equivalent levels of safety, suitability and fitness for purpose as that provided by the British Standard.

Products conforming with a European Council Directive

Any product designed and manufactured to comply with the requirements of a European Council Directive does not have to comply with any other standard or part of a standard, whether British, International or other, which relates to the same characteristic or specific purpose as the EC Directive.

CE marked construction products

Any construction product (within the meaning of the Construction Products Directive) which bears a CE marking shall be treated as if it satisfied the requirements of any appropriate British Board of Agrément Certificate, British Standard or British Standard Code of Practice relating to such a product, where the CE marking relates to the same characteristic or specific purpose as the Certificate, Standard or Code of Practice.

Testing of materials and construction

Where for the purposes of this Technical Booklet testing is carried out it shall be carried out by an appropriate organisation offering suitable and satisfactory evidence of technical and professional competence and independence. This condition shall be satisfied where the testing organisation is accredited in a Member State of the European Economic Area in accordance with the relevant parts of the EN 45000 series of standards for the tests carried out.

Materials and workmanship

Any work to which a requirement of the Building Regulations applies must, in accordance with Part B of the Building Regulations, be carried out with suitable materials and in a workmanlike manner. You can comply with the requirements of Part B by following an appropriate British Standard or you may demonstrate that you have complied with those requirements by other suitable means, such as an acceptable British Board of Agrément Certificate, Quality Assurance Scheme, Independent Certification Scheme or Accredited Laboratory Test Certificate.

References

Any references in this Technical Booklet to a publication shall, unless otherwise stated, be construed as a reference to the edition quoted, together with any amendments, supplements or addenda thereto current at 7 August 2006.

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Section 1 Common items

Definitions

1.1 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 {$m^3/(h \cdot m^2)$} at a pressure difference of 50 Pascals.

Conservatory – a part or extension of a dwelling attached to and having a door giving access from the attached dwelling and having not less than three-quarters of the area of its roof and not less than one-half of the area of its external wall area made of translucent material and which is thermally separated from the dwelling by walls, windows and doors having U-values not greater than and draught-proofing provisions not less than those of similar exposed elements elsewhere in the dwelling.

DER – the Dwelling carbon dioxide Emissions Rate measured in kilograms of carbon dioxide per square metre of floor area per year {$kg/(m^2 \cdot year)$}.

Design air permeability – the value for air permeability selected by the designer for calculating the DER.

Dwelling – a house, flat or maisonette which is a self-contained unit designed to be used solely to accommodate a single household.

Dwelling type – for the purposes of airtightness testing, a number of dwellings of the same generic form (detached, semi-detached, end-terrace, mid-terrace, mid-floor flat, ground-floor flat, top-floor flat) where the same construction is used for the main exposed elements. Small variations in floor area do not constitute a different dwelling type.

Envelope area – the total internal area of all wall, floor and ceiling elements that enclose the internal volume subject to an air permeability test. This includes elements below external ground level. Overall internal dimensions shall be used to calculate this area. No subtractions shall be 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 house includes the party wall(s).
The envelope area of a flat in a multiple storey building includes the floors, walls and ceilings to adjacent apartments.

Low or zero carbon energy sources – includes biofuels, micro-hydro, photovoltaics, solar hot water and wind power.

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.

TER – the Target carbon dioxide Emissions Rate measured in kilograms of carbon dioxide per square metre of floor area per year {kg/(m^2·year)}.

General rules

Area of elements

1.2 The area of a building element shall be 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, shall be measured in the plane of the ceiling. The area shall include the areas where internal elements abut the internal surface of the wall, floor or roof.

Area of windows, doors and rooflights

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

Service openings in walls and roofs

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

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

Technical risks

1.6 Building work must satisfy all of the requirements of the building regulations, however the requirements of Part C (Preparation of site and resistance to moisture), Part G (Sound insulation of dwellings), Part K (Ventilation) and Part L (Combustion appliances and fuel storage systems) are particularly interrelated in the whole building approach adopted by this Part.

1.7 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

1.8 U-values shall be calculated in accordance with the methods and conventions given in BRE Report BR 443: “Conventions for U-value calculations”.

Section 2 New dwellings

GENERAL

This Section gives the methodology and limiting values used by the national calculation software (SAP) to calculate the Target carbon dioxide Emissions Rate (TER) and Dwelling carbon dioxide Emissions 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 approved SAP software. The SAP software will automatically flag out-of-range values and check that the DER is equal to or less than the TER as designed.

On completion of the dwelling, details of the dwelling as built must be entered into the software to confirm that the DER for the dwelling as built is equal to or less than the TER to confirm compliance. The software will also generate the SAP Energy Rating Notice required for the dwelling.

Whilst the software covers the calculation aspects of the compliance criteria it will still be necessary to demonstrate that all of the criteria in Section 2 are met.

This Section should be read in conjunction with Section 1 – Common items.

Types of work covered by this Section

2.1 This Section gives provisions for the erection of a new dwelling.

2.2 Section 3 shall apply to work to an existing dwelling or where a dwelling is being created as the result of a material change of use.

2.3 A building containing rooms for residential purposes, such as a nursing home, student accommodation and similar are not considered as dwellings and, in such cases, the provisions in Technical Booklet F2 apply.

2.4 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) it shall be treated as a dwelling if the business part could revert to domestic use.

This would be the case where –

(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.

2.5 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.

Common areas in buildings with multiple dwellings

2.6 The common areas of buildings containing multiple dwellings are not classified as dwellings. These common areas shall –

(a) where they are heated, comply with the provisions of Technical Booklet F2; and

(b) where they are not heated, comply with the provisions of paragraphs 2.26 and 2.27.

Conservatories and other highly glazed spaces

2.7 Where a conservatory is built as part of a new dwelling, the thermal performance of the dwelling shall be assessed excluding the conservatory.

2.8 Where a highly glazed space is not thermally separated from a dwelling it shall be included as an integral part of the dwelling.

TARGET CARBON DIOXIDE EMISSIONS RATE (TER)

2.9 The Target carbon dioxide Emissions Rate (TER) is the minimum acceptable energy performance for new dwellings. It is the target established for the mass of carbon dioxide (CO_2) produced by the building and is given in units of kg per m^2 of floor area per year. This target is for the provision of heating, hot water, ventilation and fixed internal lighting for a standardised household.

2.10 To demonstrate that an acceptable CO_2 emissions rate has been achieved, the dwelling as constructed shall have a calculated Dwelling carbon dioxide Emissions Rate (DER) equal to or less than the TER calculated in accordance with paragraphs 2.13 to 2.17.

2.11 For individual dwellings the emissions rate shall be calculated using approved SAP software.

2.12 The TER and DER shall be calculated using the same SAP software.

CALCULATING THE NOTIONAL CO_2 EMISSIONS AND THE TER

Calculating the notional CO_2 emissions

2.13 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 The Government's Standard Assessment Procedure for Energy Rating of Dwellings (SAP).

2.14 The SAP software will output the CO_2 emissions resulting from –

(a) the provision of ventilation, heating and hot water (C_H), (which shall include the energy used by pumps and fans); and

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

Calculating the Target carbon dioxide Emissions Rate (TER)

2.15 Calculate the Target carbon dioxide Emissions Rate (TER) using the appropriate formula –

For mains gas, renewable energy and solid multi-fuels –

$TER = ((C_H \times \text{fuel factor}) + C_L) \times (1 - \text{improvement factor})$.

