



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



L2A New buildings other than dwellings

Draft 2006 edition
subject to amendment

L2A

New buildings other than dwellings

Please note: this is the current working draft of ADL2A. 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

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Section 0: General

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 5.

Types of work covered by this Approved Document (AD)

2 This AD is intended to give guidance in relation to works comprising:

- a. The construction of new buildings other than dwellings;
- b. Where it is deferred for any reason, the first *fit-out works* in buildings that were built to comply with Part L as amended in 2006.
- c. The construction of extensions to existing buildings where the gross floor area of the extension is greater than 100m² and greater than 25% of the gross floor area of the existing building.

3 When constructing a building that contains dwellings, account should also be taken of the guidance in Approved Document L1A. In most instances, Approved Document L1A should be used for guidance relating to the work on the individual dwellings, with this ADL2A giving guidance relating to the non-dwelling parts of the building such as any heated common areas, and in the case of mixed-use developments, the commercial or retail space.

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 ADL2A applies.

4 If a building that is to be used for commercial purposes (e.g. workshop or office) also contains living accommodation, it should be treated as a dwelling if the commercial part could revert to domestic use on a change of ownership. This could be the case if

- a. there is direct access between the commercial space and the living accommodation and
- b. both are contained within the same thermal envelope and
- c. the living accommodation occupies a substantial proportion of the total area of the building.

Sub para c) means that a small manager’s flat in large non-domestic building would not mean the whole building should be treated as a dwelling.

Technical risk

5 Building work must satisfy all the requirements set out in Schedule 1 of the Building Regulations. Part E (Resistance to the passage of sound), Part F (Ventilation), Part C (Site preparation and resistance to moisture), and Part J (Combustion appliances and fuel storage systems) are particularly relevant when considering the incorporation of energy efficiency measures.

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

Demonstrating compliance

7 In the Secretary of State’s view, compliance with Part L would be demonstrated by meeting the five separate criteria as set out in the following paragraphs. Appendix A contains a checklist that can be used to confirm that all the criteria have been met satisfactorily

The checklist can benefit both developers and building control.

8 Criterion 1: the predicted rate of carbon dioxide emissions from the building (the **BER**) is not greater than the target rate (the **TER**) which is determined by following the procedures set out in paragraphs 14 to 22 AND

9 Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits set out in paragraphs 27 to 58 AND

To fulfil requirements L1(a)(i) and L1(b).

10 Criterion 3: Those parts of the building that are not provided with comfort cooling systems have appropriate passive control measures to limit solar gains. The guidance given in paragraphs 59 to 62 of this Approved Document provide a way of demonstrating that suitable provisions have been made AND

*The aim is to counter excessive internal temperature rise in summer to reduce or eliminate the need for air conditioning in buildings intended to rely on natural cooling measures. The impact on CO₂ emissions from mechanically cooled buildings is taken into account in the **BER**.*

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

11 Criterion 4: the performance of the building, as built, is consistent with the prediction made in the **BER**. The procedures described in Section 2 can be used to show this criterion has been met, AND

12 Criterion 5: The necessary provisions for enabling energy efficient operation of the building are put in place. The procedures described in Section 3 can be used to show this criterion has been met.

Modular buildings

13 Special considerations apply to modular and/or portable buildings in those situations where:

- a. more than 70% of the external envelope is to be created from sub-assemblies manufactured before 06 April 2006 and which are obtained from a centrally held stock or from the disassembly of buildings on other premises;
- b. OR the intended life of the building is less than two years.

The hire contract could be suitable evidence of the intended life

In such situations, reasonable provision would be to follow the guidance in *Energy performance standards for modular and portable buildings*². In all other cases, the guidance given in this Approved Document should be followed.

² Energy performance standards for modular and portable buildings, MPBA, in preparation.

Section 1: Design standards

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Section 1: Design standards

Regulations 17A and 17 B

17A.–(1) The Secretary of State shall approve a methodology of calculation of the energy performance of buildings.

(2) The methodology shall comply with the requirements of the Directive.

17B. The Secretary of State shall approve minimum energy performance requirements for new buildings in the form of target CO₂ emission rates, which shall be based upon the methodology approved pursuant to regulation 17A.

Target carbon dioxide Emission Rate (TER)

14 The Target CO₂ Emission Rate (TER) represents the minimum energy performance requirement specified in Regulation 17B, and is expressed in terms of the mass of CO₂, in units of kg per m² of floor area per year that should be emitted as a result of the provision of heating, hot water, ventilation, cooling and lighting for the appropriate selection from a set of standardised activities when assessed by an approved calculation tool.

15 In accordance with the approvals given by the Secretary of State in ODPM Circular 200n/nn, the TER must be calculated using one of the following tools:

- a. Simplified Building Energy Model (SBEM)³ for those buildings whose design features are capable of being adequately modelled by SBEM, OR
- b. Other approved software such as dynamic simulation models; if used, such a tool must be capable of adequately modelling the design features in the proposed building. The procedures whereby such software is approved are set out in <ref>⁴.

As part of the submission to building control body (see paragraph 21), the applicant must justify that the tool used is appropriate to the application.

16 The TER is calculated in two stages as described below.

- a. Firstly use an approved calculation tool to calculate the CO₂ emission rate (C_{notional}) from a notional building with specified properties as described in paragraph 17.
- b. Secondly adjust the CO₂ emissions rate calculated in step a) by an improvement factor calculated according to the procedure outlined in paragraph 18.

17 The notional building shall

- a. be the same size and shape as the proposed building and
- b. comply with the energy performance values set out in Appendix X of ODPM's Non-domestic calculation methodologies⁵ in respect of both the building fabric and the *fixed building services*. Under the specific circumstances set out in paragraph 74, the air permeability used in the calculation of the TER may be varied from the value set out in Appendix X of ODPM's Non-domestic calculation methodologies. No other values may be varied under any circumstance.
- c. have the same area of vehicle access doors and *display windows* as the actual building and
- d. exclude any service not covered by Part L (such as *emergency escape lighting, specialist process lighting* and vertical transport systems) and
- e. have the same activity areas and class of building services as proposed for the actual building. The activity areas with their associated class of building services must be selected from the predefined standard activity areas specified in the Non-domestic calculation methodology.
- f. be subject to the occupancy times and environmental conditions (temperatures, illuminance, ventilation rate etc) in each activity area as defined by the standard data associated with the reference schedules.
- g. be subject to the climate defined by the CIBSE Test Reference Year for the site that is most appropriate to the location of the proposed building. Guidance on the selection of the relevant weather data is given in Non-domestic calculation methodology.
- h. Use, where it is available in the proposed building, mains gas for the heating fuel, otherwise oil should be used. Grid mains electricity should be assumed as the motive power for all other building services. The CO₂ emissions from the notional building should be determined using the CO₂ emission factors from Table 2.

