Building Control Guidance Note	Subject	CONSERVATION OF FUEL AND POWER 2006. Guide 6 – APPROVED DOCUMENT L2B Conservation of fuel and power – Work in existing buildings other than dwellings.							24
	Issued	17/05/06	Rev		Page	1	of	18	

From 6th April 2006 there are significant changes to the Building Regulations that cover the Conservation of Fuel and Power in buildings. Energy performance relating to works and extensions in existing buildings is based on a revised elemental approach in which insulation and efficiency thresholds are set for individual parts of the building envelope and services. However there are certain circumstances where for larger extensions this approach is not acceptable and they have to be treated as if they are a new build, this will be explained later on in this guidance.

Both AD L2B and AD L1B follow the same pattern in that they provide guidance on the standards to be achieved for 'Thermal Elements' (walls, floors and roofs), 'Controlled Fittings' (windows, doors and similar fittings) and 'Controlled Services' (heating, hot water, ventilation systems and lighting), or changing a buildings energy status. The main exception to this is in relation to replacement window, roof windows and rooflights, where the standard is retained at the 2002 level.

In the case of large buildings building over 1,000 m2 is extended, or where a fixed building service is installed for the first time, or the installed capacity of an existing fixed building service is increased - it may be necessary to undertake works to the building as a whole (including the existing parts). These are referred to as 'Consequential Improvements' (explained in detail below).

Part L Conservation of fuel and power

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

a. limiting heat gains and losses:

i. through thermal elements and other parts of the building fabric; and

ii. from pipes, ducts and vessels used for space heating, space cooling and hot water services;

b. providing and commissioning energy efficient fixed building services with effective controls; and

c. providing to the owner sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

Extract of L1.

Reference should be made to the other guides in this series for the requirements that apply to the following:

- Exemptions from controls / non-notifiable works.
- Repair and/or replacement of 'Thermal Elements'
- Change to a buildings energy status.

CONSEQUENTIAL IMPROVEMENTS.

Where a existing building has a *'total useful floor area'* over 1000m² and you intend to carry out any of the following building works:-

(a) Building an extension.

(b) the initial provisions of any *'fixed building services'*.

(c) an increase to the installed capacity of any *'fixed building services'*.

You must bring the existing as well as the new building into compliance with Part L, unless you can prove that such works to the existing building are not technically, functionally or economically feasible. Such supporting evidence must be prepared by a suitably qualified person and provided on application submission (see further notes below).

NOTE – the principal new works must comply with the energy efficiency requirements.

'Total useful floor area' – total area of all enclosed spaces measured to the internal face of the external walls. The area of sloping surfaces e.g. stairs, galleries, raked auditoria / terraces to be taken as plan area. Include all areas occupied by partition walls/columns chimneybreasts and internal structural of party walls. Exclude areas that are not enclosed e.g. open floors/covered ways and balconies.

'Fixed Building Services' means: any part of, or any controls associated with:
(a) Fixed internal or external lighting systems, but not emergency escape lighting or specialist process lighting: or

(b) Fixed systems for heating, hot water service, air conditioning or mechanical ventilation.

'Not economically feasible' – Measures would be considered not to be economically feasible, if there is not a Simple 15 year payback on the cost of the thermal improvement works through energy savings – unless there are other unusual circumstances e.g. say the building only has a life span under 15 years – then reasonable provisions would be to achieve a simple payback on the life of the building.

Consequential Improvements on extending a building.

New free standing buildings erected on an existing site e.g. a new classroom block at a school site are to be considered new builds and must therefore comply with ADL1A.

For extensions one way to comply with the requirements for consequential improvements would be to adopt some of the examples of measures indicated below:

10% rule - to be reasonable there is a rule where the consequential improvements provisions can be restricted to a value is N.L.T 10% of value of *'principle works'* e.g. the cost of the extension (''*principle works'*. – works necessary to achieve clients purposes in extending the building and/or increasing the installed capacity of any fixed building services.)

Values of principal works and consequential improvements must be established using current prices and must be provided in a report signed by a suitably qualified person on application submission i.e. Chartered Quantity Surveyor.

Examples of practical and economically feasible consequential improvements.

1) Upgrading heating systems and / or cooling systems/air conditioning and / or air handling more than 15 years old by provision of new plant or improved controls.

