

The Building Bye-Laws (Jersey) 2007

**TECHNICAL GUIDANCE DOCUMENT
11.1B**

**PART 11
CONSERVATION OF FUEL AND POWER
IN EXISTING DWELLINGS**

2017
EDITION

MAIN CHANGES IN THE 2011 EDITIONS

1 This Technical Guidance Document 11.1B comes into force on 01 January 2011 in support of the Building Bye-laws (Jersey) 2007 as amended. From that date the 2002 edition of Approved Document L1 will become obsolete. The main changes in the legal requirements and the supporting technical guidance in this edition of Technical Guidance Document 11.1B are as follows.

designs. The maximum floor area for exempt conservatories remains unchanged.

8 A new section contains guidance on ways of complying with the new requirements for provisions and renovation for thermal elements. A new Appendix A gives examples of what can be achieved cost-effectively.

Changes in the legal requirement

- 2 The main changes are reproduced at the front of this Technical Guidance Document and interleaved as well in the relevant text for ease of reference. In case of doubt however refer to the SI itself.
- 3 Part 11 of Schedule 2 has been consolidated into a single requirement 11.1, covering all types of buildings with no limits on application.
- 4 As well as changes to Part 11, there are changes to the definition of building works and exempt works and a new definition of 'thermal element' is introduced to address more types of alterations and renovation works. New requirements apply when providing or renovating thermal elements and commissioning heating, ventilation and lighting systems.

Changes in the technical guidance

- 5 Four Technical Guidance Documents are published reflecting the specialisation in the construction market. In the new Technical Guidance Documents regulatory requirements are shown on a blue background and defined terms are highlighted. More use has been made of more comprehensive and detailed technical reference publications that therefore form part of the approved guidance. Commentary text has been added in places to explain, for instance, the aims of the guidance and how outcomes are calculated.
- 6 In this Technical Guidance Document the guidance is based on an elemental approach to compliance. The main technical changes comprise a general improvement in the performance standards that are considered reasonable for work on thermal elements, windows, doors, heating, hot water, ventilation and lighting systems in existing dwellings. As an exception to this standards for replacement windows, roof windows and roof lights are unchanged from those in ADL1 (2002)
- 7 More guidance is given enabling greater flexibility when building extensions including conservatories and other highly glazed

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Use of Guidance

THE TECHNICAL GUIDANCE DOCUMENTS

This document is one of a series that has been approved and issued by the Minister for Planning and Environment for the purpose of providing practical guidance with respect to the requirements of Schedule 2 and Bye-law 7 of the Building Bye-laws (Jersey) 2007.

A list of all technical guidance documents that have been approved and issued by the Planning and Environment Minister for this purpose can be obtained from the department.

Technical Guidance Documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements. Thus, there is no obligation to adopt any particular solution contained in a Technical Guidance Document if you prefer to meet the relevant requirement in some other way.

OTHER REQUIREMENTS

The guidance contained in a Technical Guidance Document relates only to the particular requirements of the Bye-laws which the document addresses. The building work will also have to comply with the requirements of any other relevant parts in Schedule 2 to the Bye-laws.

There are Technical Guidance Documents which give guidance on each of the parts of Schedule 2 and on Bye-law 7.

LIMITATION ON REQUIREMENTS

In accordance with Bye-law 8, the requirements in Parts 1 to 7, 10 and 12 (except for requirements 3.6 and 6.2) of the Second Schedule to the Building Bye-laws do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings). This is one of the categories of purpose for which Building Bye-laws may be made.

Requirements 3.6 and 6.2 are excluded from Bye-law 8 because they deal directly with prevention of the contamination of water. Parts 8 and 9 (which deal, respectively, with access to and use of buildings and resistance to the passage of sound,) are excluded from Bye-law 8 because they address the welfare and convenience of building users. Part 11 is excluded from Bye-law 8 because it addresses the conservation of fuel and power. All these matters are amongst the purposes, other than health and safety, that may be addressed by Building Bye-laws.

MATERIALS AND WORKMANSHIP

Any building work which is subject to the requirements imposed by Schedule 2 to the Building Bye-laws should, in accordance with Bye-law 7, be carried out with proper materials and in a workmanlike manner.

You may show that you have complied with Bye-law 7 in a number of ways. These include the appropriate use of a product bearing CE marking in accordance with the Construction Products Directive (89/106/EEC)¹, the Low Voltage Directive (73/23/EEC and amendment 93/68/EEC)² and the EMC Directive (89/336/EEC)³ as amended by the CE Marking Directive (93/68/EEC)⁴ or a product complying with an appropriate technical specification (as defined in those Directives), a British Standard, or an alternative national technical specification of any state which is a contracting party to the European Economic Area which, in use, is equivalent, or a product covered by a national or European certificate issued by a European Technical Approval Issuing body, and the conditions of use are in accordance with the terms of the certificate. You will find further guidance in the Technical Guidance Document supporting Bye-law 7 on materials and workmanship

INDEPENDENT CERTIFICATION SCHEMES

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

Many certification bodies which approve such schemes are accredited by UKAS.

TECHNICAL SPECIFICATIONS

Building Bye-laws are made for specific purposes: health and safety, energy conservation and the welfare and convenience of disabled people. Standards and technical approvals are relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance such as serviceability, or aspects which although they relate to health and safety are not covered by the Bye-laws.

¹ As implemented by the Construction Products Regulations 1991 (SI 1991/1620).

² As implemented by the Electrical Equipment (Safety Regulations 1994)

³ As implemented by the Electromagnetic Compatibility Regulations 1992 (SI 1994/3260).

⁴ As implemented by the Construction Products (Amendment) Regulation 1994 (SI 1994/3051) and The Electromagnetic Compatibility (amendment) Regulations 1994 (SI 1994/3080)

When a Technical Guidance Document makes reference to a named standard, the relevant version of the standard is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version should be used as a source of guidance provided it continues to address the relevant requirements of the Bye-laws.

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

The Department intends to issue periodic amendments to its Technical Guidance Documents to reflect emerging harmonised European Standards. Where a national standard is to be replaced by a European harmonised standard, there will be a co-existence period during which either standard may be referred to. At the end of the co-existence period the national standard will be withdrawn.

MIXED USE DEVELOPMENT

In mixed use developments part of a building may be used as a dwelling while another part has a non-domestic use. In such cases, if the requirements of this part of the Bye-laws for dwelling and non-domestic use differ, the requirements for non-domestic use should apply in any shared parts of the building.

The Requirement

This Technical Guidance Document, which takes effect on 01 January 2011, deals with the energy efficiency requirements in the Building Bye-laws (Jersey) 2007, as amended. The energy efficiency requirements are conveyed in Part 11 of schedule 2 to the Building Bye-laws and Bye-laws 5A, 5B and 17C as described below:

Requirement

Part 11 Conservation of Fuel and Power.