18 The TER is obtained from the following formula –

$$TER = C_{notional} \times (1 - \text{improvement factor}) \times I$$

(1 – LZC benchmark), where

- a. "Improvement factor" is the improvement in energy efficiency as given in column (a) of Table 1 appropriate to the classes of building services in the proposed building. If different areas of the proposed building have different classes of building services, then the level of improvement should be calculated by applying the relevant improvement factor to each separate activity area individually.

³ SBEM – publication details to be decided

⁴ Either the Non-domestic calculation methodology, or possibly an update to CIBSE TM33

⁵ Non-domestic calculation methodology for Part L, ODPM, in preparation

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- b. “LZC benchmark” is the benchmark provision for low and zero carbon (LZC) energy sources as given in column (b) of Table 1 (see paragraph 26 for additional guidance).

This implements the requirement in Article 5 of the Energy Performance of Buildings Directive to give consideration to the incorporation of low and zero carbon energy supply systems into account before construction starts. Designers can choose to include more renewables than the benchmark provision, although the extent to which this can be traded off against fabric measures is limited by paragraphs 27 to 58. A lesser renewables provision would have to be compensated by enhanced energy efficiency measures.

Table 1 Improvement in whole building carbon dioxide emissions

| Building services strategy | (a) Improvement factor | (b) LZC benchmark |
|------------------------------------|------------------------|-------------------|
| Heated and naturally ventilated | 0.15 | 0.10 |
| Heated and mechanically ventilated | 0.20 | 0.10 |
| Air conditioned | 0.20 | 0.10 |

For example the *TER* for an air conditioned space would be $C_{notional} \times (1 - 0.20) \times (1 - 0.10) = 0.72 \times C_{notional}$

Criterion 1 – Achieving an acceptable Building CO₂ Emission Rate (BER)

19 Regulation 17C states that:

17C. Any new building shall meet the target CO₂ emission rate for the building.

20 To demonstrate that Regulation 17C has been met, the proposed building’s *BER* must be no worse than the *TER* calculated as set out in paragraphs 14 to 18.

21 The *BER* must be calculated using the same calculation tool as used for establishing the *TER*. Two calculations of the *BER* may be required as follows:

- a. A preliminary calculation as part of the design submission. This calculation will therefore be based on plans and specifications. The report produced by the approved calculation tool will indicate those features of the design that are critical to the building attaining the *TER* and should be provided to the building control body at this stage.

This would either be provided as part of the full plans submission, or requested by the bcb under regulation 13(5) where a Building Notice is given. Making the key features report available at this stage will help bcb’s during the construction phase by alerting them to focus on the critical features of the building.

- b. A final calculation as part of demonstrating that the actual building complies with Part L. This calculation must be based on the building as constructed, incorporating
- any changes to the performance specifications that have been made during construction.
 - the measured air permeability, ductwork leakage and fan performances as commissioned.

BCBs can use discretion in deciding whether the expertise and experience of the person carrying out these calculations is such that the submission can be accepted at face value. The information used for the as-built calculation could be used to prepare the Energy Performance Certificate (EPC). Developers may therefore wish to engage such experts as are required to produce the EPC to also produce this Part L submission.

22 In order to determine the *BER*, the CO₂ emission factors⁶ in Table 2 should be used.

These figures are now given in terms of CO₂, not carbon to be more in line with the Directive. The entries are therefore different by a factor of 44/12 compared to the ADL2(2002) data.

⁶ CO₂ emission factors, see <<ref to be added>>

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Table 2 CO₂ emission factors

| Fuel | CO ₂ emission factor kgCO ₂ /kWh |
|---------------------------------------|--|
| Natural gas | 0.194 |
| LPG | 0.234 |
| Biogas | 0.025 |
| Oil | 0.265 |
| Coal | 0.291 |
| Anthracite | 0.317 |
| Smokeless fuel (inc coke. | 0.392 |
| Dual fuel appliances (mineral + wood. | 0.187 |
| Biomass | 0.025 |
| Grid supplied electricity | 0.422 |
| Grid displaced electricity (note 1. | 0.568 |
| Waste heat (note 2. | 0.018 |

Note 1: Grid displaced electricity comprises all electricity generated by building integrated power generation systems (PV, CHP etc). The associated CO₂ emissions are deducted from the total CO₂ emissions for the building before determining the **BER**. Any fuel used by the building integrated power generation system (e.g. to power the CHP engine) must be included in the building CO₂ emissions.

Note 2: This includes waste heat from industrial processes and power stations rated at more than 10MWe and with a power efficiency >35%.

23 When systems are capable of being fired by more than one fuel, then

- For biomass-fired systems rated at greater than 100kW output but where there is an alternative appliance to provide standby, the CO₂ emission factor should be based on the fuel that is normally expected to provide the lead.

This is to encourage biomass systems, but which are often backed up by fossil fuelled standby plant .

- For systems rated at less than 100kW output, where the same appliance is capable of burning both biofuel and fossil fuel, the CO₂ emission factor for multi-fuel should be used, except where the building is in a smoke control area, when the anthracite figure should be used.
- In all other cases, the fuel with the highest CO₂ emission factor should be used.

This option is to cover dual fuel systems, where the choice of fuel actually used depends on prevailing market prices.

24 If thermal energy is supplied from a district or community heating or cooling system, emission factors will have to be determined based on the particular details of the scheme, but should take account of the annual average performance of the whole system (i.e. the distribution circuits, and all the heat generating plant, including any CHP, and any waste heat recovery or heat dumping). The **BER** submission should be accompanied by a report, signed by a suitably qualified person, detailing how the emission factors were derived.

Achieving the **TER**

25 Certain management features offer improved energy efficiency in practice. Where these management features are provided in the actual building, the **BER** can be reduced by an amount equal to the product of the percentages given in Table 3 and the CO₂ emissions for the system(s) to which the feature is applied.

