



The Building Regulations 2000

## Conservation of fuel and power

**DRAFT APPROVED DOCUMENT**

Subject to amendment prior to final publication



**L2B Work in existing buildings  
that are not dwellings**

**Draft 2006 edition**  
subject to amendment

# L2B

## Work in existing buildings that are not dwellings

Please note: this is the current working draft of ADL2B. 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 are given in section 5.

### 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, Regulation 17D and Part L when carrying out work on existing buildings other than dwellings.

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

- a. Consequential improvements (see paragraphs 12 to 16)
- b. An extension (see paragraphs 18 to 27)
- c. A material change of use (see paragraphs 28 to 31)
- d. A material alteration (see paragraphs 32 to 33).
- e. The provision or extension of a controlled service or fitting (see paragraphs 34 to 68)
- f. The provision or renovation of a *thermal element* (see paragraphs 69 to 74)

The work should comply with the guidance set out in the relevant sections of this Approved Document and, in all cases, with Section 4 (Providing information).

**4** In certain types of work in relation to an existing building, it may be more appropriate to utilise the guidance from the other Part L Approved Documents. The following sub-paragraphs identify some of the circumstances in which this might be appropriate.

- a. Where the work involves the first fitting out of a building where the completion certificate for that building was based on the guidance in ADL2A(2006). In such cases, the initial *fit-out works* should comply with the guidance in ADL2A as if it were part of the initial construction work. In all other cases, this ADL2B would apply to *fit-out works*.

- b. Large extensions (as defined in paragraph 20 of this Approved Document) should be carried out in accordance with the guidance in ADL2A. However, the consequential improvement required by Regulation 17D applies, and the guidance set out in this Approved Document would be relevant.
- c. Where the work involves constructing an extension to an existing building using external fabric sub-assemblies that have been obtained from a centrally held stock or from the disassembly or relocation of buildings at other premises, ADL2A would apply. However, any consequential improvement required by Regulation 17D would still apply, in which case the guidance set out in this Approved Document would be relevant.
- d. Where the work involves a building that either before the work or after the work is completed contains one or more dwellings, the guidance in Approved Document L1B would apply to the dwellings.

*It should be noted that dwellings refer to self-contained units. Buildings containing “rooms for residential purposes” (see Regulation 2(2)) such as nursing homes, student accommodation and similar are not dwellings, and so ADL2B applies*

**5** The work should comply with the guidance set out in the relevant sections of this Approved Document, and in all cases, with Section 4 covering the provision of information.

### Technical risk

**6** 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.

**7** The inclusion of any particular energy efficiency measure should not introduce increased technical risk. BR 262<sup>1</sup> provides guidance on avoiding risks in the application of thermal insulation.

<sup>1</sup> Thermal insulation: avoiding risks, BR 262, BRE, 2001

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**Historic buildings**

**8** 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.

**9** 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 to do so, 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 publication<sup>2</sup> should be taken into account in determining appropriate energy efficiency improvements.

**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 local authority's conservation officer.

**Calculation of U-values**

**11** U-values shall be calculated using the methods and conventions set out in BR443<sup>3</sup>, "Conventions for U-value calculations".

<sup>2</sup> Building Regulations and historic buildings, English Heritage guidance note, 2002.

<sup>3</sup> Conventions for U-value calculations, BR443, BRE, 2002 (under review)

## Section 1: Consequential improvements

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## Consequential improvements

12 Regulation 17D states:

17D.–(1) This regulation applies to a building with a total useful floor area over 1,000m<sup>2</sup> where the proposed building work includes:

- a. an extension; or
- b. the initial provision of any fixed building services; or
- c. an increase to the installed capacity of any fixed building services.

(2) Where this regulation applies, such work, if any, shall be carried out as is necessary to ensure that the building complies with the requirements of Part L of Schedule 1.

(3) This regulation shall not require anything to be done that is not technically, functionally and economically feasible.

13 To comply with Regulation 17D, **consequential improvements** should be made to improve the energy efficiency of the whole building, following the guidance set out in paragraphs 15 to 16.

14 In addition, the **principal works** should comply with the guidance set out in this Approved Document. In particular,

- a. any **building work** should comply with Part L; the guidance set out in Section 2 of this Approved Document is relevant.
- b. any work involving **thermal elements** should comply with Regulation 4A; the guidance set out in Section 3 of this Approved Document is relevant.