- 1 Reasonable provision shall be made for the conservation of fuel and power in buildings by:
 - a limiting heat gains and heat losses:
 - i through thermal elements and other parts of the building fabric; and
 - ii from pipes, ducts and vessels used for space heating, space cooling and hot water services;
 - b providing and commissioning energy efficient fixed building services with effective controls;
and
 - c in a case where building work is carried out in connection with a building that is (or any component of which is) required to comply with any provision of sub-paragraph (a) or (b), providing to the owner of the relevant building on completion of that building work sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than are reasonable in the circumstances.

Other changes to the Bye-laws

There are new Bye-laws that introduce new energy efficiency requirements and other relevant changes to the existing bye-laws. For ease of reference the principal elements of the bye-laws that bear on energy efficiency are repeated below and, where relevant, in the body of the guidance in the rest of this Technical Guidance Document. However it must be recognised that the Statutory Instrument takes precedence if there is any doubt over interpretation.

Interpretation

“building work” means –

- (a) the erection or extension of a building;
- (b) the provision or extension of a controlled service or fitting in or in connection with a building;
- (c) a material alteration in relation to a building;
- (d) work required by bye-law 5A, 5B, 6, or 17C, in relation to a building;
- (e) work involving the underpinning of a building;
- (f) the provision, alteration or extension of an electrical installation in a building, including, where such an installation is altered or extended, any work on the existing electrical installation of the building;

“change to a building’s energy status’ means a change to a building, being a change that has the result that the building becomes one to which any of the energy efficiency requirements applies where previously the requirement did not so apply;

‘energy efficiency requirements’ means the requirements of –

- (a) bye-laws 5A and 5B;
- (b) Part 3A; and
- (c) Part 11 of Schedule 2;

“fixed building service’ means –

- (a) a fixed internal or external lighting system (other than an emergency escape lighting system or a specialist process lighting system); or
- (b) a fixed system for heating, providing hot water, providing air conditioning or providing mechanical ventilation;

‘technical guidance document’ means a technical guidance document published under Article 32 of the Law;

‘thermal element’ has the meaning set out in bye-law 2A;

‘thermally conditioned’ means capable of being maintained at or near a given temperature by the use of one or more mechanical devices.

Bye-law (2) is amended to include the following new definitions.

- (k) the building is used as an office, where previously it was not; or
- (l) in the case of a building that is or contains a dwelling or garage, part of the building is used as a habitable room where previously the part was not so used.

A new Bye-Law 2A has been added as follows:

- (1) In these bye-laws, ‘thermal element’ means a wall, floor, or roof, that separates a thermally-conditioned part of a building from –
 - (a) part or all of the external environment; or
 - (b) in the case of a wall or floor, another part of the building, being a part that is –
 - (i) not thermally conditioned,
 - (ii) an extension falling within Class 6 in Schedule 1, or
 - (iii) where this clause applies, thermally conditioned to a different temperature, and includes all parts of the wall, floor, or roof, between the surface bounding the thermally-conditioned part of the building and the surface exposed to the external environment or to the other part of the building.
- (2) Paragraph (1)(b)(iii) only applies if –
 - (a) the relevant building is not a dwelling; and
 - (b) the other part of the relevant building is used for a purpose that is not similar or identical to the purpose for which the thermally-conditioned part is used.
- (3) In this bye-law –
 - (a) a reference to the external environment includes the ground;
 - (b) a reference to a wall, floor or roof does not include a window, door, roof-window or roof-light.

Requirements relating to building work.

Bye-law 5 is amended as follows:

- (4) Despite paragraphs (1) and (2) and without affecting the operation of paragraph (3), if building work is only of a kind required by bye-law 5A, 5B or 17C and does not constitute a material alteration to a building, paragraphs (1)

and (2) shall not apply to or in relation to the building work so long as the requirements of bye-law 5A, 5B or 17C (as the case requires) are met in relation to the work.

Requirements relating to thermal elements.

A new bye-law 5A is added as follows:

- (1) Where a thermal element is renovated, such building work shall be carried out as is necessary to ensure that the whole thermal element as so renovated complies with requirement 11.1(a)(i).
- (2) Where a thermal element is replaced, the replacement thermal element shall comply with requirement 11.1(a)(i).

Requirements relating to a change to energy status.

A new bye-law 5B is added as follows:

- (1) Where there is a change to a building's energy status, such building work shall be carried out as is necessary to ensure that the building complies with the requirements of Part 11 of Schedule 2.
- (2) However, if the change concerns the energy status of only part of the building, being a part designed, or altered, to have fixed building services that are separate from those of other parts of the building, then it shall be sufficient compliance with paragraph (1) if the building work that is carried out ensures that the part complies with the requirements of Part 11 of Schedule 2.

Requirements relating to a material change of use.

Bye-law 6 is updated to take account of the changes to Part 11.

Application for a building permit.

Bye-law 10 is amended as follows:

For sub-paragraphs (a) and (b) of bye-law 10(1) the following sub-paragraphs have been substituted –

- (a) to carry out building work;
- (b) to replace or renovate a thermal element that forms part of a building in relation to which any of the energy efficiency requirements apply;
- (c) to make a change to a building's energy status; or
- (d) to make a material change of use.

ENERGY PERFORMANCE OF BUILDINGS

New bye-laws are added as follows:

17A Interpretation

In this Part, 'building' means an entire building or such part of a building as is designed, or altered, to have fixed building services that are separate from those of other parts of the building.

17B New buildings

- (1) This bye-law applies where a new building is constructed.
- (2) The building, once constructed, shall not exceed the target rate of the energy performance for the building that has been specified in the relevant technical guidance document.
- (3) For the purposes of this bye-law, the relevant technical guidance document is one concerning minimum energy performance requirements for buildings and setting out a methodology of calculation for the energy performance of buildings.

17C Consequential improvements to energy performance

- (1) Paragraph (2) applies to an existing building with a total useful floor area over 1000m² in respect of which building work is proposed if the proposed building work consists of or includes –
 - (a) an extension of the building; or
 - (b) the initial provision of any fixed building services, or an increase to the installed capacity of any fixed building services, in relation to the building.
- (2) Subject to paragraph (3), such work, if any, shall be carried out as is necessary to ensure that the building complies with Part 11 of Schedule 2.
- (3) Nothing in paragraph (2) requires work to be carried out if it is not technically, functionally and economically feasible.

17D Notice of energy performance to Minister

- (1) This bye-law and bye-law 17E apply where a new dwelling is created by building work or by a material change of use in connection with which building work is carried out.
- (2) The person carrying out the relevant building work shall calculate a rating of the energy

- performance of the dwelling, once constructed, in accordance with the relevant technical guidance document and give notice of that rating to the Minister.
- (3) For the purposes of this bye-law, the relevant technical guidance document is one concerning minimum energy performance requirements for buildings and setting out a methodology of calculation for the energy performance of buildings.
- (4) The notice shall be given not later than –
- the date on which the notice required by bye-law 13(6) is given in relation to the building work; and
 - at least 5 days before occupation of the dwelling.

