



Office of the
Deputy Prime Minister
Creating sustainable communities

The Building Regulations 2000

Conservation of fuel and power

DRAFT APPROVED DOCUMENT

Subject to amendment prior to final publication



L1B Work in existing buildings

Draft 2006 edition
subject to amendment

L1B

Work in existing dwellings

Please note: this is the current working draft of ADL1B. We recognise the importance of making stakeholders aware in advance of the changes that are due to come into effect on 06 April 2006. We have therefore released this draft document to ensure that stakeholders have adequate time to consider its contents. **It is not, however, a final document and it may be subject to change.** When the final AD is published, we intend to publish a summary of any changes made to this draft.

Text giving an introduction to the main changes to be inserted here.

Requirement

L1.- Reasonable provision shall be made for the conservation of fuel and power in buildings by:

- a. limiting
 - i. heat losses through the fabric of the building;
 - ii. excessive solar gains; and
 - iii. heat gains and losses from pipes, ducts and vessels used for space heating, space cooling and hot water storage;
- b. providing energy efficient and properly commissioned fixed building services with effective controls;
- c. providing to the owner sufficient information about the building and its building services so that the building can be operated and maintained in such a manner as to use no more fuel and power than is reasonable in the circumstances.

Limits on application

With respect to the provision of services or fittings in existing dwellings, this Part applies only to:

- a. the provision of a window, rooflight, roof window, or door (being a door which together with its frame has more than 50% of its internal face area glazed); and
- b. the provision of a space heating or hot water service boiler,

but this limit on application does not apply to the provision of any services or fittings in an extension to an existing dwelling.

Section 0: General guidance

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General guidance

Defined terms

1 In the following text, certain key terms are printed in *bold italicised text*. The meanings of these terms for the purpose of this Approved Document are given in section 4.

Types of work covered by this AD

2 This Approved Document gives guidance on what, in ordinary circumstances, will meet the requirements of Regulation 4A and Part L when carrying out different classes of building work on existing dwellings.

3 In particular, this Approved Document gives guidance relating to the following activities:

- a. extensions (see paragraphs 12 to 18)
- b. when creating a new dwelling through a *material change of use* (paragraphs 19 to 22).
- c. material alterations to existing dwellings (paragraphs 23 to 24)
- d. the provision of a controlled fitting (paragraphs 26 to 27)
- e. the provision or extension of a controlled service (paragraphs 28 to 41)
- f. the provision or renovation of a *thermal element* (paragraphs 43 to 49)

The work should comply with the guidance set out in the relevant sections of this Approved Document and, in all cases, with Section 3 (Providing information).

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 Approved Document L2B in relation to those parts of the building that are not dwellings, including any common areas.

Technical risk

5 Building work must satisfy all the requirements in Schedule 1 of the Building Regulations, but Part B (Fire Safety), Part C (Site preparation and resistance to moisture), Part E (Resistance to the passage of sound), Part F (Ventilation), Part J (Combustion appliances and fuel storage systems) and Part N (Glazing – safety in relation to impact, opening and cleaning) are particularly relevant when considering energy efficiency improvements.

6 The inclusion of any particular energy efficiency measure should not introduce increased technical risk. BR 262¹ provides guidance on avoiding risks in the application of thermal insulation.

Historic buildings

7 Special considerations apply if the building on which the work is to be carried out has special historic or architectural value. Such buildings include:

- a. listed buildings,
- b. buildings of local architectural and historical interest and which are referred to as a material consideration in a local authority's development plan,
- c. those buildings situated in conservation areas, national parks, areas of outstanding natural beauty, and world heritage sites where the local planning authority's conservation officer has advised that special considerations should apply in the particular case.

8 When undertaking work on or in connection with buildings with special historic or architectural value, the aim should be to improve energy efficiency where and to the extent that it is practically possible, 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 publication² should be taken into account in determining appropriate energy efficiency improvements.

9 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 local authority's conservation officer.