## Consequential improvements

15 Reasonable provision for consequential improvements would be:

- a. Where there is an increase in the installed capacity of heating or cooling plant
  - i. any **thermal element** within the area served by the plant with the increased capacity and which has a U-value worse than that set out in column (a) of Table 7, should be upgraded following the guidance in paragraph 75 AND

- ii. any existing window (including roof window or rooflight, but excluding a **display window**) or door (excluding **high usage entrance door**) within the area served by the plant with the increased capacity and which has a U-value that is worse than 3.3 W/m<sup>2</sup>K should be replaced following the guidance in paragraphs 35 to 37.

*This requires all poor envelope parts to be improved when there is an increased demand for heating and or cooling, and is not limited by the 10% rule in paragraph 16. Paragraph 75 sets out what will ordinarily be cost effective.*

- b. to include additional measures from the following list to the extent set out in paragraph 16:

*The cost of upgrading of poorly insulated envelope parts may exceed the limiting value set in paragraph 16 – in which case, no additional improvement would be required.*

- i. For any heating system more than fifteen years old, to upgrade it by the **provision** of new plant or improved controls.
  - ii. For any cooling system more than fifteen years old, to upgrade it by the **provision** of new plant or improved controls.
  - iii. For any air handling system more than fifteen years old, to upgrade it by the **provision** of new plant or improved controls.
  - iv. For any general lighting system serving an area greater than 100m<sup>2</sup> and which has an average lamp efficacy of less than 40 lamp-lumens per circuit watt, to upgrade it by the **provision** of new luminaires or improved controls.
  - v. To install energy metering following the guidance given in GIL 65<sup>4</sup>.
  - vi. If the building has less than 10% of its energy demand provided by a low or zero carbon energy system, to increase the provision of low or zero carbon energy system, provided the system would achieve a **simple payback** of seven years or less. The ODPM publication, “Low or Zero Carbon Energy Sources – Strategic Guide”<sup>5</sup>, gives advice on appraising the feasibility of such systems.
- c. If the existing building is already at a reasonable standard of energy efficiency such that none of the criteria in paragraphs 15a) or 15b) apply, no consequential improvement is required.

<sup>4</sup> *Metering energy use in non-domestic buildings*, GIL 65, Action Energy, 2004GIL 65 <title>

<sup>5</sup> *Low or Zero Carbon Energy Sources – Strategic Guide*, interim publication on ODPM website

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*When there is an increase in energy intensity in a building (or part thereof), the upgrading of poorly insulated thermal elements must be carried out; additional improvements should then be carried out such that the total value of the improvement works reaches the threshold defined in paragraph 16, unless the building is already up to a reasonable standard*

**16** The extent of consequential improvement required by Regulation 17D is limited to works that are technically, functionally and economically feasible.

- a. Paragraph 75b) sets out what will ordinarily be economically feasible for work required by paragraph 15a).
- b. Work required by paragraph 15b) will be economically feasible where the value of the consequential improvements is not more than 10% of the value of the *principal works*. The value of the *principal works* and the value of the proposed *consequential improvements* 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 as part of the submission.

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

## Section 2: Guidance relating to building work

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#### Guidance relating to building work

**17** This Section gives guidance on what, in ordinary circumstances, would be acceptable as reasonable provision for the conservation of fuel and power when carrying out different classes of building work on existing buildings other than dwellings.

#### Extensions

**18** For the purposes of this Approved Document, in addition to conventional extensions, reference to extension includes enclosing existing structures that are partially enclosed (e.g. covering over a courtyard or enclosing an extended roof).

**19** Because the construction of an extension triggers the requirement for a consequential improvement, the guidance in Section 1 should be followed in addition to the following specific guidance.

#### Large extensions

**20** Where the proposed extension has a total floor area that is both:

- Greater than 100m<sup>2</sup> AND
- Greater than 25% of the floor area of the existing building.

then the work should be regarded as a new building and the guidance in ADL2A followed.

#### Conservatories

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

- Effective thermal separation from the conditioned area in the existing building. The walls, doors and windows between the building and the extension should be insulated and weather-stripped to at least the same extent as in the existing building.