17E Notice of energy performance to occupant

- (1) The person carrying out the relevant building work shall affix, as soon as practicable, in a conspicuous place in the dwelling, a notice stating the rating of the energy performance of the dwelling, calculated as referred to in bye-law 17D.
- (2) The notice shall be affixed not later than –
- the date on which the notice required by bye-law 13(6) is given in relation to the building work; and
 - at least 5 days before occupation of the dwelling.
- (3) This bye-law shall not apply in a case where the person carrying out the relevant building work intends to occupy, or occupies, the dwelling as a residence.

17F Calculations and targets

- (1) This bye-law applies to a building in relation to which requirement 11.1(a)(i) applies.
- (2) A person carrying out building work to construct the building shall ensure that pressure testing is carried out on the building in such circumstances, and in accordance with such procedures, as are set out in the relevant technical guidance document.
- (3) The person carrying out the building work shall give notice of the results of the pressure testing to the Minister not later than 7 days after the testing is completed.
- (4) The notice shall set out the results of the testing and the data on which they are based in the manner set out in the relevant technical guidance document.

- (5) For the purposes of this bye-law, the relevant technical guidance document is one concerning pressure testing in a building in order to determine heat gains and losses in the building from its thermal elements and other parts of its building fabric.

17G Commissioning

- (1) This bye-law applies to a building in relation to which requirement 11.1(b) applies and building work is carried out, but does not apply where the building work consists only of exempt electrical certifiable work (within the meaning of bye-law 15).
- (2) The person carrying out the building work shall give to the Minister a notice confirming that the relevant fixed building services have been commissioned in accordance with the procedure set out in the relevant technical guidance document.
- (3) The notice shall be given not later than –
- in every case, the date on which the notice required by bye-law 13(6) in relation to the building work is given; and
 - in the case of certifiable building work (within the meaning of bye-law 15), not more than 30 days after completion of the work.
- (4) For the purposes of this bye-law, the relevant technical guidance document is one concerning pressure testing in a building in order to determine heat gains and losses in the building from its pipes, ducts, and vessels, used for space heating, space cooling and hot water services.

17H Energy performance rate calculations

- (1) A person carrying out building work to construct a new building shall give notice of the calculated energy performance rate for the building, as constructed, to the Minister.
- (2) The notice shall be given not later than –
- the date on which the notice required by bye-law 13(6) is given in relation to the building work; and
 - at least 5 days before occupation of the building.

Exempt building and work.

Schedule 1 is altered as follows:

For Class 6(1)(c) and (d) of Schedule 1 to the principal bye-laws the following sub-paragraphs have been substituted –

- (c) its glazing satisfies requirement 10.1;
- (d) it does not cause a contravention of these bye-laws in respect of the dwelling or any service or fitting; and
- (e) in the case of an extension that is a conservatory –
 - (i) the extension is thermally separated from the dwelling with construction that achieves a maximum U-value of $2.0 \text{ W/m}^2 \text{ K}$ (where U represents how much thermal energy in watts (W) is transmitted through one square metre (m^2) of the construction at a temperature difference of one degree Kelvin (K) between the dwelling and the extension); and
 - (ii) the extension is constructed so that its external fabric achieves a maximum U-value of $2.0 \text{ W/m}^2 \text{ K}$ (where U represents how much thermal energy in watts (W) is transmitted through one square metre (m^2) of the external fabric at a temperature difference of one degree Kelvin (K) between the extension and the outside).

Section 0: General Guidance

CONVENTIONS USED IN THIS DOCUMENT

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

- a Texts shown on a blue background are extracts from the Building Bye-laws as amended and convey the legal requirements that bear on compliance with Part 11. It should be remembered however that building works must comply with all the other relevant provisions.
- b Key terms are printed in **bold italic text** and defined for the purposes of this Technical Guidance Document in Section 5 of this document.
- c References given as footnotes and repeated as end notes are given as ways of meeting the requirements or as sources of more general information as indicated in the particular case. The Technical Guidance Document will be amended from time to time to include new references and to refer to revised editions where this aids compliance.
- d Additional *commentary in italic text* appears after some numbered paragraphs. The commentary is intended to assist understanding of the immediately preceding paragraph or sub-paragraph, but is not part of the approved guidance.

TYPES OF WORK COVERED BY THIS TECHNICAL GUIDANCE DOCUMENT

2 This Technical Guidance Document gives guidance on what, in ordinary circumstances, will meet the requirements of Bye-law 5A and Part 11 when carrying out different classes of building work on existing **dwelling**s.

3 In particular guidance is given on the following activities:

- a extensions (see paragraphs 13 to 22)
- b when creating a new **dwelling** or part of a dwelling through a material change of use (paragraphs 23 to 26)
- c material alterations to existing **dwelling**s (paragraphs 27 to 28)
- d the provision of a controlled fitting (paragraphs 30 to 32)
- e the provision or extension of a controlled

service (paragraphs 33 to 46)

- f. the provision or **renovation** of a **thermal element** (paragraphs 47 to 55).

4 Where the activities include building work in a **dwelling** that is part of a mixed use building, account should also be taken of the guidance in Technical Guidance Document 11.2B in relation to those parts of the building that are not **dwelling**s, including any common areas.

It should be noted that dwellings refer to self-contained units. Rooms for residential purposes are not dwellings, and so Technical Guidance Document 11.2B applies to them.

5 The **energy efficiency requirements**, apart from those in bye-law 17B and 17C, apply to work in existing dwellings. In most instances, this will require the Department to be notified of the intended work before the work commences. In certain situations however other procedures apply. These include situations where the work is being carried out under the terms of an approved Competent Persons (CP) scheme. In such cases, in accordance with Bye-law 15 no advance notification to the Department is needed. At the completion of the work, the registered CP provides the building owner with a certificate confirming that the installation has been carried out in accordance with the relevant requirements, and the scheme operator notifies the Department to that effect.

TECHNICAL RISK

6 Building work must satisfy all the technical requirements set out in Bye-laws 5A, 5B, 17B, 17C and Schedule 2 of the Bye-laws. Part 2 (Fire safety), Part 3 (Combustion appliances and fuel storage systems), Part 4 (Site preparation and resistance to moisture), Part 5 (Ventilation), Part 9 (Resistance to the passage of sound), and Part 12 (Electrical safety) are particularly relevant when considering the incorporation of energy efficiency measures.

7 The inclusion of any particular energy efficiency measure should not involve excessive technical risk. BR 262⁵ provides general guidance on avoiding risks in the application of thermal insulation.