Calculation of U-values

10 U-values shall be calculated using the methods and conventions set out in BR 443³, "Conventions for U-value calculations".

¹ Thermal insulation: avoiding risks, BR 262, BRE, 2001

² Building Regulations and historic buildings, English Heritage guidance note, 2002.

³ Conventions for U-value calculations, BR443, BRE, 2002 (under review)

Guidance relating to building work

11 In most instances, following the guidance in this Section would constitute reasonable provision when carrying out different classes of building work.

The extension of a dwelling

Fabric standards

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

- Controlled fittings that meet the standards set out in paragraphs 26 to 27 of this Approved Document.
- Newly constructed thermal elements that meet the standards set out in paragraphs 43 to 45 of this Approved Document.
- Existing opaque fabric that becomes part of the thermal envelope of the building whereas previously it was not should follow the guidance in paragraphs 48 and 49.

Area of windows, roof windows and doors

13 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.

In some cases different approaches may be adopted by agreement with the building control body in order to achieve a satisfactory level of daylighting. BS8206 Part 2 Code of practice for daylighting gives guidance on this.

Heating and lighting in the extension

14 Where a *fixed building service* is provided, extended or replaced as part of constructing the extension, reasonable provision would be to follow the guidance in paragraphs 28 to 41.

Optional approaches with more design flexibility

15 The U-values referred to in paragraph 12 may be varied provided 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 12 and the opening area in paragraph 13 AND
- the U-value of any individual element should be no worse than the value in Table 1.

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

Element	Limiting U-value
Wall	0.70
Floor	0.70
Roof	0.35
Windows, roof windows, rooflights & doors	3.3

To minimise condensation risk. An individual element means an element of the given type that has a U-value different from other elements in the dwelling. In the case of windows, doors and rooflights, only the whole window element (comprising the glazing, frame and sub-frames that fill the opening in the fabric) need be considered. As an example, the U-value for a builder's recess for a meter cupboard should not exceed 0.70W/m²K.

16 Where even greater design flexibility is required, reasonable provision would be to use SAP2005 to demonstrate that the calculated carbon dioxide emission rate from the dwelling with its proposed extension is no greater than for the dwelling plus a notional extension complying with the standards of paragraphs 12 and 13. The procedures in SAP/RdSAP⁴ should be used to estimate the performance of the elements of the existing building where these are unknown.

17 If, as part of achieving the standard set out in paragraph 16, upgrades are proposed to the existing dwelling, such upgrades should be implemented to a standard that is no worse than set out in the relevant guidance contained in this Approved Document.

Where it is proposed to upgrade, then the standards set out in this Approved Document are cost effective and should be implemented in full. In some cases therefore, the standard of the extended house may be better than that required by paragraph 16 alone; paragraph 16 ensures that no cost-effective improvement opportunities are traded away.

Conservatories

18 Where the extension is a *conservatory*, then reasonable provision would be to provide:

- 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 weather-stripped to at least the same extent as in the existing dwelling.
- Independent temperature and on/off controls to any heating system. Any heating appliance should also conform to the standards set out in paragraph 28.

⁴ RdSAP reference

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- c. Glazed elements should comply with the standards given in column (b) of Table 2 and any opaque elements should have U-values that are no worse than the standards given in column (b) of Table 3.

Conservatories with a floor area no greater than 30m² are exempt from the Building Regulations, and so this paragraph only applies to larger conservatories.

Material change of use

19 Material changes of use are defined in Regulation 5 as follows:

For the purposes of paragraph 8(1)(e) of Schedule 1 to the Act and for the purposes of these Regulations, there is a material change of use where there is a change in the purposes for which or the circumstances in which a building is used, so that after that change:

- the building is used as a dwelling, where previously it was not;
- the building contains a flat, where previously it did not;
- the building is used as an hotel or a boarding house, where previously it was not;
- the building is used as an institution, where previously it was not;
- the building is used as a public building, where previously it was not;
- the building is not a building described in Classes I to VI in Schedule 2, where previously it was;
- the building, which contains at least one dwelling, contains a greater or lesser number of dwellings than it did previously;
- the building contains a room for residential purposes, where previously it did not;
- the building, which contains at least one room for residential purposes, contains a greater or lesser number of such rooms than it did previously.