- Fixed building services that conform to the standards set out in paragraphs 45 to 68.
- Independent controls to any fixed building services.
- Glazed elements should achieve standards that are no worse than those given in column (b) of Table 3 and any opaque elements should have U-values that are no worse than the standards given in column (b) of Table 6.

*Conservatories with a floor area no greater than 30m<sup>2</sup> are exempt from the Building Regulations, and so this paragraph only applies to larger conservatories.*

#### Other extensions

##### Fabric standards

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

- Controlled fittings that meet the standards set out in paragraphs 35 to 37 of this Approved Document.
- Newly constructed *thermal elements* that meet the standards set out in paragraphs 70 to 72 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 paragraph 75.

**23** The area of windows and rooflights in the extension should not exceed the values given in Table 1, unless a greater proportion of glazing is present in the part of the building to which the extension is attached. In such cases, reasonable provision would be to limit the proportion of glazing in the extension so that it is no greater than the proportion that exists in the part of the building to which it is attached.

Table 1 Opening areas in the extension

Building type	Windows and personnel doors as % of exposed wall	Rooflights as % of area of roof
Residential buildings where people temporarily or permanently reside	30	20
Places of assembly, offices and shops	40	20
Industrial and storage buildings	15	20
Vehicle access doors and display windows and similar glazing	As required	N/A

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Building services systems in the extension

**24** Where *fixed building services* are provided or extended as part of constructing the extension, reasonable provision would be to follow the guidance in paragraphs 38 to 68.

**Optional approaches with more design flexibility**

**25** The U-values given in paragraph 22 may be varied provided that

- a. the area weighted U-value of all the elements in the extension is no greater than that of an extension of the same size and shape that complies with the U-value standards in paragraph 22 and the opening areas in paragraph 23 AND
- b. the U-value of any individual element should be no worse than the value in Table 2.

*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/m<sup>2</sup>K.*

**26** Where even greater design flexibility is required, reasonable provision would be to use an accredited calculation tool to demonstrate that the calculated CO<sub>2</sub> emissions from the building and proposed extension is no greater than for the building plus a notional extension complying with the standards of paragraphs 22 and 23. For this calculation, the building used in the calculation of both the notional and actual extension should incorporate the improvements proposed to meet the requirement for a *consequential improvement* (see paragraphs 15 and 16).

**27** Where additional upgrades are proposed in the actual building to compensate for lower performance in the extension, then 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 building may be better than that required by paragraph 26 alone; paragraph 26 ensures that no cost-effective improvement opportunities are traded away.*

Table 2 Limiting U-value standards (W/m<sup>2</sup>K)

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

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#### Material change of use

**28** Material change of use is 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.

**29** 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.

**30** 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 34 to 68 of this Approved Document.
- b. Where the work involves the *provision* of a *thermal element*, to meet the standards set out in paragraph 70 to 72 of this Approved Document.
- c. Where *thermal elements* are being *renovated*, to meet the guidance in paragraph 73 to 74 of this Approved Document.
- d. Any *thermal element* that is being retained should be upgraded following the guidance given in paragraph 75 of this Approved 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 W/m<sup>2</sup>K, should be replaced following the guidance in paragraphs 35 to 37. *Display windows* and *high usage entrance doors* are not required to follow this guidance.

#### Option providing more design flexibility

**31** To provide more design flexibility, an accredited whole building calculation model can be used to demonstrate that the energy efficiency standard of the building as it will become is no worse than if the building had been improved following the guidance set out in paragraph 30.

#### Material alteration

**32** 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:

- a. in a building or controlled service or fitting not complying with a relevant requirement where previously it did; or
- b. 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).

**33** When carrying out a material alteration, reasonable provision would be

- a. when substantially replacing an element of opaque fabric, to follow the guidance in paragraphs 70 to 72 of this Approved Document
- b. when renovating an element of opaque fabric, to follow the guidance in paragraphs 73 to 74 of this Approved Document.

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- c. where an existing element becomes part of the thermal envelope of the building whereas previously it was not, to follow the guidance in paragraph 75.
- d. when providing a controlled fitting, to follow the guidance on controlled fittings given in paragraphs 35 to 37 of this Approved Document.
- e. when providing or extending a controlled service, to follow the guidance on controlled services given in paragraphs 38 to 68 of this Approved Document.