HISTORIC BUILDINGS

8 Historic buildings are those registered on the Planning and Environment Ministers register of Buildings and Sites of Architectural, Archaeological and Historic importance.

9 When undertaking work on historic buildings, the aim should be to improve energy efficiency where

⁵ BR 262 *Thermal insulation: avoiding risks*, BRE, 2001.

and to the extent that it is practically possible. This is provided that the work does not prejudice the character of the host building or increase the risk of long-term deterioration to the building fabric or fittings. The guidance given in the English Heritage publication⁶ should be taken into account in determining appropriate energy performance standards for such building works. Particular issues relating to work in historic buildings that warrant sympathetic treatment and where advice from others could therefore be beneficial include:

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

10 In arriving at a balance between historic building conservation and energy efficiency improvements, it would be appropriate to take into account the advice of the Departments' historic buildings officer and building control surveyor.

CALCULATION OF U-VALUES

11 U-values must be calculated using the methods and conventions set out in BR 443⁷, 'Conventions for U-value calculations'.

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

For example: the standard for a replacement rooflight in Table 2 is $2.0\text{W/m}^2 \cdot \text{K}$. This is for the unit assessed in the vertical plane. The performance of a double glazed rooflight in the horizontal plane, based on the guidance given in BR 443, would be adjusted by $0.5\text{W/m}^2 \cdot \text{K}$ to $2.0 + 0.5 = 2.5\text{W/m}^2 \cdot \text{K}$.

⁶ *Building Regulations and Historic Buildings*, English Heritage, 2002

⁷ BR443 *Convention for U-Value Calculations*, BRE 2006

Section 1: Guidance relating to building work

THE EXTENSION OF A DWELLING

Fabric standards

13 Reasonable provision would be for the proposed extension to achieve the following performance standards:

- Controlled fittings that meet the standards set out in paragraphs 30 to 32 of this Technical Guidance Document.
- Newly constructed **thermal elements** that meet the standards set out in paragraphs 47 to 51 of this Technical Guidance Document.
- When working on existing fabric elements that are to become thermal elements a way of complying would be to follow the guidance in paragraphs 52 and 55.

Area of windows, roof windows and doors

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

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

15 In some cases different approaches may be adopted by agreement with the Department in order to achieve a satisfactory level of daylighting. BS 8206⁸ gives guidance on this.

Heating and lighting in the extension

16 Where a **fixed building service** is provided or extended as part of constructing the extension,

reasonable provision would be to follow the guidance in paragraphs 33 to 46.

Optional approaches with more design flexibility

17 More flexibility in the selection of U-values and opening areas than is available by following the guidance in paragraphs 13 and 14 can be obtained by compensation elsewhere in the design. A way of complying would be to show that:

- the area weighted U-value of all the elements in the extension is no greater than that of an extension of the same size and shape that complies with the U-value standards referred to in paragraph 13 and the opening area in paragraph 14; and

The area-weighted U-value is give by the following expression:

$$\frac{\{(U_1 \times A_1) + (U_2 \times A_2) + (U_3 \times A_3) + \dots\}}{\{A_1 + A_2 + A_3 + \dots\}}$$

- the area weighted U-value for each element type is no worse than the value given in column (a) of Table 1; and
- the U-value of any individual element is no worse than the relevant value in column (b) of Table 1.

To minimise condensation risk in localised parts of the envelope. Individual elements are defined as those areas of the given element type that have the same construction details.

18 In the case of windows, doors and rooflights, the assessment should be based on the whole unit (i.e. in the case of a window, the combined performance of the glazing and frame).

19 Where even greater design flexibility is required, reasonable provision would be to use SAP 2005⁹ to show that the calculated energy rate from the **dwelling** with its proposed extension is no greater

Table 1 Limiting U-value standards (W/m²K)

Element	a Area-weighted average U-Value	b Limiting U Value
Wall	0.35	0.70
Floor	0.25	0.70
Roof	0.25	0.35
Windows, roof windows, rooflights and doors ¹	2.2	3.3
Notes:		
¹ See paragraph 12		

⁸ BS 8206-2: 1992 Lighting for buildings. Control of practice for daylighting

⁹ The UK Government's Standard Assessment Procedure for Energy Rating of Dwellings, 2005 edition, SAP 2005, Defra

than for the **dwelling** plus a notional extension built to the standards of paragraphs 13 to 16. In these cases the area-weighted average U-value of each element type should be no worse than the standards set out in column (a) of Table 1, and the U-value of any individual element should be no worse than the values in column (b) of Table 1.

20 If, as part of achieving the standard set out in paragraph 19, improvements are proposed to the existing **dwelling**, such improvements should be implemented to a standard that is no worse than set out in the relevant guidance contained in this Technical Guidance Document. The relevant standards for improving retained thermal elements are as set out in column (b) of Table 5.

Where it is proposed to upgrade, then the standards set out in this Technical Guidance Document are cost effective and should be implemented in full. It will be worthwhile implementing them even if the improvement is more than necessary to achieve compliance. In some cases therefore, the standard of the extended house may be better than that required by paragraph 19 alone. Paragraph 20 ensures that no cost-effective improvement opportunities are traded away.

Conservatories and substantially glazed extensions

21 Where the extension is a **conservatory** that is not exempt by Bye-law 3, then reasonable provision would be to provide:

- a. Effective thermal separation from the heated area in the existing **dwelling**. The walls, doors and windows between the **dwelling** and the extension should be insulated and draught-stripped to at least the same extent as in the existing **dwelling**.

*If a highly glazed extension is not thermally separated from the **dwelling**, then it should be regarded as a conventional extension. Compliance in such cases could be demonstrated using the approach set out in paragraphs 13 to 20.*

- b. Independent temperature and on/off controls to any heating system. Any heating appliance should also conform to the standards set out in paragraph 33.
- c. Glazed elements should comply with the standards given in column (b) of Table 2 and any thermal elements should have U-values that are no worse than the standards given in column (b) of Table 4.

22 Conservatories built at ground level and with a floor area no greater than 20m² are exempt from the Building Bye-laws subject to certain criteria being met. (see schedule 1 to the bye-laws).

MATERIAL CHANGE OF USE

23 Material changes of use involving dwellings are defined in Bye-law 2 as follows:

A material change of use of a building occurs if there is a change in the purposes for which or the circumstances in which a building is used, so that after that change:

- a. the building is used as a dwelling, where previously it was not;
- b. the building contains a flat, where previously it did not;
- c. the building is used as an hotel or a guest house, where previously it was not;
- d. the building is used as an institution, where previously it was not;
- e. the building is used as a public building, where previously it was not;
- f. the building is not a building described in Classes 1 to 7 in Schedule 1, where previously it was;
- g. the building, which contains at least one dwelling, contains a greater or lesser number of dwellings than it did previously;
- h. the building contains a room for residential purposes, where previously it did not;
- i. the building, which contains at least one room for residential purposes, contains a greater or lesser number of such rooms than it did previously;
- j. the building is used as a shop, where previously it was not.
- k. the building is used as an office, where previously it was not.
- l. in the case of a building that is or contains a dwelling or garage, part of the building is used as a habitable room where previously the part was not so used.