20 When carrying out a *material change of use*, Regulation 6 requires that the building or part thereof subject to the change of use should comply with the applicable requirements of various Parts of Schedule 1, including Part L.

21 In normal circumstances, reasonable provision would be:

- Where controlled services or fittings are being provided or extended, to meet the standards set out in paragraphs 25 to 40 of this Approved Document.
- Where the work involves the *provision* of a *thermal element*, to meet the standards set out in paragraph 43 to 45 of this Approved Document.

- Where *thermal elements* are being *renovated*, to meet the guidance in paragraph 46 to 47 of this Approved Document.
- Any *thermal element* that is being retained should be upgraded following the guidance given in paragraphs 48 and 49 of this Approved Document.
- 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 W/m²K, should be replaced following the guidance in paragraphs 26 to 27.

Option providing more design flexibility

22 To provide more design flexibility, an accredited whole building calculation model such as SAP2005 can be used to demonstrate that the CO₂ emissions from the building as it will become are no greater than if the building had been improved following the guidance set out in paragraph 21.

Material alteration

23 Material alterations are defined in Regulation 3(2) as follows.

3(2) An alteration is material for the purposes of these Regulations if the work, or any part of it, would at any stage result:

- in a building or controlled service or fitting not complying with a relevant requirement where previously it did; or
- in a building or controlled service or fitting which before the work commenced did not comply with a relevant requirement, being more unsatisfactory in relation to such a requirement.”

3(3) In paragraph (2) ‘relevant requirement’ means any of the following applicable requirements of Schedule 1, namely:

- Part A (structure)
- Paragraph B1 (means of warning and escape)
- Paragraph B3 (internal fire spread – structure)
- Paragraph B4 (external fire spread)
- Paragraph B5 (access and facilities for the fire service)
- Part M (access to and use of buildings).

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

- when substantially replacing a *thermal element*, to follow the guidance in paragraphs 43 to 45 of this Approved Document

- b. when renovating a *thermal element*, to follow the guidance in paragraphs 46 to 47 of this Approved 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 48 and 49 of this Approved Document.
- d. when providing a controlled fitting, to follow the guidance on controlled fittings given in paragraphs 26 to 27 of this Approved Document.
- e. when providing or extending a controlled service, to follow the guidance on controlled services given in paragraphs 28 to 41 of this Approved Document.

Work on controlled services or fittings

25 Controlled services or fittings are defined in Regulation 2 as follows:

“controlled service or fitting” means a service or fitting in relation to which Part G, H, J, L or P of Schedule 1 imposes a requirement;

Controlled fittings

26 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, column (b) to replacement fittings or new fittings installed in the existing dwelling.

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

- a. the standard configuration as set out in BR443⁶ OR
- b. the particular size and configuration of the actual fitting.

In all cases, the U-value should be determined with the window in the vertical position.

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 hot systems

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

- a. the installation of an appliance with an efficiency
 - i. not less than that recommended for its type in the Domestic Heating Compliance Guide⁷, AND
 - ii. where the appliance is the primary heating service, an efficiency which is not worse than two percentage points lower than that of the controlled service being replaced. If the new service uses a different fuel, then the efficiency of the new service should be multiplied by the ratio of the CO₂ emission factor of the fuel used in the service being replaced to that of the fuel used in the new service before making this check. The CO₂ emission factors should be taken from Table 12 of SAP 2005. In the absence of specific information, efficiency values may be taken from Table 4a or 4b of SAP 2005.