**Controlled fittings**

**35** Where windows, roof windows, rooflights or doors are to be provided, reasonable provision would be draught-proofed units whose area-weighted average performance is no worse than given in Table 3. Column (a) applies to fittings provided as part of constructing an extension, column (b) to replacement fittings or new fittings installed in the existing building.

**36** The U-value for windows can be taken as that for:

- a. the standard configuration referred to in BB443 OR
- b. for the specific size and configuration of the actual window.

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*

**Work on controlled services or fittings**

**34** A controlled service or fitting is defined in Regulation 2(1) 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;*

Table 3 Standards for controlled fittings W/m<sup>2</sup>K

Fitting	(a) Standard for new fittings in extensions	(b) Standard for replacement fittings in an existing building
Windows, roof windows and rooflights *	1.8 for the whole unit OR 1.2 centre pane	2.2 for the whole unit OR 1.2 centre pane
Alternative option for windows in buildings that are essentially domestic in character **, a window energy rating <sup>6</sup> of	Band D	Band E
Entrance doors for people where the door has more than 50% of its internal face area glazed	2.2	2.2 for the whole unit OR 1.2 centre pane
Entrance doors for people where the door has no more than 50% of its internal face area glazed	3.0	3.0
<b>High usage entrance doors</b> for people	6.0	6.0
Vehicle access and similar large doors	1.5	1.5
Roof ventilators (including smoke extract ventilators)	6.0	6.0
Notes:		
* Display windows are not required to meet the standard given in this table		
** For example, student accommodation, care homes and similar uses where the occupancy levels and internal gains are essentially domestic in character.		

<sup>6</sup> Windows for new and existing housing, CE66, EST

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**37** In certain classes of building with high internal gains, a less demanding U-value for glazing may be an appropriate way of reducing overall CO<sub>2</sub> emissions. If this case can be made, then the average U-value for windows, doors and rooflights can be relaxed from the values given in Table 3, but the value should not exceed 2.7W/m<sup>2</sup>K.

#### Controlled services

##### Controlled services – general

**38** Where the work involves the *provision* of a controlled service, reasonable provision would be to

- a. Provide new services that meet reasonable standards of energy efficiency, which in normal circumstances would be an efficiency not less than:
  - i. The efficiency set out in paragraphs 45 to 68 AND
  - ii. For central plant (i.e. boilers, chillers and main air handling plant), an efficiency that is not less 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 CO<sub>2</sub> 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 (see Table 1 in ADL2A for CO<sub>2</sub> emission factors).

*This will prevent an existing low carbon component being replaced by a lesser provision. When fuel switching, if an existing chiller with a CoP of 2.5 is replaced by an absorption chiller with a CoP of 0.8 but fired by waste heat, the equivalent efficiency of the absorption chiller would be  $0.8 \times (0.422/0.018) = 18.8$ , and so test (ii) would be satisfied. 0.422 and 0.018 kgCO<sub>2</sub>/kWh are the emission factors for electricity and waste heat respectively.*

- b. The new systems should be provided with appropriate controls to achieve reasonable standards of energy efficiency. In normal circumstances, the following features should be provided on each system:
  - i. The building services systems should be subdivided into separate control zones to correspond to each area of the building that has a significantly different solar exposure, occupancy period, or type of use.
  - ii. Each separate control zone should be capable of independent switching and control set-point.
  - iii. The provision of the service should respond to the requirements of the space it serves. If both heating and cooling are provided, they should be controlled so as to not operate simultaneously.

- iv. Central plant serving the zone-based systems should only operate as and when required. The default condition should be off.
- v. In addition to these general control requirements, the systems should meet specific control requirements and basic efficiency criteria as set out in the service-specific paragraphs beginning at paragraph 45.
- c. Demonstrate the new service has been effectively commissioned (see paragraphs 39 to 43) AND
- d. Demonstrate that reasonable provision of energy meters has been made for effective monitoring of the performance of newly installed plant (see paragraph 44) AND
- e. Demonstrate that the relevant information has been recorded in a new log book or incorporated into an update of the existing one as described in paragraphs 77 to 80.