24 When carrying out a material change of use, the Reasonable provision would be:

- a. when carrying out a material change of use: or
- b. when a building changes it's energy status to follow the guidance in paragraph 25.

25 In normal circumstances, reasonable provision would be:

- a. Where controlled services or fittings are being provided or extended, to meet the standards set out in paragraphs 27 to 46 of this Technical Guidance Document.
- b. Where the work involves the provision of a **thermal element**, to meet the standards set out in paragraphs 47 to 51 of this Technical Guidance Document.

For the purposes of Building Bye-laws, provision means both new and replacement elements.

- c. Where the work involves the **renovation** of a **thermal element** to meet the guidance in paragraphs 52 to 53 of this Technical Guidance Document.
- d. Any **thermal element** that is being retained should be upgraded following the guidance in paragraphs 54 to 55 of this Technical Guidance Document.
- e. Any existing window (including roof window or rooflight) or door which separates a conditioned space from an unconditioned space or the external environment and which has a U-value that is worse than $3.3\text{W/m}^2 \cdot \text{K}$, should be replaced following the guidance in paragraphs 30 to 32.

Option providing more design flexibility

26 To provide more design flexibility SAP 2005 can be used to demonstrate that the total energy requirement for any **dwelling** in the building as it will become is no greater than if the **dwelling** had been improved following the guidance set out in paragraph 25. In these cases the U-values of any individual element should be no worse than the values in column (b) of Table 1.

MATERIAL ALTERATION

27 Material alterations are defined in Bye-Law 1 as follows.

“**material alteration**” means any work done to a building, or to a controlled service or fitting, or to the fixed electrical installation of a building so that at any stage it could result in –

- a. it no longer complying with requirements 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 3.3, 3.5, 3.6, 6.1, 6.2, 6.5, 8.1, 8.2, 8.3, 8.4, or 12.1 where previously it did so; or
- b. where it previously failed so to comply, its falling further short of compliance with such requirements;

28 When carrying out a material alteration, reasonable provision would be

- a. when the work involves the provision of a **thermal element**, to follow the guidance in paragraphs 48 to 51 of this Technical Guidance Document.

For the purposes of the Building Bye-laws, provision means both new and replacement elements.

- b. when the work involves the renovation of a **thermal element**, to follow the guidance in paragraphs 52 and 53 of this Technical Guidance Document.
- c. where an existing element becomes part of the thermal envelope of the building where previously it was not, to follow the guidance in paragraphs 54 and 55 of this Technical Guidance Document.
- d. when providing controlled fittings, to limit glazing area to reasonable provision and to follow the guidance on controlled fittings given in paragraphs 30 to 32 of this Technical Guidance Document.

Reasonable provision for glazing area depends on the circumstances in the particular case. A way of showing compliance would be to follow the approaches given in paragraphs 14 and 15.

- e. when providing or extending a controlled service, to follow the guidance on controlled services given in paragraphs 33 to 46 of this Technical Guidance Document.

WORK ON CONTROLLED FITTINGS AND SERVICES

29 Controlled services or fittings are defined in Bye-law 1 as follows:

controlled service or fitting means a service or fitting in relation to which Part 3, 6, or 11 of Schedule 2 imposes a requirement;

Table 2 Reasonable provision when working on controlled fittings

Fitting	(a) Standards for new fittings in extensions and buildings undergoing a material change of use	(b) Standard for replacement fittings in an existing dwelling
Window, roof window and rooflight	U-value = $1.8\text{W/m}^2 \cdot \text{K}$ or Window energy rating = Band D; or Centre-pane U-value = $1.2\text{W/m}^2 \cdot \text{K}$	U-value = $2.0\text{W/m}^2 \cdot \text{K}$ or Window energy rating = Band E; or Centre-pane U-value = $1.2\text{W/m}^2 \cdot \text{K}$
Doors with more than 50% of their internal face area glazed	$2.2\text{W/m}^2 \cdot \text{K}$ or centre-pane U-value = $1.2\text{W/m}^2 \cdot \text{K}$	$2.2\text{W/m}^2 \cdot \text{K}$ or centre-pane U-value = $1.2\text{W/m}^2 \cdot \text{K}$
Other doors	$3.0\text{W/m}^2 \cdot \text{K}$	$3.0\text{W/m}^2 \cdot \text{K}$

Controlled fittings

30 Where windows, roof windows, rooflights or doors are to be provided, reasonable provision would be the provision of draught-proofed units whose area-weighted average performance is no worse than given in Table 2. Column (a) applies to fittings provided as part of constructing an extension, or when undertaking a material change of use, column (b) to replacement fittings or new fittings installed in the existing **dwelling**.

31 The U-value or Window Energy Rating of a window, roof window or rooflight fittings can be taken as the value for either:

- a the standard configuration as set out in BR 443; or
- b the particular size and configuration of the actual fitting.

32 SAP 2005 Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.

Controlled services

Heating and hotwater systems

33 Where the work involves the provision or extension of a heating or hot water system or part thereof, reasonable provision would be:

- a. With the exception of the recommendations given in respect of fuel switching, to install an appliance with an efficiency not less than that recommended for its type in the Domestic Building Services Compliance Guide¹⁰ and
- b. to provide controls that meet the minimum control requirements as given in the Domestic Building Services Compliance Guide for the particular type of appliance and heat distribution system.

34 The heating and hot water system(s) should be commissioned so that at completion, the system(s) and their controls are left in working order and can operate efficiently for the purposes of the conservation of fuel and power. In order to demonstrate that the heating and hot water systems have been adequately commissioned, Bye-law 17G states that:

17G Commissioning

- (1) This bye-law applies to a building in relation to which requirement 11.1(b) applies and building work is carried out, but does not apply where the building work consists only of exempt electrical certifiable work (within the meaning of bye-law 15).
- (2) The person carrying out the building work shall give to the Minister a notice confirming

that the relevant fixed building services have been commissioned in accordance with the procedure set out in the relevant technical guidance document.

- (3) The notice shall be given not later than –
 - (a) in every case, the date on which the notice required by bye-law 13(6) in relation to the building work is given; and
 - (b) in the case of certifiable building work (within the meaning of bye-law 15), not more than 30 days after completion of the work.
- (4) For the purposes of this bye-law, the relevant technical guidance document is one concerning pressure testing in a building in order to determine heat gains and losses in the building from its pipes, ducts, and vessels, used for space heating, space cooling and hot water services.