Table 2 Reasonable provision when working on controlled fittings

Fitting	(a) Standard for new fittings in extensions	(b) Standard for replacement fittings in an existing dwelling
Window, roof window and rooflight	U-value = 1.8 W/m ² K OR Window energy rating ⁵ = Band D OR Centre-pane U-value = 1.2 W/m ² K	U-value = 2.0 W/m ² K OR Window energy rating = Band E OR Centre-pane U-value = 1.2 W/m ² K
Doors with more than 50% of their internal face area glazed	2.2 W/m ² K	2.2 W/m ² K
Other doors	3.0 W/m ² K	3.0 W/m ² K

⁵ Windows for new and existing housing, CE66, EST

⁶ Conventions for U-value calculations, BR443, BRE, 2002 (under review)

⁷ Domestic Heating Compliance Guide in preparation

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This will prevent an existing appliance being replaced by a significantly less carbon efficient one. When fuel switching, if an old 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 $65\% \times (0.265/0.187) = 92.1\%$, and so test (ii) would be satisfied. 0.265 and 0.187 kgCO₂/kWh are the emission factors for oil and dual fuel appliances respectively.

b. the provision of controls that meet the minimum control requirements as given in the Domestic Heating Compliance Guide⁷ for the particular type of appliance and heat distribution system.

29 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, Regulation 20C states that

20C.–(1) This regulation applies to building work in relation to which paragraph L1(b) of Schedule 1 imposes a requirement.

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

(3) The notice shall be given to the local authority not later than the date on which the notice required by regulation 15(4), or regulation 16A(3) is given.

30 The procedure approved by the Secretary of State is set out in the Domestic Heating Compliance Guide⁷.

31 The notice should include a declaration signed by a suitably qualified person that the manufacturer's commissioning procedures have been completed satisfactorily.

Membership of an appropriate Competent person scheme would be a way of showing suitable qualifications. This declaration will eventually form part of the Home Information Pack.

Insulation of pipes and ducts

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

Mechanical ventilation

33 Where the work involves the *provision* of a mechanical ventilation system, reasonable provision would be to install systems that perform no worse than those described in GPG 268⁸.

Mechanical ventilation systems (whether extract only, supply only or balanced systems with or without heat recovery) must satisfy the requirements in Part F.

Mechanical cooling

34 Where the work involves the *provision* of a fixed household air conditioner, reasonable provision 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 Energy Information (Household Air Conditioners) (No. 2) Regulations 2005⁹.

Fixed internal lighting

35 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.

36 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.

⁸ GPG268 Energy efficient ventilation in housing. A guide for specifiers on requirements and options for ventilation (revision as CE124/GPG268 in preparation)

⁹ Statutory Instrument 2005 No. 1726, The Energy Information (Household Air Conditioners) (No. 2) Regulations 2005

37 Reasonable provision would be to provide in the areas affected by the work, fixed energy efficient light fittings to a number not less than the greater of:

- a. one per 25m² of dwelling floor area (excluding garages) or part thereof AND

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

- b. one per four fixed lighting fittings.

A light fitting may contain one or more lamps.

38 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.

39 Lighting fittings in less used areas like cupboards and other storage areas would not count towards the total. GIL 20¹⁰ gives guidance on identifying suitable locations for energy efficient luminaires.

Fixed external lighting

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

41 When providing external fixed 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 150W per light fitting and the lighting automatically switches off:
 - i. When there is enough daylight AND
 - ii. When it is not required at night
- b. OR: 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 this standard, but GLS tungsten lamps with bayonet cap or Edison screw bases, or tungsten halogen lamps would not.

¹⁰ GIL 20, Low energy domestic lighting, BRECSU, 1995 (a new edition is in preparation and may become available)

Section 2: Guidance on thermal elements

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Guidance on thermal elements

42 New thermal elements must comply with requirement L1(a)(i). Work on existing elements is covered by Regulations 4A(1) and 4A(2), which state:

4A.–(1) Where a person intends to carry out work in an existing building which involves the renovation of a thermal element reasonable provision shall be made to improve the energy efficiency of the thermal element.

(2) Where a person intends to carry out work in an existing building which involves the replacement of a thermal element, any new thermal element must be reasonably energy efficient.