For all other fuels –

$TER = ((1.14 \times C_H \times \text{fuel factor}) + C_L) \times (1 - \text{improvement factor})$.

The fuel factor shall be taken from Table 2.1 and the improvement factor shall be 0.2 (i.e. 20%).

2.16 The fuel factor used to calculate the TER shall be derived as follows –

(a) where all heating appliances are served by the same fuel, the fuel used in those appliances;

(b) where the dwelling has more than one heating appliance and these are served by different fuels, the fuel shall be taken to be mains gas if any of the heating appliances are served by mains gas; or in any other circumstances, the fuel used in the main heating system;

(c) where the dwelling is served by a community heating scheme, the principal fuel used by the community heating scheme;

(d) where an appliance is classed as multi-fuel, the multi-fuel factor shall be used, except where the dwelling is in a smoke control zone where the solid mineral fuel figure shall be used.

Table 2.1 Fuel factors

Heating fuel	Fuel factor
Mains gas	1.00
LPG	1.10
Oil	1.17
Grid electricity (for direct acting, storage and electric heat pump systems)	1.47
Solid mineral fuel (1)	1.28
Renewable energy (including bio-fuels such as wood pellets)(1)	1.00
Solid multi-fuel (1)	1.00

Notes –

1 The specific fuel factor shall be used solely for those appliances that can only burn that particular fuel.

Building containing multiple dwellings

2.17 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 –

$$TER_{av} = \frac{(TER_1 \times \text{Floor area}_1) + (TER_2 \times \text{Floor area}_2) + (TER_3 \times \text{Floor area}_3) + ...}{\text{Floor area}_1 + \text{Floor area}_2 + \text{Floor area}_3 + ...}$$

The average TER may be compared against the average DER as calculated in paragraph 2.24.

CRITERION 1 – ACHIEVING THE TER

Calculating the DER for the actual dwelling

2.18 The DER shall be calculated using the same SAP software used to calculate the TER. To demonstrate compliance two calculations of the DER will be required, one at plan submission stage and one on completion.

2.19 Calculate the DER using data from the drawings and specifications for the proposed dwelling as designed. The DER must be equal to or less than the TER.

2.20 The report produced by the SAP software will highlight those features of the design that are critical to the dwelling achieving its TER (see Appendix E).

A copy of this report shall be sent to the district council to facilitate checking of the Building Regulations application.

2.21 On completion of the dwelling, the DER for the dwelling as constructed shall be calculated to demonstrate that the TER has been achieved or bettered. In calculating the DER for the dwelling as constructed the following shall be incorporated;

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

(b) the measured air permeability where applicable, ductwork leakage and fan performances as commissioned.

[See Appendix A which provides a checklist to assist builders/developers in demonstrating compliance with Part F.]

Secondary heating

2.22 When calculating the DER, it shall be assumed that a secondary heating appliance meets part of the space heating demand. The fraction provided by the secondary heating system shall be as defined by SAP for the particular combination of primary heating system and secondary heating appliance.

One of the following secondary heating appliances shall be assumed when calculating the DER –

(a) where a secondary heating appliance is installed, the efficiency of the installed appliance with its appropriate fuel shall 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 shall 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 a gross efficiency of 20%; or

(ii) where there is no gas point, an open multi-fuel fire with a gross efficiency of 37%, unless the dwelling is in a smoke control zone when the fuel shall be taken as smokeless solid mineral fuel; or

(c) where none of the above is provided it shall be assumed that secondary heating is provided by an electric room heater.

Lighting

2.23 In all cases the DER shall be calculated assuming a standard provision of low energy lighting in 30% of fixed lighting fittings.

Buildings containing multiple dwellings

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

(a) each individual dwelling shall have a DER that is equal to or less than its corresponding TER; or

(b) the average DER shall be equal to or less than the average TER. The average DER is the floor area-weighted average of all the individual DERs and shall be calculated in a similar manner to paragraph 2.17.

[When adopting the average DER approach, it will still be necessary to provide the information for each dwelling so that individual energy ratings can be produced.]

Low or zero carbon energy sources

2.25 In certain circumstances, low or zero carbon (LZC) energy sources can make a substantial and cost-effective contribution to meeting the TER. Low carbon systems include heat pumps and combined heat and power (at individual dwelling, block or community levels), and zero carbon systems include biofuels (e.g. wood fuels and oil blends), micro-hydro, photovoltaics, solar hot water and wind power.

[The Department for Communities and Local Government (DCLG) publication “Low or zero carbon energy sources – Strategic guide” describes a range of potential systems and how their contribution to the DER can be assessed.]

U-values

2.26 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 –

(a) column (a) gives the area-weighted average U-value for each element. The area-weighted average is calculated using the following formula –

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

(b) column (b) gives the maximum U-value of any individual element or part of an individual element such as a meter cupboard recess.

Table 2.2 Limiting U-values {W/(m^2·K)}

Element	(a) Area-weighted average U-value	(b) Maximum U-value
Wall	0.35	0.70
Floor	0.25	0.70
Roof	0.25	0.35
Windows, roof windows, rooflights and doors	2.20	3.30

2.27 When comparing against the values in Table 2.2, the U-value of a window, roof window, rooflight or door unit shall be taken as the value for –

(a) the standard configuration given in BRE Report BR 443; or

(b) the particular size and configuration of the actual unit.

In either case, the U-value shall be with the unit in the vertical position.

Where a roof window or rooflight has been assessed in a plane other than the vertical, the U-value shall be modified by making a U-value adjustment in accordance with BR 443: “Conventions for U-value calculations”.

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

Air permeability

2.28 The maximum acceptable air permeability is 10 $m^3/(h \cdot m^2)$ @ 50 Pa (except where paragraph 2.54 applies).

[Information on some ways of achieving an acceptable air permeability is given in the Department for Communities and Local Government (DCLG) publication "Accredited construction details for Part L*".

*Note that "Part L" in the title refers to the part in England & Wales that is equivalent to Part F in Northern Ireland.]

2.29 Where the conditions given in paragraph 2.54 apply, the air permeability may be varied from the value given in paragraph 2.28 provided that compensating provisions are made such that the TER is achieved or bettered.

Minimum acceptable standards for fixed building service systems

Heating and hot water systems

2.30 The heating and hot water system shall have –

(a) in the case of an appliance fired by mains gas or LPG, a boiler with an efficiency of not less than 86%;

(b) in the case of an appliance fired by oil, a boiler with an efficiency of not less than 86% (in the period up to 1 April 2007 a boiler having an efficiency of not less than 82% may be installed provided that compensating provisions are made);

(c) in the case of any other appliance, an appliance with an efficiency not less than that recommended for its type in the Department for Communities and Local Government (DCLG) publication "Domestic Heating Compliance Guide"; and

(d) controls that meet the minimum control requirements given in the DCLG publication "Domestic Heating Compliance Guide" for that particular type of appliance and heat distribution system.

Insulation of pipes, ducts and hot water storage vessels

2.31 Pipes, ducts and hot water storage vessels shall be insulated to standards not less than those given in the DCLG publication "Domestic Heating Compliance Guide".

Mechanical ventilation systems

2.32 Mechanical ventilation systems shall be designed and installed to standards not less than those given in Good Practice Guide GPG 268 and shall also have a specific fan power not greater than, and a heat recovery efficiency not less than, those given in Table 2.3.

[GPG 268 "Energy efficient ventilation in dwellings – a guide to specifiers" also includes recommendations on appropriate air permeability standards for different ventilation strategies.]