2) Upgrading general lighting systems that have an average lamp efficiacy of less than 40 lamp - lumens per circuit watt – and that serve areas greater than 100m²:by the provision of new luminaries or improved controls.

3) Installing energy metering in accordance with CIBSE TM 39.

4) Upgrading thermal elements having a 'U' value worse than table 7 (a) (see notes on 'Thermal Elements)'.

5) Replacing existing windows/ roof windows/roof lights (not 'display windows') or doors (excluding high usage entrance doors) that have a 'U' value worse than 3.3 w/m²:k - following the guidance below for 'Controlled Fittings' (definitions of 'display windows' and 'high usage entrance doors' is included below in controlled fittings notes.)

6) Increasing on-site low and zero carbon (LZC) energy generating systems if the existing on-site systems provide less than 10% of on-site energy demand. Provided the increase would achieve a simple-payback of 7years or less.

Consequential Improvements on installing building services.

Where installing a fixed building service as the first installation, or as an installation which increases the installed capacity per unit area to an existing service - you are required to carryout consequential improvements to existing building as follows:

1. Improve the building fabrics thermal performance to those parts of the building served by the services installed (where economically feasible); **And**

2. Make consequential improvements to bring the existing as well as the new building into compliance with Part L, unless you can prove that such works to the existing building are not technically, functionally or economically feasible.

   NOTE – the cost of the improvements required in (1) above – cannot be considered as contributing to the value of such consequential improvements in (2). This is to avoid higher CO2 emissions due to a higher level of servicing from the new building services conditioning the environment.

For the purposes of these Regulations - the ***'installed capacity per unit area'*** to an existing service is defined as the *'design output of distribution system output devices [thermal units] serving the space in question divided by the 'Total useful floor area' of the space'**.*

Which means if you increase the boiler size to serve the extension, rather than to increase the existing buildings heating provision, consequential improvements (examples of which are listed previously above) must be carried out. But the requirements below would not have to be followed:

Installed capacity per unit area of a heating system is increased.

Reasonable provisions to be followed where the *'installed capacity per unit area of a heating system is increased'* are set out below: unless you can prove that such works are not technically, functionally or economically feasible. NOTE - You cannot use the 10% rule threshold .as described for other consequential improvements.

1. Thermal elements within the area serviced by the systems having a 'U'-value worse than those in Table 7 (a) must be thermally upgraded as for **Renovation, Replacement and Retained Thermal Elements.**
2. Existing windows and doors (not display windows or doors / high usage entrance doors) within the area served and that have a 'U'-value less than 3.3W/m2.K have to be replaced (see Controlled Services notes on the standards to be followed).

Installed capacity per unit area of a cooling system is increased.

Reasonable provisions to be followed where the installed capacity per unit area of a cooling system is increased are set out below: unless you can prove that such works are not technically, functionally or economically feasible*. You cannot use the 10% rule threshold .as described for other consequential improvements.*

1. Thermal elements within the area serviced by the systems having a 'U'-value worse than those in Table 7 (a) must be thermally upgraded as for **Renovation, Replacement and Retained Thermal Elements; AND**
2. If the areas of existing windows / roof windows (not display windows or doors) within the area served exceeds 40% of the façade area or the rooflights area exceeds 20% of the roof area and the design solar load exceeds 25W/m2, then the solar control provisions should be upgraded to meet at least one of the following criteria to reducing solar gain and thereby the cooling requirements which in turn reduces energy consumption:
    a. the design solar load is no greater than 25W/m2
    b. the design solar load is reduced by at least 20%
    c. the effective g-value is no worse than 0.3 (CIBSE TM37 calculation).

AND

3. Any lighting system within the area served by the relevant fixed building service, which has an average lamp efficacy of less than 40 lamp-lumens per circuit watt, should be upgraded with new luminaries and / or controls as set out in the appropriate section below to reduce lighting loads, which in turn reduces heat generation and thereby reduces space-cooling demands.

GUIDANCE RELATING TO BUILDING WORK.

Extensions.

Important to remember - Consequential improvements will be required to the existing buildings if it has a 'total useful floor area' more than 1000m².

Large Extensions.