The provision of thermal elements

43 Newly constructed *thermal elements* should make reasonable provision for energy efficiency.

- a. 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 3. In addition, no individual element should have a U-value worse than those set out in Table 1.
- b. 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 3.

44 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.

45 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 accredited design details such as those set out in <Title>¹¹OR

Reference 11 is one such catalogue of accredited details. A list of additional approved accreditation schemes may be provided in due course on the ODPM website.

- b. to demonstrate that the specified details deliver an equivalent level of performance using the guidance in *BRE IP 17/01: Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings*¹².

This will allow specialist system suppliers to develop accredited robust details for their unique products.

Table 3 Standards for thermal elements W/m²K

Element	(a) Standard for new elements in an extension	(b) Standard for replacement elements in an existing dwelling
Wall	0.30	0.35 *
Pitched roof – insulation at ceiling level	0.16	0.16
Pitched roof – insulation between rafters	0.20	0.20
Flat roof or roof with integral insulation	0.20	0.25
Floors	0.22	0.25**

Notes:
*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.
**A lesser provision may be appropriate where meeting such a standard would create significant problems in relation to adjoining floor levels.
Reference to roof includes the roof parts of dormer windows.

¹¹ Update of existing Part L robust details

¹² Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, IP17/01, BRE, being updated

Renovation of thermal elements

46 Where more than 25% of the surface area of a *thermal element* is being renovated, a way of showing compliance with the regulation would be to upgrade the whole of the element in question to the standard set out in column (b) of Table 3. In all other cases, it would be unreasonable to expect the thermal element to be made more energy efficient.

47 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 those situations where the payback period is likely to be satisfied is included in Appendix A.

Retained thermal elements

48 *Thermal elements* are subject to Part L. The following guidance applies to:

- a. an existing *thermal element* that is part of a building subject to a *material change of use* (Regulation 6) AND
- b. an existing element that as a result of a *material alteration* (Regulation 4) has become part of the thermal envelope of the building whereas previously it was not

49 Reasonable provision would be to upgrade those thermal elements whose U-value is worse than the threshold value in column (a) of Table 4 to achieve the U-value given in column (b) of Table 4, always 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. In normal circumstances, the standard given in column (b) of Table 4 should be achievable within that economic criterion. In other circumstances, the element should be improved to achieve a U-value that is the better of:

- a. the value in column (a) of Table 4 AND
- b. the best standard that is technically and functionally feasible and which can be achieved within a *simple payback* of no greater than 15 years.

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.

Table 4 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 type”.

Section 3: Providing information

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Providing information

50 On completion of the work, in accordance with requirement L1(c), the owner of the dwelling, should be provided with sufficient information, including operating and maintenance instructions enabling the dwelling and the fixed building services to be operated and maintained in such a manner as to consume no more fuel and power than is reasonable in the circumstances.

51 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 a format that householders can understand. The instructions should be directly related to the particular system(s) installed as part of the work that has been carried out.

The aim is that this information will eventually form part of the Home Information Pack.

52 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).

Definitions

53 For the purpose of this Approved Document, the following definitions apply.

54 A *conservatory* is an extension to a building which has:

- a. 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 building by walls, windows and doors with the same U-value and draught stripping provisions as provided elsewhere in the building.

55 *Fixed building services* is defined in Regulation 2 as:

“fixed building services” means/includes heating systems, hot water systems, fixed internal and external lighting, cooling systems and mechanical ventilation systems.

56 *Renovation* is defined in Regulation 4A(3) as follows, and is adopted for use throughout this Approved Document.

“renovation” means the provision of a new physical layer in the element or the replacement of an existing layer, but excludes paint work.

57 *Simple payback* means the marginal additional cost of implementing an energy efficiency measure (excluding VAT) divided by the value of the annual energy savings achieved by that measure, where:

The marginal additional cost is the additional cost (materials and labour) of incorporating additional insulation and not the whole cost of the work.