*For example, if the CO₂ emissions due to electrical energy consumption were 1000 kg per year without power factor correction, the provision of correction equipment to achieve a pf of 0.95 would enable the **BER** to be reduced by $1000 \times 0.025 = 25$ kg per year.*

Table 3 Enhanced management and control features

| Feature | Adjustment factor |
|--|-------------------|
| Automatic monitoring and targeting with alarms for out of range values | 0.050 |
| Power factor correction to achieve a whole-building power factor of at least 0.90** | 0.010 |
| Power factor correction to achieve a whole building power factor of at least 0.95** | 0.025 |
| **The power factor adjustment can only be taken if the whole building power factor is corrected to the level stated. The two levels of power factor correction are alternative values, not additive. | |

26 In appropriate circumstances, low and zero carbon energy supply systems such as solar hot water, photovoltaic power, bio-fuels (e.g. wood fuels and oil blends), combined heat and power (at the building or community levels), and heat pumps can make substantial and cost-effective contributions to achieving TERs. The Low or Zero Carbon Energy Sources – Strategic Guide⁷ describes a range of possible systems and how their contribution to the DER can be assessed at the feasibility stage.

Criterion 2: Limits on design flexibility

27 Whilst the approach to complying with Criterion 1 allows considerable design flexibility, Part L requires that reasonable provision should be made to limit heat losses through the fabric (L1(a)(i)), and that energy efficient fixed building services and effective controls be provided (L1(b)). These requirements would be met by specifying performance standards that are no worse than those given in paragraphs 29 to 58.

Implementation of these standards alone will NOT achieve the TER; better performance will be required in some or all areas to meet the target.

Criterion 2: Design limits for envelope standards

28 This section sets out the design limits for the building fabric to meet requirements L1(a)(i).

U-values

29 U-values shall be determined in accordance with the methods and conventions as set out in *BR 443: Conventions for U-value calculations*⁸. They should include allowances for any repeating thermal bridges, but should not make any allowance for non-repeating thermal bridges, as these are dealt with separately in paragraphs 65 to 67.

30 For each element type, Table 4 sets out reasonable limits for the plane element U-value for those elements which separate a normally conditioned space from an unconditioned space or the external environment:

- Column (a) sets out the reasonable limits for area-weighted average U-values for the elements of the stated type.

The area-weighted average is calculated by summing the UA values of all elements of a given type (e.g. wall elements) and dividing by the total area of those same elements.

- column (b) gives the reasonable limits for U-values for individual elements of the stated type.

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 building. 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.

⁷ Low or Zero Carbon Energy Sources – Strategic Guide, interim publication on ODPM website

⁸ Conventions for U-value calculations, BR443, BRE, 2002 (under review)

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Table 4 Limiting U-value standards (W/m²K)

| Element | (a) Area-weighted average | (b) for any individual element |
|--|---------------------------|--------------------------------|
| Wall | 0.35 | 0.70 |
| Floor | 0.25 | 0.70 |
| Roof | 0.25 | 0.35 |
| Windows* and rooflights | 2.2 | 3.3 |
| Personnel doors | 2.2 | 3.0 |
| Vehicle access & similar large doors | 1.5 | 4.0 |
| High usage entrance doors | 6.0 | 6.0 |
| Roof ventilators (inc. smoke vents. | 6.0 | 6.0 |
| Curtain walling | See paragraph 32 | |
| *Display windows and similar glazing are not required to meet the standard given in this table | | |

31 When comparing against the values in Table 4, the U-value of a window, roof window or rooflight or personnel door can be taken as the value for either

- the standard configuration set out in BRE 443⁸ OR
- the particular size and configuration of the actual unit

In either case, the U-value should be that determined for 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.

32 For curtain walling, the limiting U-value for windows in Table 4 should be applied to the glazed areas of the curtain wall, and the limiting U-value for walls in Table 4 should be applied to the opaque panels.

The impact of heat transfer via the mullions and transoms must be included when calculating the overall CO₂ performance of the building as part of criterion 1. It will also be necessary to check for condensation risk as part of developing the overall design of the curtain wall.

33 In buildings with high internal gains, a less demanding area weighted average U-value for the glazing may be an appropriate way of reducing overall CO₂ emissions and hence the **BER**. If this case can be made, then the average U-value for windows, doors and rooflights can be relaxed from the value given in column (a) of Table 4, but the value should not exceed 2.7W/m²K. The limit for individual glazing elements given in column (b) should not be exceeded unless there are exceptional circumstances, such as constraints imposed by planning authorities.

Air permeability

34 A reasonable design limit for the **design air permeability** is 10 m³/(h.m²) @ 50 Pa. Guidance on some ways of achieving this is given in <title>⁹.

⁹ Update of existing Part L accredited details – expanded and possibly merged with those produced for Part E

Better standards of air permeability are technically desirable in buildings with mechanical ventilation and air conditioning.

Criterion 2: Design limits for building services

35 This section sets out the design limits for **fixed building services** and controls to meet requirement L1(b).

Controls

36 Systems should be provided with appropriate controls to enable the achievement of reasonable standards of energy efficiency in use. In normal circumstances, the following features would be appropriate for heating, ventilation and air conditioning system controls:

- The systems should be sub-divided into separate control zones to correspond to each area of the building that has a significantly different solar exposure, or pattern, or type of use.
- Each separate control zone should be capable of independent timing, and temperature control, and, where appropriate ventilation and air recirculation rate.
- 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.
- Central plant should only operate as and when the zone systems require it. The default condition should be off.

37 In addition to these general control requirements, the systems should meet specific control requirements and basic efficiency criteria as set out in the paragraphs specific to each system type.

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Energy meters

38 To enable building operators to effectively manage energy use, systems should be provided with appropriate energy meters. Reasonable provision would be

- a. to enable at least 90% of the estimated annual energy consumption of each fuel to be assigned to the various end-use categories (heating, lighting etc.). Detailed guidance on how this can be achieved is given in GIL 65¹⁰.
- b. to provide separate meters to enable the performance of any low or zero carbon system to be monitored.
- c. in buildings with floor areas greater than 1,000m², to include automatic meter reading and data collection facilities.

Heating and hot water system(s)

39 Reasonable provision for the performance of heating and hot water systems would be to follow the guidance in *the Non-domestic Heating Compliance Guide*¹¹, in providing:

- a. suitably efficient heating plant , AND
- b. effective control systems.

The checklists included in the Non-domestic Heating Compliance Guide can help in demonstrating that reasonable provision has been made.