##### Commissioning

**39** The building services systems 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.

**40** The procedure approved by the Secretary of State is set out in:

- a. CIBSE Commissioning Code M on Commissioning Management<sup>7</sup> AND

*This provides guidance on the overall process and includes a schedule of all the relevant guidance documents relating to the commissioning of specific building services systems.*

- b. The procedures for leakage testing of ductwork set out in paragraph 42 and 43.

<sup>7</sup> Commissioning management, Commissioning Code M, CIBSE, 2003.

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- 41** The notice should include a declaration signed by a suitably qualified person confirming that
- a. a commissioning plan has been followed so that every system has been inspected and commissioned in an appropriate sequence and to a reasonable standard.
  - b. the results of tests confirm that the performance is reasonably in accordance with the proposed building designs, including written commentaries where excursions are proposed to be accepted.

*Membership of the Commissioning Specialists Association or the Commissioning group of the HVCA could be a way of demonstrating suitability to sign the report in respect of the HVAC systems. For lighting control systems, suitability would be demonstrated by <text to be added>.*

**42** Leakage testing should be carried out in accordance with the procedures set out in HVCA DW/143<sup>8</sup> on systems served by fans with a design flow rate greater than 1m<sup>3</sup>/s and for those sections of ductwork where the pressure class is such that DW/143 recommends testing.

*Membership of the HVCA specialist ductwork group or the Association of Ductwork Contractors and Allied Services could be a way of demonstrating suitable qualifications for this testing work.*

**43** If a ductwork system fails to meet the leakage standard, remedial work should be carried out as necessary and new sections tested as set out in DW/143.

Metering

**44** When installing new building services equipment, appropriate energy meters should be included to facilitate effective monitoring of performance. GIL 65<sup>4</sup> provides appropriate guidance in this respect.

**Guidance on specific fixed building services Heating and hot water systems**

**45** Reasonable provision for the performance of heating and hot water systems would be

- a. the use of heat-raising appliance(s) with an efficiency not less than that recommended for their type in the Non-domestic Heating Compliance Guide<sup>9</sup>, AND
- b. the provision of controls that meet the minimum control requirements as given in the Non-domestic Heating Compliance Guide<sup>9</sup> for the particular type of appliance and heat distribution system.

**46** The compliance checklists included in the Non-domestic Heating Compliance Guide are a useful tool in demonstrating that reasonable provision has been made.

Cooling plant

**47** Where it is practical and cost effective to do so, measures to reduce cooling loads (e.g. through improved solar control or more efficient lighting) should be incorporated as part of any work to replace a chiller. BR 364<sup>10</sup> offers guidance on solar control strategies.

**48** Reasonable provision for the performance of cooling plant would be

- a. the use of equipment with an efficiency not less than that recommended for its type in the Non-domestic Air Conditioning Compliance Guide<sup>11</sup>, AND
- b. the provision of controls that meet the minimum control requirements as given in the Non-domestic Air Conditioning Compliance Guide<sup>11</sup> for the particular type of equipment and distribution system.

**49** The compliance checklists included in the Non-domestic Air Conditioning Guide are a useful tool in demonstrating that reasonable provision has been made.

Air handling plant

**50** Where air handling plant is provided or replaced, reasonable provision would be to provide installations whose specific fan power at the design flow rate is no worse than the values in Table 4.

Table 4 Limiting specific fan power standards (W/ls<sup>-1</sup>)

System type	Specific fan power (W/ls <sup>-1</sup> )
Central mechanical ventilation including heating, cooling and heat recovery	3.0
Central mechanical ventilation with heating and cooling	2.5
All other central systems	2.0
Local ventilation with no attached ductwork	0.5
Local ventilation with attached ductwork	1.5
Fan coil units (rating weighted average)	0.8

8 A practical guide to ductwork leakage testing, DW/143, HVCA, 2000  
 9 Non-domestic Heating Compliance Guide, ICOM, in preparation  
 10 Solar shading of buildings, BR 364, CRC Ltd, 1999  
 11 Non-domestic air-conditioning compliance guide, FETA, in preparation

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**51** In addition, the system should be capable of achieving a specific fan power at 25% of design flow rate which is no greater than that achieved at 100% design flow rate.