- a. the cost of implementing the measure should be based on prices current at the date the proposals are made known to the building control body and be confirmed in a report signed by a suitably qualified person.

An example of a suitably qualified person would be a chartered quantity surveyor.

- b. the annual energy savings should be estimated using an energy calculation tool approved by the Secretary of State pursuant to Regulation 17A.
- c. for the purposes of this Approved Document, the following energy prices should be used when evaluating the value of the annual energy savings -
 - i. Mains gas – 1.63 p/kWh
 - ii. Electricity – 3.65 p/kWh
 - iii. Heating oil – 2.17 p/kWh
 - iv. LPG -- 3.71 p/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.

58 *Thermal element* is defined in Regulation 4A(3) as follows, and is adopted for use throughout this Approved Document.

(3) In this regulation

“thermal element” means:

- a. a wall;
- b. a floor; or
- c. a roof,

which separates the internal conditioned space from the external environment, and in each case includes all parts of the element between the surface bounding the internal conditioned space and the external environment;

This would include walls between (e.g.) the heated part of the dwelling and an unheated garage.

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Work to thermal elements

59 When the work involves the renovation of a *thermal element*, such as the replacement of finishes or coverings, an opportunity exists for 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*.

60 Table A1 sets out the circumstances and the level of performance that would be considered reasonable provision in ordinary circumstances. When dealing with existing dwellings 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:

- the other parts of Schedule 1, and
- the general guidance on technical risk relating to insulation improvements contained in BR 262¹ and
- if the existing building has historic value, the guidance produced by English Heritage².

Where, it is not reasonable, in the context of the scheme, to achieve the performance set out in table B1 the level of performance achieved should be as close as possible thereto.

61 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, without compromising performance with respect to any other part of the regulations.

General guidance

62 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 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.

63 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 approved 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 (2004a) Energy efficient refurbishment of existing housing, Good Practice guide 155, 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 (2004b) Refurbishing Cavity Walled Dwellings, CE 57, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust.

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

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

Roofs

EST (2002a) 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 (2000a) 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 (2000b) Refurbishment Site Guidance for Solid-Walled Houses – Walls, GPG 297, Energy Efficiency Best Practice in Housing, London, Energy Saving Trust

Floors

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

L1B Work in existing dwellings

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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 – Part 5: 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*

Improvement Opportunity	Target U value (W/m ² K)	Typical construction	Comments (reasonableness, practicability and cost effectiveness)
Pitched roof constructions			
Renewal of roof covering – No living accommodation in the roof void – existing insulation (if any) at ceiling level. No existing insulation, existing insulation less than 50mm, in poor condition, and/or likely to be significantly disturbed or removed as part of the planned work.	0.16	Provide loft insulation – 250mm mineral fibre or cellulose fibre as quilt laid between and across ceiling joists or loose fill orequivalent. This may be inappropriate if the loft is already boarded out and the boarding is not to be removed as part of the work.	Assess condensation risk in roof space and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation. Additional provision 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.	0.20	Top up loft insulation to at least 200mm 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 C 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 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 accordance with the requirements of Part C 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 the target U value may not be achievable.

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Table A1 Cost effective U value targets when undertaking renovation works to <i>thermal elements</i>			
Improvement Opportunity	Target U value (W/m ² K)	Typical construction	Comments (reasonableness, practicability and cost effectiveness)
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 dependant on material) placed between and below rafters. Warm structure – Insulation placed between and above rafters.	Assess condensation risk, (particularly interstitial condensation) and make appropriate provision in accordance with the requirements of Part C relating to the control of condensation (Clause 8.4 of BS 5250:2002 and BS EN ISO, 13788:2001). Practical considerations with respect to an increase in structural thickness (particularly in terraced dwellings) may necessitate a lower performance target.
Dormer Window constructions			
Renewal of cladding to side walls.	0.30	Insulation (thickness dependant on material) placed between and/or fixed to outside of wall studs. Or fully external to existing structure depending on construction.	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C.
Renewal of roof covering.	—	Follow guidance on improvement to pitched or flat roofs as appropriate.	Assess condensation risk and make appropriate provision in accordance with the requirements of Part C.
Flat roof constructions			
Renewal of roof covering – Existing insulation, if any, less than 100mm, 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 requirements of Part C. 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 C. Also see BS 6229:2003 for design guidance. Where ceiling height would be adversely affected, a lower performance target may be appropriate.