Important to remember- If your extension has a total useful floor area greater than 100m2 and greater than 25% of the 'total useful floor area' of the existing building; then the works are to be treated as a new building and must fully comply with ADL2A (not this guidance). However consequential improvements as explained above will still apply in accordance with ADL2B.

Other Extensions - Fabric Standards.

Controlled Fittings (Windows/doors/roof windows/ roof lights).

Curtain walling is also to be considered as a Controlled Fitting.

Controlled Fittings must be 'Suitably draught-sealed' and their 'Thermal performances to must comply with table 5 column (a) for extensions or (b) for replacement fittings or new fitting installed in an existing building'.

Table 5 – Standards for controlled fittings.

Fitting	(a) Standard for new fittings in extensions.	(b) Standard for replacement or new fittings in an existing building.
Window, roof window and roof lights*	U-value = 1.8W/m2.K for whole unit or Centre-pane U-value = 1.2W/m2.K	U-value = 2.2W/m2.K for whole unit or Centre-pane U-value = 1.2W/m2.K
Alternative option for windows in buildings that are essentially domestic in character e.g. student accommodation/ nursing homes or similar.	Window energy rating - Band D	Window energy rating - Band E
Pedestrian doors where the doors have more than 50% of their internal face area glazed.	U-value = 2.2W/m2.K	U-value = 2.2W/m2.K
High usage entrance doors for people.	U-value = 6.0W/m2.K	U-value = 6.0W/m2.K
Vehicle access and similar large doors.	U-value = 1.5W/m2.K	U-value = 1.5W/m2.K
Roof ventilators (including smoke extract ventilators.)	U-value = 6.0W/m2.K	U-value = 6.0W/m2.K

***Display windows have a lower 'U' value than those quoted.**

DEFINITIONS:

'display windows' – area of glazing, including doors – intended for the display of products and services. They must be at an access level and immediately adjacent to a pedestrian thoroughfare. No permanent workspace must be within one glazing height of the perimeter. *NOTE – glazing that extends more than 3metres above access level is not to be considered as part of the display window and must therefore fully comply with 'controlled services requirements'* (unless it is necessary for display purposes or in replacing existing the existing is higher than 3 metres or for building work involving changes to the façade there is a planning requirement for greater display window heights to fit in with surrounding buildings or to maintain the character of the existing building façade).

'high usage entrance doors' - doors subject to high volume usage, fitted with automatic opening and closing controls and having a draught lobby fitted.

Note - for certain buildings with high internal gains - a lower 'U' value may be an appropriate way of reducing overall CO2 emissions – therefore relaxed standards can be applied but N.L.T 2.7 W/M²:k.

Curtain walling 'U' value – not greater than 0.9 + 1.3 x (x = Fraction curtain walling is glazed) e.g. curtain walling 60% glazed and 40% opaque 'u' value standard required = 0.9 + 1.3 x 0.6 = 1.7w/m²k.

The extract below is from the old ADL indicating typical window U-values – basic 'Pilkington 'K' glass has an emissivity value of 0.15 / new Optitherm is 0.09. You are advised to check the relevant manufacturers U-value data.

Typical 'U' values

Pilkington 'K' Glass – 16mm gap air filled units – 2.0W/m2.K
Pilkington 'K' Glass – 16mm gap argon filled units – 1.8W/m2.K
Pilkington 'Optitherm' - 16mm gap SN argon filled units – 1.6W/m2.K

If you intend to use metal windows you must supply U-value calculations and the windows should be thermally broke to prevent condensation problems.

Table A1 **Indicative U-values (W/m²·K) for windows and rooflights with wood or PVC-U frames, and doors**