**52** In order to aid commissioning and to provide flexibility for future changes of use, reasonable provision would be to equip with variable speed drives those fans that are rated at more than 1100 W and which form part of the environmental control system(s).

*Smoke control fans and similar therefore fall outside this guidance*

**53** In order to limit air leakage, ventilation ductwork should be constructed and assembled so as to be reasonably airtight. One way of achieving this is to comply with the specifications given in HVCA DW144<sup>12</sup>.

*Membership of the HVCA specialist ductwork group or the Association of Ductwork Contractors and Allied Services could be a way of demonstrating suitable qualifications.*

#### Insulation of pipes, ducts and vessels

**54** Provision should be made for insulating hot and chilled water pipework and storage vessels, refrigerant pipework and ventilation ductwork to conserve energy and to maintain the temperature of the heating or cooling service.

**55** Reasonable provision would be demonstrated by following the guidance in the TIMSA HVAC Insulation Guide<sup>13</sup>.

#### Fixed internal lighting

**56** Where lighting systems serving more than 100m<sup>2</sup> of floor area are to be replaced, reasonable provision would be to install new systems that meet the criteria in paragraphs 57 to 68 inclusive, depending on the use of the space.

#### General lighting efficacy in office, industrial and storage areas in all building types

**57** For the purposes of this Approved Document, office includes those areas that involve predominantly desk-based tasks, including classrooms, seminar rooms and conference rooms, including those in schools.

**58** Reasonable provision would be to provide lighting with an average efficacy of not less than 45 luminaire-lumens/circuit-watt as averaged over the whole area of these space types in the building.

*This allows design flexibility to vary the light output ratio of the luminaire and the luminous efficacy of the lamp.*

The average luminaire-lumens/circuit-watt is calculated by:

(Lamp lumens x LOR) summed for all luminaires in the relevant areas of the building, divided by the total (circuit watts x control factor) for all the luminaires

where

Lamp lumens = the sum of the average initial (100 hour) lumen output of all the lamp(s) in the luminaire and

LOR = the light output ratio of the luminaire, which means the ratio of the total light output of a luminaire under stated practical conditions to that of the lamp or lamps contained in the luminaire under reference conditions.

Control factor = the factor applicable when automatic controls substantially reduce the power consumption of the luminaire when electric light is not required (see commentary at paragraph 63, which includes values of the control factor for use in the above formula).

*The controls factor is included in ADL2B to allow greater flexibility and to encourage better controls.*

#### General lighting efficacy in all other types of space

**59** For electric lighting systems serving other than office or storage space, it may be appropriate to provide luminaires for which photometric data is not available and/or are lower powered and use less efficient lamps. For such spaces, the requirements would be met if the installed lighting has an average initial (100 hour) lamp plus ballast efficacy of not less than 50 lamp lumens per circuit-watt

#### Lighting controls for general lighting in all types of space

**60** Lighting controls should be provided so as to avoid unnecessary lighting during the times when daylight levels are adequate or when spaces are unoccupied. However, the operation of automatically switched lighting systems should be the subject of a risk assessment for safety and suitability.

**61** Reasonable provision would be local switches in easily accessible positions within each working area or at boundaries between working areas and general circulation routes that are operated by the deliberate action of the occupants (referred to as occupant control), either manually or remotely.

*Manual switches include rocker switches, push buttons and pull cords. Remote switches include wireless transmitters and telephone handset controls. For the purposes of Approved Document L, reference to switches includes dimmer switches and switching includes dimming. As a general rule, dimming should be effected by reducing rather than diverting the energy supply.*

<sup>12</sup> Specifications for sheet metal ductwork, DW/144, HVCA, 1998

<sup>13</sup> HVAC Insulation Guide, TIMSA, in preparation

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**62** The distance on plan from any local switch to any luminaire it controls should generally be not more than six metres, or twice the height of the light fitting above the floor if this is greater. Where a space is a **daylit space** served by side windows, the perimeter row of lighting should in general be separately switched.

**63** Occupant control of local switching can be supplemented by other controls such as automatic systems which:

- a. switch the lighting off when they sense the absence of occupants or
- b. either dim or switch the lighting off when there is sufficient daylight.

Table 5 gives the control factors for such enhanced controls, which can be used as part of achieving the luminaire efficacy set out in paragraph 58.