Cooling plant

The carbon emissions associated with the operation of cooling systems are comparatively severe so careful attention to reducing solar and internal heat gains and arranging plant and control systems to match the demand effectively over the cooling season are effective ways of reducing the BER.

40 Reasonable provision for the performance of cooling systems would be to follow the guidance in *the Non-domestic Air Conditioning Compliance Guide*¹² in providing:

- a. suitably efficient cooling plant , AND
- b. effective control systems.

The checklists included in the Non-domestic Air Conditioning Guide can help in demonstrating that reasonable provision has been made.

Air handling plant

41 Where fan systems are installed to either provide ventilation or air circulation, reasonable provision would be air distribution systems whose *specific fan power* at the design flow rate is no worse than the values in Table 5.

Table 5 Limiting specific fan powers (W/litre.s)

| System type | Specific fan power W/l.s ⁻¹ |
|--|--|
| Central mechanical ventilation including heating, cooling and heat recovery | 2.5 |
| Central mechanical ventilation with heating and cooling | 2.0 |
| All other central systems | 1.8 |
| Local ventilation units within the local area, such as window/wall/roof units, serving one room/area | 0.5 |
| Local ventilation units remote from the area such as ceiling void or roof mounted units, serving one room/area | 1.2 |
| Fan coil units (rating weighted average). | 0.8 |

42 In addition, the system should be capable of achieving a specific fan power at 25% of design flow rate no greater than that achieved at 100% design flow rate. Reasonable provision for ventilation system fans rated at more than 1100 W would be to equip them with variable speed drives.

10 *Metering energy use in non-domestic buildings*, GIL 65, Action Energy, 2004

11 *Non-domestic heating compliance guide*, ICOM, in preparation

12 *Non-domestic air-conditioning compliance guide*, FETA, in preparation

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Following this guidance would facilitate commissioning and provide flexibility for future changes of use. The guidance is not applicable to smoke control fans and similar ventilation systems only used in abnormal circumstances.

43 In order to limit air leakage, ventilation ductwork should be made and assembled so as to be reasonably airtight. One way of achieving this would be to comply with the specifications given in HVCA DW144¹³.

Insulation of pipes, ducts and vessels

44 Reasonable provision would be demonstrated by insulating pipes, ducts and vessels to standards not less than those set out in the TIMSA HVAC Insulation Guide¹⁴.

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

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

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

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

47 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 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, i.e. the ratio of the total light output under stated practical conditions to that of the lamp or lamps contained in the luminaire under reference conditions.

Note that in ADL2B, this equation is modified to include the impact of lighting controls. This is not appropriate in ADL2A, where the calculation tool used to determine the BER accounts for the impact of controls.

General lighting efficacy in all other types of space

48 For lighting systems serving other types of 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 requirement 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 spaces

49 Lighting controls should be provided so as to avoid unnecessary lighting during the times when daylight levels are adequate or when spaces are unoccupied.

For safety reasons automatically switched lighting systems should be subjected to risk assessment.

50 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 manually operated by the deliberate action of the occupants.

Manual switches include rocker switches, push buttons and pull cords and remote switching devices such as wireless transmitters and telephone handsets.

51 For the purposes of Approved Document L, switches includes dimmer switches and switching includes dimming. It would usually be reasonable for dimming to be effected by reducing rather than diverting the energy supply.

52 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 luminaire above the floor if this is greater. Where a space is a *daylit space* served by side windows, it would be reasonable for the perimeter row of luminaires to be separately switched.

53 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 off the lighting when there is sufficient daylight.

When installed in appropriate locations, such control systems can make a useful contribution towards reducing the BER.

54 An alternative way of meeting the requirement would be to follow the recommendations in BRE Digest XXX¹⁵.

Display lighting in all types of space

55 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

56 Spaces where display lighting is present would normally be expected to also have general lighting used for circulation and for purposes of cleaning and restocking outside public access hours; paragraphs 46 to 48 apply to this general lighting, depending on the type of space.

¹³ Specifications for sheet metal ductwork, DW/144, HVCA, 1998

¹⁴ HVAC Insulation Guide, TIMSA, in preparation

¹⁵ BRE Digest xxx: Selecting lighting controls, awaiting publication

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Controls for display lighting in all types of space.

57 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 attending entertainment events. 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*.

Systems not covered by Part L

58 *Emergency escape lighting, specialist process lighting* and vertical transportation systems are not subject to the requirements of Part L.

Criterion 3: Limiting solar gains in summer.**Spaces not served by comfort cooling systems**

59 For those occupied spaces¹⁶ without comfort cooling, provisions should be made to limit solar gains so as to reduce internal temperature rise in summer. This can be done by an appropriate combination of window size and orientation, solar protection through shading and other solar control measures, and by using thermal capacity coupled with night ventilation. BR 364¹⁷ and AM10¹⁸ offer guidance on strategies to limit solar gain.

Part L does not specify minimum daylight requirements. However, window area has an impact on the BER, because energy for electric lighting will increase as window area decreases. Conduction heat loss and solar gains in winter will also reduce. Therefore, when considering the proportions of glazing in the building, the designer should give consideration to the provision of adequate levels of daylight – see BS8206 Part 2¹⁹ for guidance on daylighting.

Designers may wish to go beyond the requirements in the current Building Regulations to consider the impacts of future global warming on the risks of higher internal temperatures occurring more often. CIBSE TM36 Reducing overheating – a designer's guide²⁰ gives guidance on this issue.

60 Reasonable provision to show compliance with the requirement would be to show that for every occupied space that is not served by a comfort cooling system

- a. the combined solar and internal casual gains (people, lighting and equipment) per unit floor area averaged over the period of daily occupancy is not greater than 35W/m² when the building is subject to the solar irradiances given as the entry for July in the table of design irradiances given in CIBSE Guide A²¹ OR

This is Table 2.24 in the 1999 edition of the Guide. When calculating the gains for a perimeter area with side windows, it would be normal to calculate the gains over a perimeter area not more than 6m from the window wall.

- b. the operative dry resultant temperature does not exceed 28°C for more than a reasonable number of occupied hours per annum when the building is tested against the CIBSE Design Summer Year appropriate to the building location. The number of hours above 28°C considered to be tolerable by occupiers depends on the activities within the space, and clients and designers will agree appropriate limits in order to meet Workplace Regulations. TM37²² provides a method for making an assessment of the risks of excessive temperatures occurring.