35 The procedure approved by the Minister is set out in the Domestic Building Services Compliance Guide.

36 The notice should include a declaration signed by someone suitably qualified to do so that the manufacturer's commissioning procedures have been completed satisfactorily.

One option would be to engage a member of an approved Competent Persons scheme.

Insulation of pipes and ducts

37 As part of the provision or extension of a heating or hot water service, reasonable provision would be demonstrated by insulating pipes ducts and vessels to standards that are not worse than those set out in the Domestic Building Services Compliance Guide.

The TIMSA Guide¹¹ explains the derivation of the performance standards and how they can be interpreted in practice.

Mechanical ventilation

38 Where the work involves the provision of a mechanical ventilation system or part thereof, reasonable provision would be to install systems no worse than those described in GPG 268¹¹ which also have specific fan powers and heat recovery efficiency not worse than those in Table 3.

39 Mechanical ventilation systems must satisfy the requirements in Part 5.

Mechanical cooling

40 Where the work involves the provision of a fixed household air conditioner, reasonable provision

¹⁰ HM Government Domestic Building Services Compliance Guide, 2010 edition

¹¹ HVAC Guidance for Achieving Compliance with Part L of the Building Regulation, TIMSA 2006

Table 3 Limits on design flexibility for mechanical ventilation systems

System type	Performance
Specific Fan Power (SFP) for continuous supply only and continuous extract only	0.8 litre/s.W
SFP for balanced systems	2.0 litre/s.W
Heat recovery efficiency	66%

would be to provide a unit having an energy efficiency classification equal to or better than class C in Schedule 3 of the labelling scheme adopted under The UK Energy Information (Household Air Conditioners) (No. 2) Regulations 2005¹².

Fixed internal lighting

41 Reasonable provision should be made for dwelling occupiers to obtain the benefits of efficient electric lighting whenever

- a. a **dwelling** is extended; or
- b. a new **dwelling** is created from a material change of use; or
- c. an existing lighting system is being replaced as part of re-wiring works.

The re-wiring works must comply with Part 12.

42 A way of showing compliance would be to provide lighting fittings (including lamp, control gear and an appropriate housing, reflector, shade or diffuser or other device for controlling the output light) that only take lamps having a luminous efficacy greater than 40 lumens per circuit-Watt. Circuit-Watts means the power consumed in lighting circuits by lamps and their associated control gear and power factor correction equipment.

Fluorescent and compact fluorescent lighting fittings would meet this standard. Lighting fittings for GLS tungsten lamps with bayonet cap or Edison screw bases, or tungsten halogen lamps would not.

43 Reasonable provision would be to provide in the areas affected by the building work, fixed energy efficient light fittings that number not less than 80% of all fixed light fittings.

*This assessment should be based on the extension, the newly created **dwelling** or the area served by the lighting system as appropriate to the particular case.*

Installing mains frequency fluorescent lighting in garages may cause dangers through stroboscopic interaction with vehicle engine parts or machine tools. Fluorescent lamps with high frequency electronic ballasts substantially reduce this risk.

44 A light fitting may contain one or more lamps.

45 Lighting fittings in less used areas like cupboards

and other storage areas would not count towards the total. GIL 20¹³ gives guidance on identifying suitable locations for energy efficient luminaires. In some cases, it may be more appropriate to install the energy efficient light fitting in a location that is not part of the building work, e.g. to replace the fitting on the landing when creating a new bedroom through a loft conversion.

Fixed external lighting

*Fixed external lighting means lighting fixed to an external surface of the **dwelling** or any ancillary building supplied from the occupier's electrical system. It excludes the lighting in common areas in blocks of flats and other access-way lighting provided communally*

46 When providing fixed external lighting, reasonable provision should be made to enable effective control and/or the use of efficient lamps such that:

- a. EITHER: Lamp capacity does not exceed 150 Watts per light fitting and the lighting automatically switches off:
 - i. When there is enough daylight; and
 - ii. When it is not required at night; or
- b. the lighting fittings have sockets that can only be used with lamps having an efficacy greater than 40 lumens per circuit-Watt.

Compact fluorescent lamp types would meet the standard in (b), but GLS tungsten lamps with bayonet cap or Edison screw bases, or tungsten halogen lamps would not.

¹² Statutory Instruments SI 2005/1726, the Energy Information (Household Air Conditioners) (No. 2) Regulations 2005

¹³ GIL20 Low energy domestic lighting, EST, 2006

Section 2: Guidance on thermal elements

47 New **thermal elements** must comply with requirement 11.1(a) (i). Work on existing elements is covered by bye-law 5A which states:

5A. -

- (1) Where a thermal element is renovated, such building work shall be carried out as is necessary to ensure that the whole thermal element as so renovated complies with requirement 11.1(a)(i).
- (2) Where a thermal element is replaced, the replacement thermal element shall comply with requirement 11.1(a)(i).

THE PROVISION OF THERMAL ELEMENTS

U-values

48 Reasonable provision for newly constructed **thermal elements** such as those constructed as part of an extension would be to meet the standards set out in column (a) of Table 4. In addition, no individual element should have a U-value worse than those set out in column (b) of Table 1.

49 Reasonable provision for those **thermal elements** constructed as replacements for existing elements would be to meet the standards set out in column (b) of Table 4. In addition, no part of a **thermal element** should have a U-value worse than those set out in column (b) of Table 1.

Continuity of insulation and airtightness

50 The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements and at the edges of elements such as those around window and door openings. Reasonable provision should also be made to reduce unwanted air leakage through the new envelope parts.

51 A suitable approach to showing the requirement has been achieved would be to submit a report signed by a suitably qualified person confirming that appropriate design details and building techniques have been specified, and that the work has been carried out in ways that can be expected to achieve reasonable conformity with the specifications. Reasonable provision would be to:

- a. adopt design details such as those set out in the TSO Robust Details catalogue¹⁴; or

- b. to demonstrate that the specified details deliver an equivalent level of performance using the guidance in BRE IP 1/06¹⁵

RENOVATION OF THERMAL ELEMENTS

52 Where a **thermal element** is being renovated reasonable provision in most cases would be to achieve the standard set out in column (b) of Table 5. Where the works apply to less than 25% of the surface area however reasonable provision could be to do nothing to improve energy performance.

53 If such an upgrade is not technically or functionally feasible or would not achieve a **simple payback** of 15 years or less, the element should be upgraded to the best standard that is technically and functionally feasible and which can be achieved within a **simple payback** of no greater than 15 years. Guidance on this approach is given in Appendix A.

RETAINED THERMAL ELEMENTS

54 Part 11 applies to retained **thermal elements** in the following circumstances:

- a. where an existing **thermal element** is part of a building subject to a material change of use;
- b. where an existing element is to become part of the thermal envelope and is to be upgraded.