Table 2.3 Limiting performance values for mechanical ventilation systems	
System type	**Performance**
Specific Fan Power (SFP) for continuous supply only and continuous extract only	not greater than 0.8 W/(l/s)
SFP for balanced systems	not greater than 2.0 W/(l/s)
Heat recovery efficiency	not less than 66%

Mechanical cooling systems

2.33 Fixed air coolers shall have an energy efficiency classification of not less than Class C in Schedule 3 of the labelling scheme adopted under "The Energy Information (Household Air Conditioners) (No.2) Regulations 2005".

Fixed internal lighting

2.34 Fixed energy efficient light fittings shall be installed in the most frequented areas in a dwelling, and there shall be not less than –

(a) one per 25 m^2 of dwelling floor area (excluding garages) or part thereof; or

(b) one per four light fittings,

whichever is the greater.

A light fitting may contain one or more lamps.

2.35 Light fittings in less frequented areas such as cupboards, storage areas and garages shall not count towards the total. "GIL 20 Low energy domestic lighting" gives recommendations on identifying suitable locations.

2.36 For the purposes of paragraph 2.34 an energy efficient light fitting (including the lamp, control gear and an appropriate housing, reflector, shade or other device for controlling the light output) is a light fitting that can only be fitted with lamps having a luminous efficacy greater than 40 lumens per circuit-Watt.

[Circuit-Watt means the power consumed in lighting circuits by lamps, their associated control gear and power factor correction equipment.]

[Fluorescent and dedicated compact fluorescent light fittings would meet this requirement, but those accommodating GLS tungsten lamps and compact fluorescent lamps (CFLs) with a bayonet cap or Edison screw base, or tungsten halogen lamps would not.]

Fixed external lighting

2.37 Fixed external lighting means lighting permanently fixed to an external surface of the dwelling and under the direct control of the occupant by having an electricity supply from the dwelling.

2.38 External lighting shall –

(a) have a maximum output of 150W per fitting and automatically switch off –

(i) when there is adequate daylight; and

(ii) when not required at night; or

(b) have sockets that can only be fitted with lamps having a luminous efficacy greater than 40 lumens per circuit-Watt.

[Fluorescent and dedicated compact fluorescent light fittings would meet this requirement, but those accommodating GLS tungsten lamps and compact fluorescent lamps with a bayonet cap or Edison screw base, or tungsten halogen lamps would not.]

CRITERION 3 – LIMITING THE EFFECTS OF SOLAR GAINS

2.39 Provisions shall be made to limit internal temperatures due to excessive solar gains. This shall be achieved by an appropriate combination of window size and orientation, solar protection by shading or other solar control measures, ventilation (day and night) and high thermal capacity.

[CE 129 “Reducing overheating – a designers guide” gives recommendations on strategies to limit overheating.]

2.40 SAP contains a procedure to enable designers to check whether solar gains are excessive. The designer shall ensure that the calculation does not indicate a high risk of high internal temperatures during hot weather.

2.41 When seeking to limit solar gains, consideration should be given to the provision of adequate levels of daylighting.

[“BS 8206 - 2:1992 Lighting for buildings. Code of practice for daylighting” gives recommendations on maintaining adequate levels of daylighting.]

CRITERION 4 – QUALITY OF DESIGN, CONSTRUCTION AND COMMISSIONING

2.42 Every dwelling shall be designed and constructed such that the thermal and air permeability properties of the building envelope, and the building services and controls achieve a calculated Dwelling carbon dioxide Emissions Rate (DER) equal to or less than the TER.

Building fabric

2.43 The building fabric shall be constructed such that there are no readily 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.

2.44 The dwelling shall be constructed –

(a) to details given in the Department for Communities and Local Government (DCLG) publication "Accredited construction details for Part L*"; or

(b) to details that give an equivalent level of performance when assessed in accordance with BRE IP 1/06: "Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings".

[*Note that "Part L" in the title refers to the part in England & Wales that is equivalent to Part F in Northern Ireland.]

2.45 The builder shall demonstrate that an appropriate system of site inspection is in place to ensure that the construction standards achieve the required level of consistency. Where the accredited design details approach is adopted (paragraph 2.44(a)), a report shall be provided showing that the construction checklists given in the DCLG publication "Accredited construction details for Part L*" have been completed and show satisfactory results and a copy shall be forwarded to the district council.

[*Note that "Part L" in the title refers to the part in England & Wales that is equivalent to Part F in Northern Ireland.]

Air permeability and air pressure testing

2.46 The DER is calculated using the design air permeability specified by the designer. Where testing is required to demonstrate that the design air permeability has been achieved (see paragraphs 2.48 and 2.49) the dwelling shall be air pressure tested in accordance with the Air Tightness Testing and Measurement Association (ATTMA) publication "Measuring Air Permeability of Building Envelopes". The manner approved for recording the results and the data on which they are based is given in section 4 of that document. The tests shall be carried out by a suitably qualified person such as a tester who is registered with or approved by the British Institute of Non-destructive Testing in respect of pressure testing for the air tightness of buildings.

2.47 A block of flats shall be treated as a separate development irrespective of the number of blocks of flats on the site.

Most larger developments will include many types of unit including terraced (end and centre), semi-detached, flats, etc. and at least one of each type shall be tested to confirm the robustness of the designs and the construction procedures.

Dwellings built to accredited construction details

2.48 On each development built to accredited construction details an air pressure test shall be carried out on a unit of each dwelling type selected by the district council.

Dwellings NOT built to accredited construction details

2.49 Air pressure tests shall be carried out on each dwelling type not built to accredited construction details in the development to the number given in Table 2.4.

2.50 The dwellings selected for test shall be chosen by the district council in consultation with the builder. They shall 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.

Table 2.4 Tests for dwellings NOT built to accredited construction details

Number of dwellings of the dwelling type	Number of dwellings tested of the dwelling type
4 or less	One
More than 4 but not more than 40	Two
More than 40	At least 5% of the dwelling type unless the first 5 dwellings of that type achieve the design air permeability in which case the testing frequency may be reduced to 2%

Demonstrating compliance

2.51 Compliance with the air permeability requirements shall be demonstrated where –

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

(b) the DER on completion, calculated using the measured air permeability, is equal to or less than the TER.

Consequences of failing a pressure test

2.52 Where a dwelling fails to achieve its design air permeability, remedial measures shall be carried out, such that on retest the design air permeability is achieved.

However, in the period up to 31 October 2007, if the initial test result on a dwelling is unsatisfactory, provision shall be made to –

(a) carry out remedial measures such that on re-test a result is achieved that shows either –

(i) an improvement of 75% on the difference between the initial test result and the design air permeability; or

(ii) if more easily achieved, a test result within 15% of the design air permeability; or

(b) revise the TER by substituting the measured air permeability for the value given in Appendix R of SAP and demonstrate that the DER for the building as built is equal to or less than the revised TER.

Example – following an initial failure where the test result is 18.0 and the design air permeability target is 8.0, the revised pass level following remedial works would be –

Using (a)(i);	Using (a)(ii);
18.0 - {0.75 x (18.0 - 8.0) } = 10.5	8 x 1.15 = 9.2

Therefore, option (a)(i) is easier to achieve.

However, if the initial test result is 9.5 it would be less demanding to use the alternative option in (a)(ii). The revised pass level following remedial works would be –

Using (a)(i);	Using (a)(ii);
9.5 - {0.75 x (9.5 - 8.0) } = 8.375	8 x 1.15 = 9.2

Therefore, option (a)(ii) is easier to achieve.