For example, CIBSE suggest that for office type spaces, the number of occupied hours with temperatures over 28°C should not exceed 20. Clients and designers may also wish to consider the possible impacts of climate change on excessive internal temperatures; CIBSE TM36²³ gives guidance on this issue.

61 For school buildings, Building Bulletins 87²⁴ and 101²⁵ specify the overheating criterion and provide guidance on methods to achieve compliance.

Spaces served by comfort cooling systems

62 For spaces served by comfort cooling systems, reasonable provision for the control of excessive solar gains is demonstrated by meeting the TER. However, if solar gains are controlled to the limits set out in paragraph 60a), cooling energy demand will be moderate, and it will be easier to achieve the TER.

The TER is based on a notional building with modest amounts of glazing. Buildings that allow greater solar gain will have to compensate through enhanced energy efficiency measures in other aspects of the design.

¹⁶ This excludes spaces such as stacks and un-occupied atria intended to drive natural ventilation via buoyancy.

¹⁷ Solar shading of buildings, BR 364, CRC Ltd, 1999

¹⁸ Natural ventilation in non-domestic buildings, AM10, CIBSE, 2005

¹⁹ BS 8206 Part 2 Code of practice for daylighting

²⁰ *Climate change and the indoor environment: impacts and adaptation*, TM36, CIBSE, 2005.

²¹ *Environmental design*, Guide A, CIBSE, 1999

²² Design for improved solar shading control, TM37, CIBSE, to be published

²³ *Climate change and the indoor environment: impacts and adaptation*, TM36, CIBSE, 2005.

²⁴ Guidelines for Environmental Design in Schools, Building Bulletin 87, School Building and Design Unit. Department of Education and Skills, DATE

²⁵ Ventilation of School Buildings, Building Bulletin 101, School Building and Design Unit. Department of Education and Skills, DATE

Section 2: Criterion 4 – Quality of construction and commissioning

L2A New buildings other than dwellings

Conservation of fuel and power – Approved Document L2A

Section 2: Criterion 4 – Quality of construction and commissioning

Criterion 4 – Quality of construction

63 Buildings should be constructed and equipped so that performance is consistent with the predicted **BER**. As specified in paragraph 21b), a final calculation of the **BER** is required to reflect

- a. any changes in performance between design and construction,
- b. the achieved air permeability, ductwork leakage and commissioned fan performance.

The report referred to in paragraph 21a) will assist bcbs in checking the key features of the design are included as specified during the construction process.

Building fabric

64 The building fabric should be constructed to a reasonable quality of construction so that:

- a. The insulation is reasonably continuous over the whole building envelope and
- b. the **air permeability** is within reasonable limits.

Continuity of insulation

65 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.

66 Reasonable provision would be to

- a. Adopt accredited design details such as
 - i. For construction styles similar to dwellings, to adopt details from the publication on accredited construction details⁹.

These might apply to small scale buildings such as doctor's surgeries etc.

- ii. For cladding systems, to adopt the guidance given in the MCRMA/EPIC technical Report²⁶ and
 - iii. For curtain walling, to adopt the guidance given in the CWCT/CAB report²⁷.
- b. To demonstrate that the specified details deliver an equivalent level of performance using the guidance in BRE IP 17/01²⁸.

67 In addition, the builder would have to demonstrate that an appropriate system of site inspection is in place to give confidence that the construction procedures achieve the required standards of consistency. For those using the accredited details approach (paragraph 66a)) a way of achieving this would be to produce a report demonstrating that the construction checklists such as those included in <Title>⁹ have been completed and show satisfactory results.

It could be helpful to builders and building control bodies if such reports are signed by a suitably qualified person.

Air permeability and air pressure testing

68 In order to demonstrate that the specified **design air permeability** has been achieved, Regulation 20B states that:

20B.–(1) This regulation applies to the erection of a building.

(2) Where this regulation applies, the person carrying out the work shall, for the purpose of ensuring compliance with Regulation 17C and paragraph L1(a)(i) of Schedule 1:

- a. ensure that, in such circumstances as are approved by the Secretary of State, appropriate air pressure testing is carried out in accordance with a procedure approved by the Secretary of State; and
- b. give a copy of the results of the testing to the local authority.

(3) The results of the testing referred to in paragraph (2)(a) shall be:

- a. recorded in a manner approved by the Secretary of State; and
- b. given to the local authority in accordance with paragraph (2)(b) not later than the date on which the notice required by regulation 15(4) or regulation 16A(3) is given.

69 The procedure approved by the Secretary of State for air pressure testing is set out in the ATTMA publication *Air permeability measurement*²⁹. The tests should be carried out by a suitably qualified person.

A way of demonstrating that the testing organisation has the appropriate skills and experience is for them to be members of the Air Tightness Testing and Measurement Association – see www.attma.org. It could be helpful to demonstrating compliance for the testing organisation to sign the certificate.

²⁶ MCRMA revised report in preparation in conjunction with EPIC.

²⁷ CWCT/CAB report – under development

²⁸ Assessing the effects of thermal bridging at junctions and around openings in the external elements of buildings, IP17/01, BRE, (under review)

²⁹ Air permeability measurement, ATTMA, in preparation.

70 The manner approved by the Secretary of State for the reporting of the test would be a declaration signed by a suitably qualified person

- a. confirming that the test had been carried out in accordance with the approved procedure (paragraph 69) AND
- b. recording the values of both the measured *air permeability* and the *design air permeability*.

71 The approved circumstances under which the Secretary of State requires pressure testing to be carried out are set out in paragraph 72.

72 All buildings other than dwellings should be subject to pressure testing, with the following exceptions:

- a. buildings less than 500m² floor area; in this case the developer may choose to avoid the need for a pressure test provided that the air permeability used in the calculation of the *BER* is taken as 15 m³/(h.m²) at 50Pa.

Compensating improvements in other elements of the building fabric and building services will be needed for the BER to equal or better the TER.

- b. factory-made modular buildings where no site assembly work is needed; in this case, it can be assumed that the standard of airtightness for its module type had been achieved, provided that a third party accreditation approval had demonstrated through site based testing, that the *design air permeability* is routinely achieved.

Site based testing is necessary to demonstrate the building is sufficiently robust to resist flexure during lifting and transportation.