	Gap between panes			Adjustment for rooflights in dwellings[3]
	6mm	12mm	16mm or more	
Single glazing		4.8		+0.3
Double glazing (air filled)	3.1	2.8	2.7	
Double glazing (low-E, ε_n = 0.2)[1]	2.7	2.3	2.1	
Double glazing (low-E, ε_n = 0.15)	2.7	2.2	2.0	
Double glazing (low-E, ε_n = 0.1)	2.6	2.1	1.9	
Double glazing (low-E, ε_n = 0.05)	2.6	2.0	1.8	
Double glazing (argon filled)[2]	2.9	2.7	2.6	
Double glazing (low-E ε_n = 0.2, argon filled)	2.5	2.1	2.0	
Double glazing (low-E ε_n = 0.1, argon filled)	2.3	1.9	1.8	
Double glazing (low-E ε_n = 0.05, argon filled)	2.3	1.8	1.7	+0.2
Triple glazing	2.4	2.1	2.0	
Triple glazing (low-E, ε_n = 0.2)	2.1	1.7	1.6	
Triple glazing (low-E, ε_n = 0.1)	2.0	1.6	1.5	
Triple glazing (low-E, ε_n = 0.05)	1.9	1.5	1.4	
Triple glazing (argon filled)	2.2	2.0	1.9	
Triple glazing (low-E ε_n = 0.2, argon filled)	1.9	1.6	1.5	
Triple glazing (low-E ε_n = 0.1, argon filled)	1.8	1.4	1.3	
Triple glazing (low-E ε_n = 0.05, argon filled)	1.7	1.4	1.3	
Solid wooden door[4]		3.0		

Area of windows and roof lights.

Area of windows and roof lights in extension are not to exceed the values below unless a greater proportion of glazing is present in the part of the building to which the extension is attached. In such cases limit the extension's glazing proportions to no greater than the proportion that exists in the part of the building in which it is attached.

Table 2 – Opening areas in extensions.

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
Smoke vents.	N/A	As required

Provision of newly constructed 'Thermal Elements'.

Newly constructed thermal elements are to comply with the standards as set out in table 6 Column (a) and no individual element should be worse than those set out in column (b) Table 3.

Table 6 – Standards for Thermal Elements W/m^{2}k

Element.	(a) Standards for new thermal elements.	(b) Standards for replacement thermal elements.
Wall	0.30	0.35(2)
Pitched roof – insulation at ceiling level	0.16	0.16
Pitched roof – insulation at rafter level	0.20	0.20
Flat roof or roof with integral insulation	0.20	0.25
Floors (3)	0.22(4)	0.25(4)

NOTES

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

Table 3 - Limiting U-Value Standards (W/m2.K)

Element	(a) Area-weighted average U-value.	(b) Limiting U-value of individual elements.
Wall	0.35	0.70
Floor	0.25	0.70
Roof	0.25	0.35
Windows, roof lights, roof windows and doors	2.2	3.3

Renovation, Replacement and Retained Thermal Elements.

(Refer to Guide 24 – (2) for further guidance) refers to a wall, floor or roof that separates the heated or cooled space from the outside. Works relating to thermal elements can arise in building an extension, a material change of use, a material alteration, changing a buildings energy status or when carrying out other renovation works. Refer to guide 24 (2).

The requirements for **'Thermal Elements'** represent a significant change in regulation since it requires efficiency improvements whenever a roof, wall or floor is replaced or renovated. Thus the replacement of render or tile hanging to a wall will require insulation works to be undertaken at the same time. The AD gives guidance on the U values that should be achieved depending on whether an element is newly constructed, rebuilt, retained, replaced or renovated. *NOTE: consider carefully the potential for condensation problems and the controls necessary to prevent it when upgrading existing construction).*

Renovation of Thermal Elements.

Renovation is defined as the provision or replacement of a construction layer, such as external render, cladding, tile hanging or internal plaster. It would not include decorations or re-pointing brickwork. Where 25% or more of an elements surface area is to be renovated the whole element should be thermally improved (see AD L2B Table 7 (b) extract below).

Table 7 –Upgrading retained thermal elements

Element	(a) Threshold value W/m2.K	(b) Improved value W/m2.K
Cavity wall	0.70	0.35(2)
Other Wall type	0.70	0.35(3)
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
Floors(4)	0.35	0.25(5)

NOTES TO TABLE 7.

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

Replacement Thermal Elements.

Any existing element that is replaced or rebuilt should achieve the U values as for renovation and comply with Table 6 column (b) and have no 'U' value for individual elements worse than those in column (b) Table 3 (above).

Table 6 – Standards for Thermal Elements W/m^{2}k

Element.	(b) Standards for replacement thermal elements.
Wall	0.35(2)
Pitched roof – insulation at ceiling level	0.16
Pitched roof – insulation at rafter level	0.20
Flat roof or roof with integral insulation	0.25
Floors (3)	0.25(4)

(see full table extract below for key to numbered items)

Retained Thermal Elements.