After 31 October 2007 paragraph 2.51 will be the only method of demonstrating compliance.

2.53 In addition to the remedial work on the dwelling that failed to achieve its design air permeability, one additional dwelling of the same type shall be tested to increase the overall sample size.

Alternative to pressure testing on small developments

2.54 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 tested in accordance with paragraphs 2.46 to 2.51 and had achieved its design air permeability; or

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

Design, installation and commissioning of heating and hot water systems

2.55 The heating and hot water systems shall be designed, installed and commissioned such that, for the purposes of the conservation of fuel and power, the system and its controls are handed over in efficient working order.

2.56 All fixed building services shall be commissioned in accordance with the procedure given in the DCLG publication "Domestic Heating Compliance Guide" for the relevant fuel type(s), and in accordance with the manufacturer's commissioning procedures.

2.57 A notice confirming that all fixed building services have been properly commissioned shall be provided and a copy shall be given to the district council and the building owner. The notice shall be signed by a suitably qualified person.

CRITERION 5 – OPERATING AND MAINTENANCE INSTRUCTIONS

2.58 The building owner shall be given sufficient information, including operational and maintenance instructions, to enable the dwelling and its fixed building services to be operated and maintained in an energy efficient manner. The instructions shall be directly related to the specific system(s) installed in the dwelling and shall be readily understandable by the occupier.

2.59 Without compromising health and safety requirements, the instructions shall explain to the occupier of the dwelling how to operate the systems efficiently. These shall 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.

2.60 An energy rating shall be calculated for the dwelling as built and a notice stating the energy rating shall be fixed in the dwelling.

An example of this notice can be found in Appendix G.

The energy rating shall be calculated using the same SAP software used to calculate the TER and DER.

[It would be appropriate to fix this notice adjacent to the electrical distribution board such as on the inside of the cupboard door housing this unit.]

Section 3 Existing dwellings

GENERAL

This Section should be read in conjunction with Section 1 – Common items.

Types of work covered by this Section

3.1 This Section gives provisions for altering or extending an existing dwelling or creating a dwelling through a material change of use.

3.2 This Section gives provisions relating to the following building works –

(a) extensions (see paragraphs 3.6 to 3.9 and 3.23 to 3.29);

(b) when creating a dwelling or part of a dwelling through a material change of use (see paragraphs 3.30 to 3.36);

(c) the provision or extension of a controlled service (see paragraphs 3.37 to 3.50);

(d) the provision or extension of a controlled fitting (see paragraphs 3.10 and 3.11); and

(e) the replacement or renovation of a thermal element (see paragraphs 3.12 to 3.22).

3.3 When the building works are in relation to a dwelling as part of a mixed use building 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.

Historic buildings

3.4 Special considerations apply where the building on which the work is to be carried out has historic or architectural value and compliance with this Technical Booklet would unacceptably alter the character or appearance of the building.

3.5 When undertaking work on or in connection with a building of historic or architectural merit, the aim should be to improve energy efficiency to the extent that it is practicable. Particular issues in relation to work in historic 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.

The guidance given in the DOE Environment and Heritage Service publication "Historic buildings and energy efficiency. A guide to Part F of the Northern Ireland Building Regulations" shall be taken into account in determining appropriate energy efficiency improvements.

EXTENSION TO DWELLINGS

3.6 For the extension of a dwelling three alternative approaches are given; they are –

(a) the Standards Based Approach;

(b) the Calculated Trade-off Approach; and

(c) the Equivalent Carbon Target Approach.

Standards Based Approach

Fabric standards

3.7 An extension to a dwelling shall achieve the following performance standards –

(a) controlled fittings that comply with the provisions given in paragraphs 3.10 and 3.11;

(b) newly constructed thermal elements that comply with the provisions given in paragraphs 3.12 to 3.17; and

(c) existing opaque fabric that becomes part of the thermal envelope of the dwelling where previously it was not, shall comply with the provisions given in paragraphs 3.18 to 3.22.

Area of openings

3.8 The total area of windows, roof windows, rooflights and doors in an extension shall be limited such 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.

Heating and lighting

3.9 Where a fixed building service is provided or extended as part of constructing the extension, it shall comply with the provisions given in paragraphs 3.37 to 3.50.

Controlled fittings

3.10 Where windows, roof windows, rooflights or doors are to be provided, they shall be draught-proofed units whose area-weighted average performance is not greater than that given in Table 3.1.

Column (a) applies to new fittings provided as part of constructing the extension. Column (b) applies to replacement fittings or new fittings installed in the existing building.

3.11 The U-value or Window Energy Rating of a window, roof window, rooflight or door unit may be taken as the value for –

(a) the standard configuration given in BR 443: "Conventions for U-value calculations"; or

(b) the particular size and configuration of the actual unit.

In both cases, the U-value shall be with the unit in the vertical position.

Where a roof window or rooflight has been assessed in a plane other than the vertical, the U-value shall be modified by making a U-value adjustment in accordance with BR 443.

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

Table 3.1 Standards for controlled fittings Maximum U-values {W/(m^2·K)} or Window Energy Rating (WER)

Fitting	(a) New fittings (in an extension or change of use)	(b) Replacement fittings (in an existing dwelling)
Windows, roof windows and rooflights	U-value = 1.8 or WER (1) = Band D or Centre-pane U-value = 1.2	U-value = 2.0 or WER (1) = Band E or Centre-pane U-value = 1.2
Doors with more than 50% of their internal face glazed	U-value = 2.2 or Centre-pane U-value = 1.2	U-value = 2.2 or Centre-pane U-value = 1.2
Other doors	U-value = 3.0	U-value = 3.0

Notes –

1 See CE 66, "Windows for new and existing housing".

Provision of thermal elements

3.12 New thermal elements, such as those constructed as part of an extension, shall have a U-value not greater than that given in column (a) of Table 3.2 and no individual element shall have a U-value greater than that given in column (b) of Table 3.4.

3.13 Thermal elements constructed as replacements for existing elements shall have a U-value not greater than that given in column (b) of Table 3.2. No part of an individual element shall have a U-value greater than that given in column (b) of Table 3.4.

Table 3.2 U-values for thermal elements {W/(m^2·K)}		
Element	**(a) New elements (in an extension or change of use)**	**(b) Replacement elements (in an existing dwelling)**
Wall	0.30	0.35 (1)
Pitched roof (horizontal insulation at ceiling level)	0.16	0.16
Pitched roof (inclined insulation at rafter level)	0.20	0.20
Flat roof or roof with integral inclined insulation	0.20	0.25
Floors (1)	0.22	0.25 (1)

Notes –

1 Where meeting the above standards would cause a significant (5%) reduction in floor area or cause problems in relation to adjoining floor levels these values may be exceeded provided that compensating provisions are made.

Continuity to limit thermal bridging and air leakage

3.14 The building fabric shall be constructed such that there are no readily 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.

3.15 The building fabric shall be constructed to minimise air leakage through the new or replacement parts of the thermal element.

3.16 The building fabric shall be constructed –

(a) in accordance with the accredited construction details given in the DCLG publication “Accredited construction details for Part L*”; or

(b) to details that give an equivalent level of performance when assessed in accordance with BRE IP 1/06: “Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings”.

[*Note that “Part L” in the title refers to the part in England & Wales that is equivalent to Part F in Northern Ireland.]