- c. Large complex buildings, where due to building size or complexity, it may be impractical to carry out whole building pressure testing. This limitation will only exist in relatively few projects, and the ATTMA publication indicates those situations where such considerations might apply. In order to follow this route, developers should produce a detailed justification of why pressure testing is impractical. This should be produced as part of the initial application to the building control body, and should be endorsed by an independent and appropriately qualified expert. In such cases, compliance with Regulation 20B would be demonstrated if a suitably qualified person has been appointed to undertake a detailed programme of design detail development, component testing and site supervision and who demonstrates that a complete air barrier exists around the whole building envelope. The component testing should provide evidence that the *design air permeability* has been achieved; in such cases it would not be reasonable to claim an *air permeability* better than 5.0 m³/(h.m²) at 50Pa has been achieved.

One example of a suitably qualified person would be an ATTMA member. The 5.0 m³/(h.m²) at 50Pa limit is because at such a standard, the achieved level of performance is increasingly susceptible to single point defects in the air barrier.

73 In the event of the building failing to meet the required *design air permeability*, remedial action should be taken and the test repeated until satisfactory performance is achieved. Satisfactory performance would be demonstrated if:

- a. the measured *air permeability* is not worse than the design limit value given in paragraph 34 AND
- b. the *BER* calculated using the measured *air permeability* is not worse than the *TER*.

If it proves impractical to meet the design air permeability, any shortfall must be compensated through improvements to subsequent fit-out activities. Builders may therefore wish to schedule pressure tests early enough to facilitate remedial work on the building fabric e.g. before false ceilings are up.

74 For buildings with a total floor area of less than 1,000m² and in the period up to 31 October 2007, if the initial test result is unsatisfactory, reasonable provision would be to

- a. carry out remedial measures such that on retest, a result was achieved that showed
 - i. an improvement of 75% of the difference between the initial test result and the *design air permeability*.
 - ii) OR if less demanding, a test result within 15% of the *design air permeability*.

To illustrate the revised target following an initial failure, if the initial test result was 18.0, and the air permeability standard was 8.0, the revised pass level to reach in tests following remedial action would be $[18.0 - 0.75 \times (18.0 - 8.0)] = 10.5 \text{ m}^3/(\text{h.m}^2)$ at 50 Pa. However, if the initial test result was 9.5, the pass level to be achieved in tests following remedial action would be $8.0 \times 1.15 = 9.2$.

- b. revise the *TER* by substituting the measured *air permeability* from paragraph 74a) for the value set out in the Appendix to the Non-domestic calculation methodology and demonstrate that the *BER* is no worse than the revised *TER*.

This allows some time for contractors involved in smaller buildings that have not yet been subject to testing to develop the techniques for constructing to reasonable standards of airtightness. However, the poorer airtightness will be reflected in the Energy Performance Certificate, which will impact on the value of the building.

Section 2: Criterion 4 – Quality of construction and commissioning

L2A New buildings other than dwellings

Conservation of fuel and power – Approved Document L2A

Pressure testing in compartmentalised buildings

75 It may be impractical to carry out whole building pressure tests on buildings that are compartmentalised into self-contained units with no internal connections. In such cases reasonable provision would be to carry out a pressure test on a representative area of the building as detailed in the ATTMA guidance²⁹. In the event of a test failure, the provisions of paragraphs 73 and 74 would apply, but it would be reasonable to carry out a further test on another representative area in an effort to confirm that the expected standard is achieved in all parts of the building.

Criterion 4: Inspection and Commissioning of the Building Services Systems

76 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.

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

- a. CIBSE Commissioning Code M on Commissioning Management³⁰ 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 79.

78 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...

Air leakage testing of ductwork

79 Leakage testing should be carried out in accordance with the procedures set out in HVCA DW/143³¹ on systems served by fans with a design flow rate greater than 1m³/s and for those sections of ductwork where

- a. the pressure class is such that DW/143 recommends testing and
- b. the **BER** calculation assumes a leakage rate for a given section of ductwork that is lower than the standard defined in DW/144 for its particular pressure class. In such cases, any low pressure ductwork should be tested using the DW/143 testing provisions for medium pressure ductwork.

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.

80 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.

³⁰ Commissioning management, Commissioning Code M, CIBSE, 2003.

³¹ A practical guide to ductwork leakage testing, DW/143, HVCA, 2000

Section 3: Criterion 5 – Providing information

Building log-book

81 In accordance with Requirement L1(c), the owner of the building should be provided with details of the installed building services plant and controls, their methods of operation and maintenance, and other details that collectively enable operation and maintenance in such a manner as to use no more fuel and power than is reasonable in the circumstances.

82 A way of showing compliance would be to follow the guidance in CIBSE TM31 *Building logbook toolkit*³². The information should be presented using the standard templates in the TM. The information 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.

83 The data used to calculate the *TER* and the *BER* should be included in the log-book.

It would also be sensible to retain an electronic copy of the input file for the energy calculation to facilitate any future analysis that may be required when altering or improving the building.

³² Building logbook toolkit, TM 31, CIBSE, 2003

Section 4: Model designs

L2A New buildings other than dwellings

Conservation of fuel and power – Approved Document L2A

Section 4 – Model designs

84 Some builders may prefer to adopt model design packages rather than to engage in design for themselves. These model packages of fabric U-values, boiler seasonal efficiencies, window opening allowances etc would have been shown to achieve compliant overall performance within certain constraints. The construction industry has developed model designs for this purpose and they are registered on the Internet at www.modeldesigns.info (to be confirmed).

85 It will still be necessary to demonstrate compliance in the particular case by going through the procedures described in paragraphs 7 to 12.

DRAFT

Section 5 – Definitions as used in Part L

86 For the purposes of this Approved Document, the following definitions apply.

87 *Air permeability* is the physical property used to measure airtightness of the building fabric. It is defined as air leakage rate per envelope area at the test reference pressure differential across the building envelope. For the purposes of this Approved Document, the test reference pressure differential is 50 Pa. The envelope area of the building, or measured part of the building, is the total area of all floors, walls and ceilings bordering the internal volume subject to the test. This includes walls and floors below external ground level. Overall internal dimensions shall be used to calculate this area. No subtractions shall be made for the area at junction of internal walls, floors and ceilings with exterior walls, floors and ceilings.

88 The *design air permeability* is the value of air permeability selected by the dwelling designer for use in the calculation of the *BER*. Paragraph 34 sets an upper limit for this value.