55 Reasonable provision would be to upgrade those **thermal elements** whose U-value is worse than the threshold value in column (a) of Table 5 to achieve the U-value given in column (b) of Table 5 provided this is technically, functionally and economically feasible. A reasonable test of economic feasibility is to achieve a **simple payback** of 15 years or less. Where the standard given in column (b) is not technically, functionally or economically feasible, then the element should be upgraded to the best standard that is technically and functionally feasible and delivers a simple payback period of 15 years or less.

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

¹⁴ Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings, Amendment 1, TSO 2002. See www.est.org.uk

¹⁵ IP 1/06 Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, BRE 2006

Table 4 Standards for thermal elements W/m².K

Element ¹	(a) Standard for new thermal elements in an extension	(b) Standard for replacement thermal elements in an existing dwelling, or material change of use to form a dwelling
Wall	0.30	0.35 ²
Pitched roof – insulation at ceiling level	0.16	0.16
Pitched roof – insulation at rafter level	0.20	0.20
Flat roof or roof with integral insulation	0.20	0.25
Floors	0.22 ³	0.25 ³

Notes:

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

Table 5 Upgrading retained thermal elements

Element	(a) Threshold value W/m ² .K	(b) Improved value W/m ² .K
Cavity Wall*	0.70	0.55
Other wall type	0.70	0.35
Floor	0.70	0.25
Pitched roof – insulation at ceiling level	0.35	0.16
Pitched roof – insulation between rafters	0.35	0.20
Flat roof or roof with integral insulation	0.35	0.25

*This only applies 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 'other wall types.'

Section 3: Providing information

56 On completion of the work, in accordance with requirement 11.1(c), the owner of the **dwelling**, should be provided with sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

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

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

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

59 Where a new **dwelling** is created by a material change of use (see paragraphs 23 to 26), an energy rating shall be prepared and fixed in a conspicuous place in the **dwelling** as required by Bye-law 17D, which states that:

- 17D Notice of energy performance to Minister
- (1) This bye-law and bye-law 17E apply where a new dwelling is created by building work or by a material change of use in connection with which building work is carried out.
 - (2) The person carrying out the relevant building work shall calculate a rating of the energy performance of the dwelling, once constructed, in accordance with the relevant technical guidance document and give notice of that rating to the Minister.
 - (3) For the purposes of this bye-law, the relevant technical guidance document is one concerning minimum energy performance requirements for buildings and setting out a methodology of calculation for the energy performance of buildings.
 - (4) The notice shall be given not later than –
 - (a) the date on which the notice required by bye-law 13(6) is given in relation to the building work; and
 - (b) at least 5 days before occupation of the dwelling.

60 The calculation procedure approved by the Minister is the UK Government's Standard Assessment Procedure for Energy rating of Dwellings – 2005 Edition (SAP 2005).

61 Guidance on the preparation of the notices is available from the Department.

Section 4: Definitions

62 For the purpose of this Technical Guidance Document, the following definitions apply.

63 A **conservatory** is an extension to a building which:

- a. has not less than three quarters of its roof area and not less than one half of its external wall area made from translucent material and.
- b. is thermally separated from the **dwelling** by walls, windows and doors with the same U-value and draught-stripping provisions as provided elsewhere in the **dwelling**.

64 Dwelling means a self-contained unit designed to be used separately to accommodate a single household.

65 Energy efficiency requirements means the requirements of Bye-laws 5A, 5B, Part 3A and Part 11 of Schedule 2.

66 Renovation in relation to a thermal element means the provision of a new layer in the thermal element or the replacement of an existing layer, but excludes decorative finishes, and 'renovate' shall be construed accordingly.

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

- a. The marginal additional cost is the additional cost (materials and labour) of incorporating (e.g.) additional insulation, not the whole cost of the work.
- b. the cost of implementing the measure should be based on prices current at the date the proposals are made known to the Department and be confirmed in a report signed by a suitably qualified person.
- c. the annual energy savings should be estimated using SAP 2005.
- d. for the purposes of this Technical Guidance Document, the following energy prices should be used when evaluating the value of the annual energy savings:
 - i. Gas – 8.93p/kWh
 - ii. Electricity – 8.51p/kWh
 - iii. Heating oil – 4.45p/kWh

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.

Energy prices are increasing significantly so dwelling owners may wish to use higher values such as those prevailing when they apply for Building Bye-law approval.

Appendix A: Work to thermal elements

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

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

- a the other parts of Schedule 2; and
- b the general guidance on technical risk relating to insulation improvements contained in BR 262; and
- c if the existing building has historic value, the guidance produced by English Heritage.

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

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

GENERAL GUIDANCE

4 This section lists general guidance documents that provide advice on the **renovation** options available and their application. The listing of any guide, British Standard or other document does not indicate that the guidance contained is approved or applicable to any particular scheme. It is for the applicant and his or her advisors to assess the applicability of the guidance in the context of a particular application. Responsibility for the guidance contained in the documents listed rests with the authors and authoring organisations concerned.

5 In a number of documents (particularly those produced by the Energy Saving Trust's Energy

Efficiency Best Practice in Housing programme) a recommended thermal performance is stated in the form of a U value for different elements and forms of construction. The inclusion of such a performance value in any guidance document in this Appendix does not constitute a performance limit or target for the purposes of this Technical Guidance Document. In all cases the relevant target U values are those contained in Table A1.

General guidance

Stirling, C. (2002) Thermal insulation: Avoiding Risks, Building Research Establishment report BR 262, Watford, Construction Research Communications Ltd.

EST (2004) Energy efficient refurbishment of existing housing, Good Practice guide 15, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

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

EST (2004) Refurbishing Cavity Walled Dwellings, CE 57, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

EST (2004) Refurbishing Dwellings with Solid Walls, CE 58, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

EST (2004) Refurbishing Timber-Framed Dwellings, CE 59, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

Roofs

EST (2002) Refurbishment Site Guidance for Solid-Walled Houses – Roofs, GPG 296, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

Stirling (2000) Insulating roofs at rafter level: sarking insulation, Good Building Guide 37, Watford, Building Research Establishment.

Code of practice for loft insulation: National Insulation Association.

Walls

EST (2000) External Insulation Systems for Walls of Dwellings, GPG 293, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

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

EST (2000) Refurbishment Site Guidance for Solid-Walled Houses – Walls, GPG 297, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

Floors

EST (2002) Refurbishment Site Guidance for Solid-Walled Houses – Ground Floors, GPG 294, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

International, European and British Standards

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

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.

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

BS 5803-5:1985, Thermal insulation for use in pitched roof spaces in dwellings. Specification for installation of man-made mineral fibre and cellulose fibre insulation. Amended 1999 incorporating amendment no.1 1994.