*When installed in appropriate locations, such enhanced control systems will deliver an energy benefit that can be traded against other aspects of the lighting system using the factors listed in Table 6.*

**64** An alternative way of meeting the requirement would be to follow the recommendations in BRE Digest XXX<sup>14</sup>.

#### Display lighting in all types of space

**65** Reasonable provision for **display lighting** would be to demonstrate that the installed display lighting has an average initial (100 hour) efficacy of not less than 15 lamp-lumens per circuit-watt. In calculating this efficacy, the power consumed by any transformers or ballasts should be taken into account.

**66** Spaces where **display lighting** is present would normally be expected to also have general lighting for circulation and for purposes of cleaning and restocking outside public access hours. Paragraphs 56 to 59 apply to this general lighting, depending on the type of building.

#### Controls for display lighting in all types of space.

**67** A way of meeting the requirement would be to connect **display lighting** in dedicated circuits that can be switched off at times when people will not be inspecting exhibits or merchandise or being entertained. In a retail store, for example, this could include timers that switch the **display lighting** off outside store opening hours, except for displays designed to be viewed from outside the building through display windows.

#### Emergency escape lighting and process lighting

**68** **Emergency escape lighting** and **specialist process lighting** are not subject to the requirements of Part L.

Table 5 Luminaire control factors

Control function	Control factor
(a) The luminaire is in a <b>daylit space</b> and its light output is controlled by photoelectric switching or dimming control, with or without manual override.	0.90
(b) The luminaire is in a space that is likely to be unoccupied for a significant proportion of working hours and where a sensor switches off the lighting in the absence of occupants but switching on is done manually, except where this would be unsafe	0.90
(c) Circumstances (a) and (b) combined	0.85
(d) None of the above	1.00

<sup>14</sup> BRE Digest xxx: Selecting lighting controls, awaiting publication

## Section 3: Guidance on thermal elements

### L2B Work in existing buildings that are not dwellings

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#### Guidance on thermal elements

**69** 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

**70** 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 6. In addition, no individual element should have a U-value worse than those set out in Table 2.
- 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 6.

**71** 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 newly constructed thermal elements.

**72** 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

- a. For domestic style construction, to adopt details from the publication on accredited construction details<sup>15</sup>.
- b. For other types of construction, guidance on appropriate details is given in the MCRMA/EPIC technical Report<sup>16</sup> and the CWCT/CAB report<sup>17</sup>.
- c. An alternative would be to demonstrate, using the guidance in BRE IP 17/01<sup>18</sup> that the proposed details deliver an appropriate level of performance

Table 6 Standards for thermal elements W/m<sup>2</sup>K

Element	(a) Standard for new elements in an extension	(b) Standard for replacement elements in an existing building
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.

<sup>15</sup> Update of existing Part L accredited details – expanded and possibly merged with those produced for Part E

<sup>16</sup> MCRMA revised report in preparation in conjunction with EPIC.

<sup>17</sup> CWCT/CAB report – under development

<sup>18</sup> Building logbook toolkit, TM31, CIBSE, 2003

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**Renovation of thermal elements**

**73** 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 6. In all other cases, it would be unreasonable to expect the thermal element to be made more energy efficient.

**74** 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 for domestic-type construction is included in Appendix B of ADL1B.

c. where an existing element is being upgraded as a *consequential improvement* (regulation 17D) in accordance with paragraph 15a).

**76** Reasonable provision would be to upgrade those thermal elements whose U-value is worse than the threshold value in column (a) of Table 7 to achieve the U-value given in column (b) of Table 7, 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 7 should be achievable. In other circumstances, the element should be improved to achieve a U-value that is the better of

- the value in column (a) of Table 7 AND
- the best standard that is technically and functionally feasible and which can be achieved within a simple payback of no greater than 15 years.

**Retained thermal elements**

**75** Part L will apply to thermal elements in the following circumstances:

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

*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 7 Upgrading retained thermal elements**

Element	(a) Threshold value W/m <sup>2</sup> K	(b) Improved value W/m <sup>2</sup> 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 cavity wall capable of accepting insulation. Where this is not the case it should be treated as for “other wall type”.