Where an existing thermal element is part of a building subject to material change of use; or where an existing element becomes part of the thermal element; or where an existing element is being upgraded as a consequential improvement or where existing opaque fabric becomes part of the building thermal envelope whereas it previously was not: they should comply as follow:

Any thermal element below the 'Threshold Value' in Table 7 column (a) must be upgraded to the 'Improved Values' in Table 7 column (b) above. In the case of an existing wall, where the existing U value is greater than 0.70 it should be upgraded to at least 0.35 depending on construction.

(Refer to notes on technically, functionality and economically feasible issues allowing a reduction of standards e.g. the construction thickness of additional insulation reduces usable floor area by more than 5% or creates difficulties with adjoining floor levels or overloads the existing structure).

For Material Alterations/ Material Changes of Use or where there is a Change of Energy Status - Any existing window or roof light or door separating heated or cooled areas from outside or unheated space that has a 'U'-value worse than 3.3W/m2.K must be replaced following the guidance for 'Controlled Fittings' (reduced standards may be acceptable for *'display windows' and **'high usage entrance doors').*** NOTE: Glazing restrictions apply as for extensions.

Feasibility.

When undertaking works to existing buildings there are often practical constraints or technical problems that need to be taken into account, such as an unreasonable reduction in internal floor area where internal insulation is applied; the approved document suggests that the application of internal insulation is unfeasible if the associated reduction in floor area exceeds 5%. Technical problems will be assessed with respect to the impact on other aspects of the regulations. Such things as the need to avoid compromising ventilation when replacing windows and differences in floor levels, the effects of the new construction's loading on the existing will all be important.

All these questions of feasibility will be taken into account on a case-by-case basis. Economic feasibility is determined by a simple 15-year payback calculation, i.e. the amount of time taken to recover the initial investment through energy savings. So technically the level of upgrade could be limited to that which could be paid back over a fifteen-year period, however the examples quoted in the approved document are believed to meet this requirement.

Historic Buildings / Listed Buildings.

AD L2B will have an impact on renovation and conservation works to historic buildings. The AD provides for special considerations in these cases. In broad terms the advice of the conservation officer should be sought in assessing the works and reference should be made to the English Heritage guidance note on regulations and historic buildings *Building Regulations and Historic Buildings*.

Work on Controlled Services and Fittings.

(Heating, Hot water services, Mechanical Ventilation and Air Conditioning systems, Fixed internal and external lighting).

Where ***'fixed building services'*** are to be provided (including replacement) or extended – you must ensure that they meet enhanced minimum standards of energy efficiency.

'Fixed Building Services' means: any part of, or any controls associated with:

(a) Fixed internal or external lighting systems, but not emergency escape lighting or specialist process lighting: or

(b) Fixed systems for heating, hot water service, air conditioning or mechanical ventilation).

Refer to Guide 3 for exemptions of some minor works to Controlled services or fittings.

New 'Fixed Building Services'.

1. Must have efficiencies as indicated for the different types of service provision below: **and**

   For central plant i.e. boilers / chillers and main air handling plant – must have an efficiency no worse than the plant being replaced. If changing the services fuel type a calculation must be carried out to ensure that an existing low carbon component is not being replaced with a lesser provision.

2. New HVAC systems must have appropriate controls to achieve reasonable standards of energy efficiency – for example:

(a) Fixed building services systems to be sub-divided into separate control zones corresponding to each area of the building that has significantly different solar exposure, occupancy periods, or type of use.

(b) Each separate control zone should be capable of independent switching and control set-point.

(c) Service provisions should respond to the requirements of the space it serves. If both heating and cooling are provided they should be controlled so they do not operate simultaneously.

(d) Central plant serving zone-based systems should operate as and when required - (default condition MUST BE OFF).

(e) Additional controls and efficiency criteria are listed under the individual types of services below.

3. Provide new lighting systems with appropriate controls to achieve reasonable standards of energy efficiency.

4. Demonstrate the services have been effectively commissioned.

5. Demonstrate that reasonable provision of energy meters has been made for the effective monitoring of the plant performance.

6. Demonstrate that the relevant information has been recorded in a new logbook or incorporated into an update of the existing one.

Heating and Hot Systems.