89 *BER* is the Building carbon dioxide Emission Rate. Criterion 1 requires the *BER* to be no greater than the *TER*.

90 *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 to a height of more than 3m above such an access level will not be considered 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 should 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 6.

Table 6 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 as used in Part L

L2A New buildings other than dwellings

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91 Daylit space means any space:

- a within 6m of a window wall, provided that the lazing area is at least 20% of the internal area of the window wall.
- b. Below rooflights and similar provided that the glazing area is at least 10% of the floor area.

The normal light transmittance of the glazing should be at least 70%, or, if the light transmittance is reduced below 70%, the glazing area could be increased proportionately.

92 Display lighting means lighting intended to highlight displays of exhibits or merchandise, or lighting used in spaces for public leisure and entertainment such as dance halls, auditoria, conference halls, restaurants and cinemas.

93 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.

94 Fit-out work means that work needed to complete the partitioning and building services within the external fabric of the building (the shell) to meet the specific needs of incoming occupiers. Fit-out work can be carried out in whole or in parts:

- a. In the same project and time frame as the construction of the building shell, or
- b. At some time after the shell has been completed.

95 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.

96 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.

97 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.

98 Specific Fan Power is defined as the sum of the design total circuit-watts, including all losses through switchgear and controls such as inverters, of the fans in the system that supply air and exhaust it back to outdoors (i.e., the sum of supply and extract fans), divided by the design ventilation rate through that system.

99 TER is the Target carbon dioxide Emission Rate as calculated for comparison with the BER in order to meet Criterion 1 as described in paragraph 8.

L2A New buildings other than dwellings

Conservation of fuel and power – Approved Document L2A

Compliance checklist

The following table provides a checklist of the evidence that could be compiled to facilitate for builders and building control bodies the processes of demonstrating compliance with Part L. The checklist gives the evidence that needs to be provided to allow the check to be made, and who could produce the evidence. For most steps, the evidence could be provided by a suitably qualified person acting for the builder and may be accepted at face value at the

discretion of the building control body dependent upon the credentials of the person making the declaration. Examples of checks where this could apply and who might be suitably qualified are indicated using bold italicised text in the “Produced by” column, but BCBs have the discretion to accept evidence from other groups of appropriately qualified and/or experienced individuals or to decline to accept at face value. The final two columns allow the design to be checked, often based on the outputs of an assessment by an approved calculation tool, with the final column being used to confirm that the design features have been installed in practice.

| | | | |
|-----------------------|--|----------------|---|
| Site reference | | Plot reference | |
| Developer | | Contact |  |
| Building Control body | | Contact |  |

| No. | Check | Evidence | Produced by | Design OK ? | As built OK? |
|--|--|--|-------------------------|-------------|--------------|
| Criterion 1 – Predicted carbon dioxide emission from proposed building does not exceed the target | | | | | |
| 1 | Calculated CO ₂ emission rate from notional building kgCO ₂ /m ² .annum | Standard output from accredited software | <i>Accredited model</i> | | |
| 2 | Improvement factor | From Table 2 | Developer’s submission | | |
| 3 | LZC benchmark | From Table 2 | Developer’s submission | | |
| 4 | TER (kg CO ₂ /m ² .a. | Standard output from accredited software | Developer’s submission | | |
| 5 | BER for dwelling as designed (kg CO ₂ /m ² .a. | Standard output from accredited software | <i>Accredited model</i> | | |
| 6 | Are emissions from building as designed less than or equal to the target? | Compare TER and BER as designed | <i>Accredited model</i> | | N/A |
| 7 | BER for building as constructed (kg CO ₂ /m ² .a. | Standard output from accredited software | <i>Accredited model</i> | | |
| 8 | Are emissions from actual building less than or equal to the target? | Compare TER and BER as constructed | <i>Accredited model</i> | N/A | |

Appendix A: Compliance checklist

L2A New buildings other than dwellings

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| No. | Check | Evidence | Produced by | Design OK ? | As built OK? |
|--|--|---|---|-------------|--------------|
| Criterion 2: the performance of the building fabric and the building services systems should be no worse than the design limits | | | | | |
| Fabric U-values | | | | | |
| 9 | Are U-values better than the design limits? | Schedule of U-values produced as standard output from accredited software | <i>Accredited model</i> | | |
| 10 | Is air permeability no greater than the worst acceptable standard? | Standard output from accredited software | <i>Accredited model</i> | | |
| Building services systems | | | | | |
| 11 | Are all building services standards acceptable? | Schedule of system efficiencies produced as standard output from accredited software | <i>Accredited model</i> | | |
| 12 | Does fixed internal lighting comply with paragraphs 45 to 57. | Schedule of installed fixed internal lighting | Builder or electrical contractor who could be an <i>Approved Competent Person</i> | | |
| 13 | Energy meters installed in accordance with GIL 65 ? | Metering strategy document | Developer | | |
| Criterion 3: the building has appropriate passive control measures to limit solar gains. | | | | | |
| 14 | Method of showing compliance para 60a), G ≤ 35 W/m ² , or 60b), t > 28°C for ≤ X hours per year ? | | Developer's submission | | |
| 15 | Is the solar gain acceptable in occupied zones without mechanical cooling? | Schedule for each zone | Developer's submission | | |
| Criterion 4: the performance of the building, as built, is consistent with the BER | | | | | |
| 16 | Have the key features of the design been included (or bettered) in practice? | List of key features produced by accredited software to facilitate sample checking by BCB | Building control body | | |
| Building Fabric | | | | | |
| 17 | Is level of thermal bridging acceptable? | Schedule of accredited details used and their reference codes. OR Evidence that details adopted deliver equivalent performance | Developer's submission | | |
| 18 | Has satisfactory documentary evidence of site inspection checks been produced? | Completed pro-formas showing checklists have been completed. | Developer's submission. | | |

L2A New buildings other than dwellings

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| No. | Check | Evidence | Produced by | Design OK ? | As built OK? |
|--|---|--|---|-------------|--------------|
| 19 | <i>Design air permeability</i> (m ³ /(h.m ²) at 50Pa. | Standard output from accredited software | <i>Accredited model</i> | | |
| 20 | Has evidence been provided that demonstrates that the <i>design air permeability</i> has been achieved satisfactorily | Pressure test results in comparison to design value OR Report on agreed programme of design development and component testing OR Modular buildings type test results | <i>ATTMA member or similar accredited tester</i> | | |
| Inspection and Commissioning of the Building Services Systems | | | | | |
| 21 | Has commissioning been completed satisfactorily? | Commissioning report submitted in accordance with CIBSE Code M ? | <i>Suitably qualified person e.g. see comment on para 78</i> | | |
| 22 | Has evidence been provided that demonstrates that the ductwork is sufficiently airtight? | Report confirming that the results of the leakage tests are in line with the leakage specification | <i>Suitably qualified person, e.g. see comment on para 79</i> | | |
| Criterion 5 – providing information | | | | | |
| 23 | Has a suitable building log-book been prepared? | Completed CIBSE TM31 template (or equivalent. | Developer's submission | | |

Appendix B: Performance Standards for use in the notional building

L2A New buildings other than dwellings

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Performance Standards for use in the notional building

(Not to be included in the published edition of ADL2A – it will be incorporated into the national calculation methodology).