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

Proposed works	Target U-value (W/m ² .K)	Typical construction	Comments (reasonable practicability and cost-effectiveness)
Pitched roof constructions			
Renewal of roof covering – No living accommodation in the roof void – existing insulation less than 50mm, in poor condition and/or likely to be significantly disturbed or removed as part of the planned works	0.16	Provide loft insulation – 250mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joints or loose fill or equivalent. This may be inappropriate if the loft is already boarded out and boarding is not to be removed as part of the work	Assess consideration risk in roof space and make appropriate provision in accordance with the requirements of Part 5 relating to the control of condensation. Additional provisions may be required to provide access to and insulation of services in the roof void.
Renewal of roof covering – Existing insulation in good condition and will not be significantly disturbed by proposed works. Existing insulation thickness 50mm or more but less than 100mm	0.2	Top-up loft insulation to at least 200mm mineral fibre as quilt laid between and across ceiling joists or loose fill or equivalent	Assess condensation risk in roof space and make appropriate provision in line with the requirements of Part 5 relating to the control of condensation. Additional provision may be required to provide insulation and access to services in the roof void. When the loft is already boarded out and the boarding is not to be removed as part of the work, the practicality of insulation works would need to be considered.
Renewal of the ceiling to cold loft space. Existing insulation at ceiling level removed as part of the works	0.16	Provide loft insulation – 250mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill or equivalent	Assess condensation risk in roof space and make appropriate provision in line with the requirements of Part 5 relating to the control of condensation. Additional provision may be required to provide insulation and access to services in the roof void. Where the loft is already boarded out and the boarding is not to be removed as part of the work, insulation can be installed from the underside but target U-Value may not be achievable
Renewal of roof covering – Living accommodation in roof space (room-in-the-roof type arrangement), with or without dormer windows	0.20	Cold structure – Insulation (thickness dependent on material) placed between and above rafters Warm structure – Insulation placed between and above rafters	Access condensation risk (particularly interstitial condensation), and make appropriate provision in accordance with the requirements of Part 5 relating to the control of condensation (Clause 8.4 of BS 5250:2002 and BS EN ISO 13788:2001) Practical consideration with respect to an increase in structural thickness (particularly in terrace dwellings) may necessitate a lower performance target

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

Proposed works	Target U-value (W/m ² .K)	Typical construction	Comments (reasonable practicability and cost-effectiveness)
Dormer window constructions			
Renewal of cladding to side walls	0.35	Insulation (thickness dependent on material) to be placed between and/or fixed to outside of wall studs. Or fully external existing structure depending on construction	Assess condensation risk and make appropriate provision in accordance with the requirements of Part 5
Renewal of roof covering		Follow guidance on improvements to pitched or flat roof as appropriate	Assess condensation risk and make appropriate provision in accordance with the requirement of Part 5
Flat roof construction			
Renewal of roof covering – Existing insulation, if any, less than 100mm, mineral fibre (or equivalent resistance), or in poor condition and likely to be significantly disturbed or removed as part of the planned work	0.25	Insulation placed between and over joists as required to achieve the target U-value - Warm structure	Assess condensation risk and make appropriate provision in accordance with the requirement of Part 5. Also see BS 6229:2003 for design guidance
Renewal of the ceiling to flat roof area. Existing insulation removed as part of the works	0.25	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 5. Also see BS 6229:2003 for design guidance Where ceiling height would be adversely affected, a lower performance target may be appropriate
Solid wall construction			
Renewal of internal finish to external wall or applying a finish for the first time	0.35	Dry-lining to liner 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 the internal floor area. In general it would be reasonable to accept a reduction of no more than 5% of 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 5. This will usually require the provision of a vapour control and damp protection to components. Guidance on the risks involved is provided in Sterling (20020 and, on the technical options, in EST (2003)
Renewal of finishing or cladding to external wall area or elevation (render or other claddings) or applying a finish or cladding for the first time	0.35	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
Cavity wall construction			
Replace wall ties at least one elevation	0.55	Include cavity wall insulation	Assess suitability or cavity for full fill insulation in accordance with requirements of Part 5.

Table A1 Cost-effective U-value targets when undertaking renovation works to thermal elements (cont)

Proposed works	Target U-value (W/m ² .K)	Typical construction	Comments (reasonable practicability and cost-effectiveness)
Ground floor constructions			
Renovation of a solid or suspended floor involving the replacement of screed or a timber floor deck	See comment	<p>Solid floor – replace screed with an insulated floor deck to maintain existing floor level</p> <p>Suspended timber floor – fit insulation between floor joists prior to replacement of floor deck</p>	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 uninsulated floor U-values are already relatively low when compared with wall and roof U-values. When the existing floor U-value is greater than 0.7 w/m ² .K then addition of insulation is likely to be cost effective. Analysis shows that the cost-benefits 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 level, etc)

Documents referred to

BRE **www.bre.co.uk**

BR 262 *Thermal insulation: avoiding risks*, 2001. ISBN 1 86081 515 4

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

Information Paper IP1/06 *Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings*, 2006. ISBN 1 86081 904 4

Simplified Building Energy Model (SBEM) user manual and Calculation Tool. (Available from www.odpm.gov.uk.)

Department of the Environment, Food and Rural Affairs (Defra) **www.defra.gov.uk**

The Government's Standard Assessment Procedure for energy rating of dwellings, SAP 2005. (Available at www.bre.co.uk/sap2005.)

Department of Transport, Local Government and the Regions (DTLR)

Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings, Amendment 1. Published by TSO, 2002. ISBN 0 11753 631 8 (or download from Energy Saving Trust (EST) website on <http://portal.est.org.uk/housingbuildings/calculators/robustdetails/>.)

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

CE66 *Windows for new and existing housing*, 2006.

GPG268 *Energy efficient ventilation in dwellings – a guide for specifiers*, 2006.

GIL20 *Low energy domestic lighting*, 2006.

English Heritage **www.english-heritage.org.uk**

Building Regulations and Historic Buildings, 2002 (revised 2004).

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

L24 *Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations 1992, Approved Code of Practice and Guidance, The Health and Safety Commission*, 1992. ISBN 0 71760 413 6

NBS (on behalf of ODPM) **www.thebuildingregs.com**

HM Government Domestic Building Services Compliance Guide, 2010 Edition

Thermal Insulation Manufacturers and Suppliers Association (TIMSA) **www.timsa.org.uk**

HVAC Guidance for Achieving Compliance with Part L of the Building Regulations, 2006.

Legislation

SI 1991/1620 Construction Products Regulations 1991.

SI 1992/2372 Electromagnetic Compatibility Regulations 1992.

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

SI 1994/3080 Electromagnetic Compatibility (Amendment) Regulations 1994.

SI 1994/3260 Electrical Equipment (Safety) Regulations 1994.

SI 2001/3335 Building (Amendment) Regulations 2001.

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

SI 2006/652 Building And Approved Inspectors Standards referred to

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

Standards referred to

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