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

Improvement Opportunity	Target U value (W/m ² K)	Typical construction	Comments (reasonableness, practicability and cost effectiveness)
Solid wall constructions			
Renewal of internal finish to external wall or applying a finish for the first time.	0.30	<p>Dry-lining to inner face of wall – insulation between studs fixed to wall to achieve target U value – thickness dependent on insulation and stud material used.</p> <p>Insulated wall board fixed to internal wall surface to achieve the required U value – thickness dependent on material used.</p>	<p>Assess the impact on 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.</p> <p>This is likely to be a problem where air-based insulants (mineral fibre etc.) are appropriate. In such cases the U value target may have to be increased to 0.35 or above depending on the circumstances.</p> <p>Assess condensation and other moisture risks and make appropriate provision in accordance with the requirements of Part C. This will usually require the provision of a vapour control and damp protection to components. Guidance on the risks involved is provided in Sterling (2002) and, on the technical options, in EST (2003)</p>
Renewal of finish or cladding to external wall area or elevation (render or other cladding) or applying a finish or cladding for the first time.	0.30	External insulation system (PU foam, EPS, mineral fibre) with rendered finish or cladding to give required U value.	Assess technical risk and impact of increased wall thickness on adjoining buildings.
Cavity wall constructions			
Replace wall ties to at least one elevation.	0.55	Include blown fibre cavity wall insulation.	Assess suitability of cavity for full fill insulation in accordance with requirements of Part C.

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Table A1 Cost effective U value targets when undertaking renovation works to <i>thermal elements</i>			
Improvement Opportunity	Target U value (W/m ² K)	Typical construction	Comments (reasonableness, 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>	<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.</p> <p>Where the existing floor U-value is greater than 0.70W/m²K, then the addition of insulation is likely to be cost effective. Analysis shows that the cost benefit curve for the thickness of added insulation is very flat, and so a target U-value of 0.25W/m²K is appropriate subject to other technical constraints (adjoining floor levels etc).</p>

Approved Documents

- Approved Document A – Structure: 2004 Edition
- Approved Document B – Fire safety: 2000 Edition, amended 2000 and 2002
- Approved Document C – Site preparation and resistance to moisture: 1992 Edition, second impression (with amendments) 1992, further amended 2000
- Approved Document D – Toxic substances: 1985 Edition, amended 1992, further amended 2000
- Approved Document E – Resistance to the passage of sound: 2003 Edition, amended July 2004
- Approved Document F – Ventilation: 2006 Edition
- Approved Document G – Hygiene: 1992 Edition, second impression (with amendments) 1992, further amended 2000
- Approved Document H – Drainage and waste disposal: 2002 Edition
- Approved Document J – Combustion appliances and fuel storage systems: 2002 Edition
- Approved Document K – Protection from falling, collision and impact: 1998 Edition, amended 2000
- Approved Document L1A – Conservation of fuel and power in new dwellings: 2006 Edition
- Approved Document L1B – Conservation of fuel and power in existing dwellings: 2006 Edition
- Approved Document L2A – Conservation of fuel and power in new buildings other than dwellings: 2006 Edition
- Approved Document L2B – Conservation of fuel and power in existing buildings other than dwellings: 2006 Edition
- Approved Document M – Access and facilities for disabled people: 2004 Edition
- Approved Document N – Glazing – safety in relation to impact, opening and cleaning: 1998 Edition, amended 2000
- Approved Document P – Electrical safety: 2004 Edition
- Approved Document to support regulation 7 – materials and workmanship: 1999 Edition, amended 2000