3.17 The builder shall demonstrate that an appropriate system of site inspection is in place to ensure that the construction standards achieve the required level of consistency. Where the accredited design details approach is adopted (paragraph 3.16(a)), a report shall be provided showing that the construction checklists given in the DCLG publication “Accredited construction details for Part L*” have been completed and show satisfactory results and a copy shall be forwarded to the district council.

[*Note that “Part L” in the title refers to the part in England & Wales that is equivalent to Part F in Northern Ireland.]

Renovation of thermal elements

3.18 Where more than 25% of the surface area of a thermal element is being renovated, the whole of that element shall be upgraded to the improved U-value given in column (b) of Table 3.3.

3.19 Where upgrading to the standards required by paragraph 3.18 is not technically or functionally feasible, the element shall be upgraded to the best practicable standard that can be achieved within a simple payback period of 15 years. Appendix B gives the information necessary to assess the simple payback of the proposed works. Appendix C gives provisions that will satisfy this requirement.

Retained thermal elements

3.20 Where an existing thermal element becomes part of a dwelling as a result of a material change of use or an existing element becomes part of the thermal envelope where previously it was not, and where it has a U-value greater than that given in column (a) of Table 3.3, the element shall be upgraded to the standard given in column (b) of Table 3.3.

3.21 Where upgrading to the standards required by paragraph 3.20 is not technically or functionally feasible, the element shall be upgraded to the best practicable standard that can be achieved within a simple payback period of 15 years. Appendix B gives the information necessary to assess the simple payback of the proposed works. Appendix C gives provisions that will satisfy this requirement.

3.22 Examples of where a lesser provision than that required by paragraph 3.20 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.

Table 3.3 U-values for retained thermal elements {W/(m^2·K)}		
Element [1]	**(a) Threshold U-value**	**(b) Improved U-value**
Cavity wall [2]	0.70	0.55 [3]
Other wall types	0.70	0.35
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation at rafter level	0.35	0.20
Pitched roof with integral insulation or flat roof	0.35	0.25
Floor [4]	0.70	0.25 [5]

Notes –

1 "Roof" includes the roof parts of dormer windows and "wall" includes the cheeks of dormer windows

2 Where a cavity wall is unsuitable for cavity insulation it shall be treated as "Other wall type".

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

4 The U-value of the floor may be calculated using the exposed perimeter and floor area of the enlarged building.

See BR 443 and either "CIBSE Guide A: Environmental Design - Section A3: Thermal properties of building structures", or
BS EN ISO 13370:1998 "Thermal performance of buildings - Heat transfer via the ground - Calculation methods".

5 A lesser provision may be appropriate where meeting the standard would create significant problems in relation to adjoining floors.

Conservatories and highly glazed extensions

3.23 Where the extension is a conservatory that is not exempt from the Building Regulations, it shall have –

(a) effective thermal separation from the dwelling by having separating walls, doors and windows between the dwelling and the conservatory that are insulated and draught-proofed to at least the same standard as the same elements in the existing dwelling;

(b) glazed elements that comply with the standards given in column (b) of Table 3.1 and thermal elements that have U-values that are no greater than those given in column (b) of Table 3.2; and

(c) where a heating system is installed, the heating appliance shall comply with the provisions of paragraphs 3.37 to 3.40 and the heating system in the conservatory shall have independent on/off and temperature controls separate from those of the existing dwelling.

3.24 Where a highly glazed extension is not a conservatory (because it has less than the minimum qualifying amounts of translucent material) but otherwise complies with the requirements of paragraph 3.23, it may be treated in a similar manner to a conservatory. The area-weighted U-value of the elements in the highly glazed extension shall not be greater than that of a conservatory of the same shape and size that complies with paragraph 3.23.

3.25 Where a highly glazed extension is not thermally separated from the dwelling it shall be treated as a conventional extension and compliance shall be demonstrated using one of the approaches given in paragraphs 3.6 to 3.9 and 3.26 to 3.29.

Calculated Trade-off Approach

3.26 The fabric standards referred to in paragraph 3.7 and the opening areas referred to in paragraph 3.8 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 3.7 and the opening areas referred to in paragraph 3.8;

(b) the area-weighted U-value for each element type is not greater than the relevant value given in column (a) of Table 3.4; and

(c) the maximum U-value of an individual element or part of an individual element is not greater than the relevant value given in column (b) of Table 3.4.

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

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

3.27 For the purposes of the above paragraph, an individual element means those areas of a given element type that have the same construction details. In the case of windows, doors, roof windows and rooflights, the assessment shall be based on the unit as a whole i.e. for windows the combined performance of the glazing and frame.

Table 3.4 Limiting U-values {W/(m^2·K)}		
Element	**(a) Area-weighted average U-value**	**(b) Maximum U-value**
Wall	0.35	0.70
Floor	0.25	0.70
Roof	0.25	0.35
Windows, roof windows (1), rooflights (1) and doors	2.20	3.30

Notes –

1 Where a roof window or rooflight has been assessed in a plane other than the vertical, the U-value shall be modified by making a U-value adjustment in accordance with BR 443: "Conventions for U-value calculations".

Equivalent Carbon Target Approach

3.28 SAP shall be used to demonstrate that the calculated carbon dioxide emissions rate from the dwelling and 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 3.7 to 3.9. The procedures in SAP Appendix S shall be used to estimate the performance of the elements of the existing building where these are unknown. When using this approach the area-weighted average U-value of each element type in the extension shall be no greater than the value given in column (a) of Table 3.4 and the U-value of any individual element shall be no greater than the relevant value given in column (b) of Table 3.4.

3.29 Where additional upgrades are proposed to the existing dwelling to compensate for lower performance in the extension, the upgrades shall comply with the relevant provisions given in this Technical Booklet. The standards for upgrading retained thermal elements are given in column (b) of Table 3.3.

MATERIAL CHANGE OF USE

3.30 Where a dwelling is created by a material change of use, two alternative approaches are given; they are –

(a) the Standards Based Approach; and

(b) the Equivalent Carbon Target Approach.

Standards Based Approach

3.31 Where controlled services or fittings are being provided or extended, they shall comply with the provisions of paragraphs 3.37 to 3.50.

3.32 Where the work involves the provision of a thermal element, it shall comply with the provisions of paragraphs 3.12 to 3.17.

3.33 Where a thermal element is to be renovated, it shall comply with the provisions of paragraphs 3.18 to 3.19.

3.34 Where a thermal element is to be retained, it shall comply with the provisions of paragraphs 3.20 to 3.22.

3.35 Where any existing window (including roof windows or rooflights) or door that separates a conditioned space from an unconditioned space (or the external air), has a U-value greater than 3.3 W/(m^2·K), it shall be replaced in accordance with the provisions of paragraphs 3.10 and 3.11.

Equivalent Carbon Target Approach

3.36 SAP shall be used to demonstrate that the calculated carbon dioxide emissions rate from the proposed dwelling is no greater than that for a notional dwelling of the same shape and size complying with the standards referred to in paragraphs 3.31 to 3.35. The procedure may also be applied to a group of dwellings such that the total carbon dioxide emissions from the group of dwellings shall not be greater than if each individual dwelling complied with paragraphs 3.31 to 3.35. The U-value of any individual element shall be not greater than the maximum U-value given in column (b) of Table 3.4.