General

1 This note describes how the notional building is defined³³. Generally, elemental values are taken from ADL2 (2002) but there are exceptions³⁴.

- a. The notional building has the same size and shape as the actual building, with the same conventions relating to dimensions³⁵ and the inclusion of non-usable spaces such as ducts.

- b. Each space contains the same activity (and therefore the same activity area parameter values) in the notional and the actual building
- c. The notional and actual building have the same orientation and are exposed to the same weather.
- d. Any service not covered by Part L (eg emergency escape lighting, specialist process lighting) is ignored in both the actual and notional building

2 Where values depend on building detail (eg U-values of flat or pitched roofs), the notional building has the same “class” (eg flat roof) as the actual building.

| U-values and Thermal Bridges: | |
|--|-----------------------------|
| Exposed element | U-value(W/m ² K) |
| Pitched roof (pitch more than 10°)** | 0.16 |
| Flat roof | 0.25 |
| Walls | 0.35 |
| Floors and ground floors (subject to note below. | 0.25 |
| Windows, roof windows, rooflights and doors | 2.2 |
| High usage entrance doors, display windows and similar glazing | 6.0 |
| Smoke vents | 6.0 |
| Vehicle access and similar large doors | 1.5 |

**Any part of a roof having a pitch greater or equal to 70° can be considered as a wall.

3 Thermal bridge heat losses will be based on the same geometry (perimeter lengths, number and height of corners etc) as the actual building. In the notional building, the following linear thermal transmittance (psi values) will be used:

| Type of junction | Psi value (W/m.K) |
|--|---|
| Wall-ground floor junction | 0.16 |
| Intermediate floor | 0.07 |
| Wall – wall corner (perpendicular walls. | 0.09 |
| Wall – wall “inverted” (re-entrant) corner | 0.09 |
| Party wall between premises | 0.03 (applied to each premise.) |
| Eaves | 0.06 (equates to insulation at ceiling level) |
| Lintel above window or door opening | 0.21 |
| Window or door jamb | 0.05 |
| Window sill | 0.04 |

³³ Accredited software will automatically generate the notional building from the information provided for the actual building

³⁴ All trade-off rules in ADL2 (2002) are ignored

³⁵ The basic convention is that dimensions are measured between the internal finished surfaces of the elements bounding the building (or the part thereof under consideration). If dimensions are measured within rooms or spaces, the thickness of internal walls and ceiling and floor void depths have to be added

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4 For ground floors,

- a. SBEM will calculate a U-value (for an uninsulated floor) using default assumptions (yet to be defined) about perimeter/floor area ratio.
- b. If this is above 0.25, the value of 0.25 will be used
- c. If it is less than 0.25, the value will be reported to the user who has the option of providing the actual perimeter/floor area ratio.
- d. If the calculated U-value based on the actual perimeter/floor area ratio is less than 0.25, this lower value is used
- e. (if the value in the actual building is “significantly” better than the value used in the notional building, this should trigger a warning to building control)

Construction Types

5 Since the calculation method takes account of the thermal capacity of the building fabric, it is not sufficient to define U-values alone. Each element in the notional building has to be defined in terms of a specific construction.

Window, Door and Rooflight Area

6 Window and rooflight areas in the notional building shall be those in the table below. All external walls and roofs shall be taken to have windows (or rooflights)

| Building type | Windows ** and doors as % of the area 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 |
| High usage entrance doors and display windows and similar glazing | As required | |

**Dormer windows in a roof are included in the rooflight area.

Solar Transmittance

7 Total solar energy transmittance (g-value) of glazing (including display windows and rooflights) is 0.65

| HVAC system efficiencies | | | |
|--------------------------|---|--|------------------------------------|
| | Cooling SSEER (cooling demand/cooling energy. | Heating SCoP(heating demand/heating energy | Auxiliary EnergykWh/m ² |
| Heating only | | 0.73 | 6.5 |
| Air conditioning | 1.67 | 0.83 | 26.6 |
| Mechanical ventilation | | | 11.0 |

L2A New buildings other than dwellings

Conservation of fuel and power – Approved Document L2A

9 The “efficiencies” have been derived using the SBEM system procedures, and are consistent with TM 32:2003. The figures differ slightly from those in TM32 because of the different basis of calculation, for example, allowances for heat pick-up from fans, duct leakage etc.

10 It is intended to relate the auxiliary energy consumption to the type of activity area to reflect differing hours of occupation

11 The heating fuel is taken as natural gas where this is available on the site; otherwise oil is assumed. The cooling and auxiliary energy is electricity.

12 DHW systems efficiency is 45% with gas as the fuel.

Inclusion of air-conditioning and heating

13 If a space in the actual building has air-conditioning, the equivalent space in the notional building also has air-conditioning. (And therefore the appropriate improvement factor will be applied).

14 If a space in the actual building has heating, the equivalent space in the notional building also has heating.

15 If a space in the actual building has neither heating nor air-conditioning, neither does the equivalent space in the notional building.

Lighting installed power density

16 For general lighting:

- a. in office, storage and industrial spaces, divide the illuminance appropriate to the activity area by 100, then multiply by 3.75 Wm⁻² per 100 lux.
- b. for other spaces, divide the illuminance appropriate to the activity area by 100, then multiply by 5.2 Wm⁻² per 100 lux.
- c. The notional building has local manual switching in all spaces.

17 For display lighting, take the notional display lighting density appropriate to the activity (from the activity area database)

Air Permeability

18 Assume the notional building meets the pressure test requirement of a permeability 10m³/h/m² at 50 Pa

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