## Section 4: Providing information

### L2B Work in existing buildings that are not dwellings

#### Conservation of fuel and power – Approved Document L2B

### Providing information

#### Logbook

**77** On completion of the work, in order to comply with requirement L1(c), the building logbook should be brought up to date (or a new one prepared if it does not already exist).

**78** The new or updated logbook should provide details of:

- a. Any newly provided, renovated or upgraded thermal elements,
- b. any newly provided fixed building services, their method of operation and maintenance,
- c. any newly installed energy meters
- d. and any other details that collectively enable energy consumption to be monitored and controlled.

**79** The information should be provided in summary form, suitable for day-to-day use. This summary could draw on or refer to information available as part of other documentation, such as the Operation and Maintenance Manuals and the Health and Safety file required by the CDM Regulations<sup>19</sup>.

**80** CIBSE publication TM31<sup>20</sup> gives detailed guidance on the recommended content of the logbook, including a series of standard templates. If an alternative guidance document is followed in preparing the logbook, then the information conveyed and the format of presentation should be equivalent to TM31.

## L2B Work in existing buildings that are not dwellings

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#### Definitions

**81 Consequential improvement** means those energy efficiency improvements required by regulation 17D.

**82 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.

**83 Display window** means an area of glazing, including glazed doors, intended for the display of products or services on sale within the building, positioned at the external perimeter of the building, at an access level and immediately adjacent to a pedestrian thoroughfare. There should be no permanent workspace within one glazing height of the perimeter. Glazing that extends beyond 3m above such an access level is not part of a display window except:

- a. Where the products on display require a greater height of glazing;
- b. in existing buildings, when replacing display windows that already extend to a greater height.
- c. in cases of building work involving changes to the façade and glazing and requiring planning consent, where planners have discretion to require a greater height of glazing, e.g. to fit in with surrounding buildings or to match the character of the existing façade.
- d. It is expected that display windows will be found in buildings in use classes A1, A2, A3 and D2 as detailed in Table 8.

**84 Emergency escape lighting** means that part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before leaving an area.

**85 Fitout work** means that work needed to complete the internal layout and servicing of the building shell to meet the specific needs of an incoming occupier. The building shell is the structural and non-structural envelope of a building provided as a primary stage (usually for a speculative developer) for a subsequent project to fit out with internal accommodation works.

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

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

**87 High usage entrance door** means a door to an entrance that is expected to experience large traffic volumes, and where robustness and/or powered operation is the primary performance requirement. To qualify as a high usage entrance door, the door should be equipped with automatic closers, and except where operational requirements preclude, be protected by a lobby.

**88 Principal works** means the work necessary to achieve the client’s purposes in extending the building and/or increasing the installed capacity of any **fixed building services**. The value of the **principal works** is the basis for determining a reasonable provision of **consequential improvements**.

**89 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.

Table 8 Building classes

Class	Use
A1	Shops including Retail-Warehouse, Undertakers, Showrooms, Post Offices, Hairdressers, Shops for sale of cold food for consumption off premises
A2	Financial and Professional Services Banks, Building Societies, Estate and Employment Agencies, Betting Offices
A3	Food and Drink Restaurants, Pubs, Wine Bars, Shops for sale of hot food for consumption off premises
D2	Assembly and Leisure Cinemas, Concert Halls, Bingo Halls, Casinos, Sports and Leisure Uses

## Section 5: Definitions

### L2B Work in existing buildings that are not dwellings

#### Conservation of fuel and power – Approved Document L2B

**90 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:

- 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 – 1.45 p/kWh
  - ii. Electricity – 5.0 p/kWh
  - iii. Heating oil – 1.90 p/kWh
  - iv. LPG – 3.39 p/kWh

*For example if the cost of implementing a measure was £4,300 and the value of the annual energy savings was £384/year, the simple payback would be  $(4300/384) = 11.2$  years.*

**91 Specialist process lighting** means lighting intended to illuminate specialist tasks within a space rather than the space itself. It could include theatre spotlights, projection equipment, lighting in TV and photographic studios, medical lighting in operating theatres and doctors' and dentists' surgeries, illuminated signs, coloured or stroboscopic lighting, and art objects with integral lighting such as sculptures, decorative fountains and chandeliers.

**92 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.

## 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