CONTROLLED SERVICES

Heating and hot water systems

3.37 Where the work involves the provision or extension of a heating or hot water system or part thereof, and a heating appliance is to be installed –

(a) the appliance shall have an efficiency of not less than that recommended for its type in the DCLG publication "Domestic Heating Compliance Guide" and, where a primary heating appliance is being replaced, the replacement appliance shall have an efficiency not less than two percentage points lower than the appliance being replaced; and

(b) the appliance shall have controls that meet the minimum control requirements given in the DCLG publication "Domestic Heating Compliance Guide" for the installed appliance and its heat distribution system.

3.38 When checking compliance with 3.37(a), and the replacement appliance uses a different fuel to that of the original appliance, the efficiency of the new appliance shall be multiplied by the ratio of the CO_2 emission factor of the fuel used in the appliance being replaced to that of the fuel used in the replacement appliance. The CO_2 emissions factor shall be taken from Table 12 of SAP. In the absence of specific information, efficiency values may be taken from Table 4a or 4b of SAP as appropriate.

[When fuel switching, where an existing oil fired boiler with an efficiency of 72% is to be replaced by a dual solid fuel boiler with an efficiency of 65%, the equivalent efficiency of the dual solid fuel boiler would be 65% x (0.265/0.187) = 92.1% which is greater than the efficiency of the existing system (72%) which therefore satisfies the requirement. The values of 0.265 and 0.187 kg/kWh are the CO_2 emissions factors for oil and dual solid fuel appliances respectively.]

3.39 The heating and hot water system(s) shall be designed, installed and commissioned such that, for the purposes of the conservation of fuel and power, the system and its controls are handed over in efficient working order.

3.40 The heating and hot water system(s) shall be commissioned in accordance with the procedure given in the DCLG publication "Domestic Heating Compliance Guide" for the relevant fuel type(s).

3.41 A notice confirming that all the heating and hot water system(s) have been properly commissioned shall be provided by the builder and a copy shall be given to the district council and the building owner. The notice shall be signed by a suitably qualified person.

Insulation of pipes, ducts and hot water storage vessels

3.42 Pipes, ducts and hot water storage vessels shall be insulated to standards not less than those given in the DCLG publication "Domestic Heating Compliance Guide".

Mechanical ventilation systems

3.43 Any mechanical ventilation system shall be designed and installed to standards not less than those given in GPG 268 "Energy efficient ventilation in dwellings, a guide to specifiers" and shall have specific fan powers not greater than and a heat recovery efficiency not less than those given in Table 3.5.

[GPG 268 "Energy efficient ventilation in dwellings – a guide to specifiers" also includes recommendations on appropriate air permeability standards for different ventilation strategies.]

Table 3.5 Limiting performance values for mechanical ventilation systems

System type	Performance
Specific Fan Power (SFP) for continuous supply only and continuous extract only	not greater than 0.8 W/(l/s)
SFP for balanced systems	not greater than 2.0 W/(l/s)
Heat recovery efficiency	not less than 66%

Mechanical cooling systems

3.44 Fixed air coolers shall have an efficiency classification of not less than Class C in Schedule 3 of "The Energy Information (Household Air Conditioners) (No. 2) Regulations 2005".

Fixed internal lighting

3.45 The requirements of paragraphs 3.46 to 3.48 apply solely to an extension to an existing dwelling, a dwelling created by a material change of use or to a replacement lighting system which forms part of re-wiring works.

3.46 Fixed energy efficient light fittings shall be installed in the most frequented areas in a dwelling, and this shall be not less than –

(a) one per 25 m^2 of dwelling floor area (excluding garages) or part thereof; or

(b) one per four light fittings,

whichever is the greater.

A light fitting may contain one or more lamps.

3.47 Light fittings in less frequented areas such as cupboards, storage areas and garages shall not count towards the total. "GIL 20 Low energy domestic lighting" gives recommendations on identifying suitable locations.

3.48 For the purposes of paragraph 3.46, an energy efficient light fitting (including the lamp, control gear and an appropriate housing, reflector, shade or other device for controlling the light output) is a light fitting that can only be fitted with lamps having a luminous efficacy greater than 40 lumens per circuit-Watt.

[Circuit-Watt means the power consumed in lighting circuits by lamps, their associated control gear and power factor correction equipment.]

[Fluorescent and dedicated compact fluorescent light fittings would meet this requirement, but those accommodating GLS tungsten lamps and compact fluorescent lamps (CFLs) with a bayonet cap or Edison screw base, or tungsten halogen lamps would not.]

Fixed external lighting

3.49 Fixed external lighting means lighting permanently fixed to an external surface of the dwelling and under the direct control of the occupant by having an electricity supply from the dwelling.

3.50 External lighting shall –

(a) have a maximum output of 150 W per fitting and automatically switch off –

(i) when there is adequate daylight; and

(ii) when not required at night; or

(b) have sockets that can be used solely with lamps having an efficacy greater than 40 lumens per circuit-Watt.

[Fluorescent and dedicated compact fluorescent light fittings would meet this requirement, but those accommodating GLS tungsten lamps and compact fluorescent lamps (CFLs) with a bayonet cap or Edison screw base, or tungsten halogen lamps would not.]

OPERATING AND MAINTENANCE INSTRUCTIONS

3.51 The building owner shall be given sufficient information, including operational and maintenance instructions, to enable the dwelling to be operated and maintained in an energy efficient manner. The instructions shall be directly related to the specific system(s) installed in the dwelling and shall be readily understandable by the occupier.

3.52 Without compromising health and safety requirements, the instructions shall explain to the occupier of the dwelling how to operate the systems efficiently. These shall 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.

3.53 Where a new dwelling is created by a material change of use, an energy rating shall be calculated for the dwelling as built and a notice stating the energy rating shall be affixed in the dwelling.

The energy rating shall be calculated using the same software used to calculate the TER and DER.

An example of this notice can be found in Appendix G.

[It would be appropriate to fix this notice adjacent to the electrical distribution board such as on the inside of the cupboard door housing the unit.]

Appendix A Compliance checklist

THIS APPENDIX IS NOT PART OF THE DEEMED - TO - SATISFY PROVISION

The following table provides a checklist to assist builders/developers in demonstrating compliance with Part F. The checklist shows the evidence that needs to be provided to allow the check to be made, and who should produce the evidence. For most criteria, the evidence can be provided by a suitably qualified person acting on behalf of the builder/developer.

Nº	Check	Evidence	Produced by	Design compliant?	As built compliant?
Criterion 1 Achieving the TER					
1	TER {kg/(m^2·year)} of CO_2	Standard output from SAP calculation	SAP assessment	N/A	N/A
2	DER for dwelling as designed {kg/(m^2·year)} of CO_2	Standard output from SAP calculation	SAP assessment	N/A	N/A
3	Are the emissions from the dwelling as designed equal to or less than the target?	Compare TER and DER as designed	SAP assessment		N/A
4	DER for dwelling as constructed	Standard output from SAP calculation	SAP assessment	N/A	N/A
5	Are the emissions from the dwelling as constructed equal to or less than the target?	Compare TER and DER as constructed	SAP assessment	N/A	
Criterion 2 Minimum acceptable standards					
	U-values				
6	Are all U-values within the minimum acceptable standards?	Schedule of U-values output by calculation software	SAP assessment		
	Common areas in building with multiple dwellings				
7	If the common areas are unheated are all U-values within the design limits given in Table 2.2?	Schedule of U-values output by calculation software			
	Heating and hot water systems				
8	Does the efficiency of the heating systems meet the minimum values given in the Domestic Heating Compliance Guide?	Schedule of appliance efficiencies output by calculation software	SAP assessment		
9	Does the insulation of the hot water cylinder meet the standards given in the Domestic Heating Compliance Guide?	Cylinder insulation specification as output by calculation software			
10	Do the controls meet the minimum provisions given in the Domestic Heating Compliance Guide?	Controls specification as output from calculation software	SAP assessment		
11	Does the heating and hot water system meet the other minimum provisions given in the Domestic Heating Compliance Guide?	Schedule of compliance provisions as output from calculation software	Builder or heating engineer		

Nº	Check	Evidence	Produced by	Design compliant?	As built compliant?
	Fixed internal and external lighting				
12	Does the fixed internal lighting comply with paras 2.34 to 2.36?	Schedule of fixed internal lighting	Builder or electrical contractor		
13	Does the fixed external lighting comply with paras 2.37 to 2.38?	Schedule of fixed external lighting	Builder or electrical contractor		
Criterion 3	**Limiting the effects of solar gain**				
14	Does the dwelling have a high risk of high summertime temperatures?	Standard output from SAP calculation	SAP assessment		
Criterion 4	**Quality of design, construction and commissioning**				
15	Have the key features of the design been included (or bettered) in practice?	Key features produced as standard output from SAP	SAP assessment	N/A	
	Building fabric				
16	Have accredited details been used?	Schedule of details used and their reference codes	Builder		
17	Have Non-accredited details been used?	Evidence that the details comply with IP 1/06	Builder		
18	Has satisfactory evidence of site inspection checks been provided?	Completed and signed checklist pro-formas	Builder	N/A	
	Air permeability and air pressure testing				
19	Design air permeability {$m^3/(h \cdot m^2)$ @ 50 Pa}	Standard output from SAP calculation	SAP assessment		N/A
20	Has the design air permeability been achieved?	Sample pressure test results compared with design value	Builder's submission	N/A	
	Commissioning of heating and hot water systems				
21	Have the heating and hot water system(s) been properly commissioned?	Commissioning completion certificate	Builder/ Heating Engineer	N/A	
Criterion 5	**Operating and maintenance instructions**				
22	Has the relevant information been provided in a suitable form?	Information leaflet	Builder/ Heating Engineer	N/A	
23	Has the Energy Rating been provided and displayed?	Copy submitted to district council	Builder	N/A	

Appendix B Simple payback

THIS APPENDIX IS PART OF THE DEEMED - TO - SATISFY PROVISION

B1 Simple payback means 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 (excluding VAT) by the value of the annual energy savings (excluding VAT) achieved by that measure, where –

(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 shall be based on prices current at the date on which the proposal is submitted to the district council and shall be confirmed in a report signed by a suitably qualified person;

(c) the annual energy savings shall be estimated using approved energy calculation software; and

(d) for the purposes of this Technical Booklet the following energy prices shall be used when evaluating the value of the annual energy savings –

Mains gas	1.63	p/kWh
Electricity	3.65 (1)	p/kWh
Heating oil	2.17	p/kWh
LPG	3.71	p/kWh

1. This is a weighted combination of peak and off peak tariffs.

Energy efficiency measures are considered to be cost effective if they achieve a simple payback within 15 years.

For example, if the cost of implementing a measure was £430 and the value of the annual energy savings was £38/year, the simple payback would be 430/38 = 11.3 years and the measure is therefore regarded as cost effective.

[Energy prices are increasing significantly, so designers may wish to use higher values such as those current at the time of the Building Regulation application.]

Appendix C Cost effective target U-values

THIS APPENDIX IS PART OF THE DEEMED - TO - SATISFY PROVISION

C 1 Where the work involves the renovation of a thermal element such as the replacement of surface finishes or coverings, an opportunity arises for insulation improvements to be undertaken at marginal additional cost. This Appendix gives guidance on the cost effectiveness of insulation measures when undertaking various types of work on a thermal element.

C 2 Table C1 gives the circumstances and provisions that in most cases can be considered reasonable provisions when upgrading thermal elements. However, as renovation work is context dependent, some flexibility in applying the provisions is necessary with the aim being as far as possible to make a reasonable improvement to the thermal performance of the element being renovated.

As part of this flexible approach it will be necessary to take account of technical risks, practicability and the impacts of such works on adjoining buildings.

C 3 In general terms the proposed works should take account of –

(a) other requirements of the building regulations;

(b) technical risks relating to insulation improvements as described in BR 262: “Thermal insulation: avoiding risks”; and

(c) where the building has historic value, guidance produced by DOE Environment and Heritage Service.

C 4 Where it is not practicable in the context of a specific scheme to achieve the performance standard given in Table C1, the level of performance achieved shall be as close as possible thereto.

Table C1 Cost effective target U-values when undertaking works to thermal elements			
Improvement opportunity	**Target U-value W/(m²·K)**	**Typical construction**	**Main matters to be considered**
Pitched roof constructions			
Renewal of roof covering – No living accommodation in the roof void – existing insulation (if any) horizontal 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 250 mm loft insulation such as mineral or cellulose fibre laid between and over the ceiling joists.	Impact on boarded walkways or boarded roofspaces. Condensation risks. Impact of new insulation on access to and the insulation of services.
Renewal of roof covering – Existing insulation in good condition and will not be significantly disturbed by proposed works. Existing insulation 50 mm to 100 mm in thickness.	0.20	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 roofspaces. Condensation risks. Impact of new insulation on access to and the insulation of services.
Renewal of the ceiling immediately below a cold loft space. Existing insulation removed as part of the works.	0.16	Provide 250 mm loft insulation – such as mineral or cellulose fibre laid between and over the ceiling joists.	The impact on boarded walkways or boarded roofspaces. Condensation risks. Impact of new insulation on access to and the insulation of services.
Renewal of roof covering – Living accommodation in roof space (room-in-the-roof).	0.20	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.
Dormer construction			
Renewal of cladding to dormer cheeks.	0.35	Insulate between and over studs or externally.	Condensation risks.
Renewal of roof covering.	-	Refer to guidance on flat or pitched roofs as appropriate.	Condensation risks.
Flat roof constructions			
Renewal of roof covering – Existing insulation, if any, less than 100 mm, or in poor condition and likely to be significantly disturbed or removed as part of the planned works.	0.25	Insulation between and/or over joists to achieve the target U-value.	Condensation risks. Impact of BS 6229.
Renewal of the ceiling to flat roof area. Existing insulation removed as part of the works.	0.25	Insulation between and/or below joists to achieve the target U-value.	Condensation risks. Impact of BS 6229. Impact on ceiling height.

Improvement opportunity	Target U-value W/(m^2·K)	Typical construction	Main matters to be considered
Solid wall constructions			
Renewal of internal finish to external wall or dry lining for the first time.	0.35	Dry lining of plasterboard to inner face of the external wall with insulation between battens. Insulated wall board fixed to internal surface.	Impact on reduced floor area. Condensation risks. Dampness risks.
Renewal of external finish or cladding or applying a new finish or cladding for the first time.	0.35	External insulation system with render. Cladding with insulation behind.	Condensation risks. Dampness risks. Impact of increased wall thickness on adjoining buildings.
Cavity wall constructions			
Replace wall ties to at least one elevation.	0.55	Blown cavity fill.	Suitability for cavity fill.
Ground floor constructions			
Renovation of a solid or suspended floor involving the replacement of screed or a timber deck.	0.25	Solid floor – replace screed with an insulated floor deck. Suspended timber floor – insulate between and/or over floor joists.	Impact on floor levels. Inherent U-value. Usually cost effective if existing U-value is greater than 0.7 W/(m^2·K).

Appendix D General guidance on renovation

THIS APPENDIX IS NOT PART OF THE DEEMED - TO - SATISFY PROVISION

D1 This Appendix lists general guidance documents that provide advice on renovation options and their application. The listing of any guide, British Standard or other document does not mean that the guidance is applicable to any particular scheme. It is the designer's/builder's responsibility to assess the appropriateness of the guidance in relation to a particular application.

D2 In a number of documents (particularly those produced by the Energy Saving Trust's Energy Efficiency Best Practice in Housing programme) a recommended U-value is stated for different elements and forms of construction. The inclusion of such a performance value does not constitute a performance limit or target for the purposes of this Technical Booklet. The relevant Target U-values for the purposes of compliance with this Technical Booklet are those given in Table C1 of Appendix C.

General guidance

D3 Thermal insulation: Avoiding risks, Building Research Establishment Report 262, Watford, Construction Research Communications Ltd.

D4 EST (2004) Energy efficient refurbishment of existing housing: Good Practice Guide 155, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

D5 EST (2005) Advanced Insulation in Housing Refurbishment: CE 97, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

D6 EST (2006) Refurbishing dwellings – a summary of best practice: CE189, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

Roofs

D7 EST (2006) Practical refurbishment of solid walled houses: CE 184, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

D8 Insulating roofs at rafter level: Sarking insulation, Good Building Guide 37, Watford, Building Research Establishment.

D9 Code of practice for loft insulation: National Insulation Association.

Walls

D10 EST (2006) External Insulation Systems for Walls of Dwellings: GPG 293, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

D11 EST (2003) Internal Wall Insulation in Existing Housing: GPG 138, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

D12 EST (2006) Practical refurbishment of solid walled houses: CE 184, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

Floors

D13 EST (2006) Practical refurbishment of solid walled houses: CE 184, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

International, European and British Standards

D14 BS 5250: 2002 Code of practice for the control of condensation in buildings.

D15 BS EN ISO 13788: 2001 Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods.

D16 BS 6229: 2003 Flat roofs with continuously supported coverings – Code of practice.

D17 BS 5803–5: 1985 Thermal Insulation for use in pitched roof spaces in dwellings – Part 5: Specification for installation of man-made mineral fibre and cellulose fibre insulation. Amended 1999 incorporating Amendment No.1 1994.

Appendix E Important features of the design

THIS APPENDIX IS NOT PART OF THE DEEMED - TO - SATISFY PROVISION

E1 The building regulations application shall include a report from the SAP assessment that indicates if any of the following apply –

1. A wall U-value less than 0.28 W/(m^2·K)
2. A floor U-value less than 0.20 W/(m^2·K)
3. A roof U-value less than 0.15 W/(m^2·K)
4. A window or door U-value less than 1.8 W/(m^2·K)
5. Thermal bridging less than the default value for accredited details
6. A design air permeability less than 7 m^3/(h·m^2) @ 50 Pa
7. A main heating system efficiency more than 4 percentage points better than that recommended for its type in the “Domestic Heating Compliance Guide”
8. The use of any low carbon or renewable energy technology such as –
   (i) Bio-fuel used for the main heating system (including multi-fuel appliances)
   (ii) CHP or community heating
   (iii) A heat pump
   (iv) A solar panel
   (v) A photovoltaic array
9. Any item involving the application of SAP Appendix Q

Appendix F Model designs

THIS APPENDIX IS NOT PART OF THE DEEMED - TO - SATISFY PROVISION

F1 Some builders 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.

F2 Where a model design is used, it will still be necessary to demonstrate compliance to the satisfaction of the district council and to provide the building owner with operational information and an Energy Rating which shall be copied to the district council.

Appendix G SAP energy rating notice

THIS APPENDIX IS PART OF THE DEEMED - TO - SATISFY PROVISION

Certificate number: xxxxxxxxxxx

Date of issue: 03 December 2006

SAP

ENERGY RATING

Note: SAP logo and certificate number can be used only by companies which guarantee quality assured ratings and are therefore Authorised by the Government to use the SAP logo. If that does not apply the logo and certificate number are to be omitted

Address of dwelling:

481 High Street, Ballymena,
BT42 6AZ

The Energy Rating of this dwelling* is:

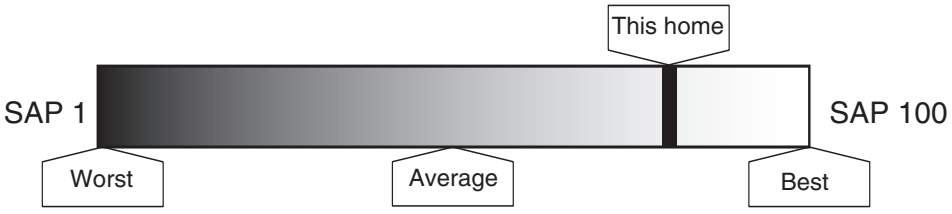
81

on a scale of 1 to 100 - the higher the rating the more energy efficient the home.

The assessment is based on energy costs for space heating, water heating and lighting assuming standard occupancy and standard climate conditions.

The energy rating was calculated in accordance with the current building regulations by/for <name of person or company carrying out the building work>.

What is the energy performance of this home in comparison with other homes?



For more information on energy ratings contact your local energy efficiency advice centre on 0800 512 012

* calculated according to SAP 2005

Appendix H Publications referred to

THIS APPENDIX IS NOT PART OF THE DEEMED - TO - SATISFY PROVISION

Air Tightness Testing and Measurement Association (ATTMA)

Measuring air permeability of building envelopes, 2006

BRE

BR 262: Thermal insulation: Avoiding risks, 2002

BR 443: Conventions for U-value calculations, 2006

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

British Standards Institution (BSI)

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

BS 8206 - 2: 1992 Lighting for buildings. Code of Practice for daylighting

BS EN ISO 13370: 1998 Thermal performance of buildings – Heat transfer via the ground – Calculation methods

Chartered Institution of Building Services Engineers (CIBSE)

CIBSE Guide A: Environmental Design, 2006. Section 3 – Thermal properties of building structures

Department of the Environment, Food and Rural Affairs (DEFRA)

SAP 2005: The Government's Standard Assessment Procedure for the energy rating of dwellings, 2005

Department for Communities and Local Government (DCLG) (formerly ODPM)

Accredited construction details for Part L
(Note that "Part L" in the title refers to the part in England & Wales that is equivalent to Part F in Northern Ireland. This document will not be printed but is published on the DCLG website.)

Domestic heating compliance guide, 2006

Low or zero carbon energy sources: Strategic guide, 2006

Energy Saving Trust (EST)

CE 66 Windows for new and existing housing, 2006

CE 129 Reducing overheating – a designer's guide, 2005

GIL 20 Low energy domestic lighting, 2006

GPG 268 Energy efficient ventilation in dwellings – a guide for specifiers, 2006

DOE Environment and Heritage Service

Historic buildings and energy efficiency. A guide to Part F of the Northern Ireland Building Regulations 2006

This document will not be printed but is available on the website www.ehsni.gov.uk

Legislation

The Energy Information (Household Air Conditioners)(No.2) Regulations 2005