Appliance efficiency and controls must comply with the provisions in the Non- Domestic Heating and Cooling and Ventilation Compliance Guide for the particular appliance type and distribution system. Checklists tools are provided in the guide and completed checklists must be provided on application submission.

Cooling Plant.

Where practical and cost effective to do so try and reduce the cooling requirements by improving solar control and by using more efficient lighting provisions.

Appliance efficiency and controls must comply with the provisions in the Non- Domestic Heating and Cooling and Ventilation Compliance Guide for the particular appliance type and distribution system. Checklists tools are provided in the guide and completed checklists must be submitted on application submission.

Air Handling Plant.

Appliance efficiency and controls must comply with the provisions in the Non-Domestic Heating, Cooling and Ventilation Compliance Guide for the particular appliance type & distribution system.

Systems must be capable of achieving a specific fan power at 25% of design flow rate, which is N.M.T that achieved at 100% design flow rate.

To aid commissioning / future flexibility variable speed fans are required for fans rated over 1100watts and which form part of the environmental control systems.

To reduce air leakage ventilation ductwork is to be constructed to be reasonably air tight and in compliance with HVCA DW144.

Insulation of Pipes, Vessels and Ducts.

Adequate provisions are to be made for insulating hot and chilled water pipework and storage vessels, refrigerant pipework and ventilation ductwork to conserve energy and maintain the temperature of the heating or cooling services, in accordance with the Non- Domestic Heating and Cooling and Ventilation Compliance Guide.

Lighting.

Fixed Internal Lighting, including Display Lighting.

Note – where the area covered by the new lighting system is less than 100m2 the work must in its self comply with these standards, but there is no requirement to notify Building Control (see Guide 24 (2).

Emergency escape lighting and specialist process lighting (i.e. specialist task lighting within a space) are not subject to these requirements.

General Lighting Efficacy in Office, Industrial and Storage Areas in all Building types.

For these provisions - 'office' means areas of desk-based tasks, including classrooms, seminar rooms, and conference rooms, including those in schools.

Lighting to have an average efficacy not less than 45 luminaire-lumens per circuit watt (averaged out over the whole area of these space types in the building - to allow for design flexibility to vary the light output ratio of the luminaires and the lamps luminous efficacy).

Average luminaire-lumens/circuit-watt is calculated by:

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

(a) Lamp-lumens = sum of average initial (100 hour) lumen output of all the lamps in the luminaire; and

(b) LOR – 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.

(c) Control factor = the factor applicable when automatic controls substantially reduce the luminaries power consumption when electric light is not required (see commentary below) – which includes values of the control factor for use in the above formula. Control factors allow greater flexibility and encourage better controls.

General Lighting Efficacy in all Other Types of Space.

Lighting to have an average initial (100 hour) lamp plus ballast efficacy not less than 50 lamp-lumens per circuit Watt.

Lighting Controls For General Lighting in All Types of Space.

Controls to be provided so that unnecessary lighting can be switched off when rooms are not occupied or there is an adequate daylight level. Always risk assess the use of automatically switched lighting.

Local switches to be provided in easily accessible positions within each working area or at the boundaries between working areas and general circulation routes that are operated by deliberate action of the occupants (***'occupant control'***), either manually or remotely.

The distance on plan from any local switch to any luminaire it controls to be N.M.T 6 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 lights are to be separately switched.

'daylit space' – means any space:

(a) within 6m of a window wall, provided that the glazing area is at least 20% of the internal area of the window wall.

(b) Below rooflights and similar provided that the glazing area is as least 10% of the floor area. The normal light transmittance of the glazing should be minimum 70%, or, if the light transmittance is reduced below 70%, the glazing area could be increased proportionately.

Occupant control can be supplemented by automatic systems that switch off, when they sense no occupants or dim or switch lighting off when sufficient daylight is detected.

Table 4 below gives control factors for such enhanced controls – used as part the luminaire efficacy calculation above.

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 factors listed in table 4.

Table 4 Luminaire Control Factors.

Control Function.		Control Factor.
(a)	The luminaire is in a daylit space 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**

Alternatively to the above - follow BRE Digest 498.

Display Lighting in All Types of Space.

Lighting to have an average initial (100 hour) lamp efficacy not less than 15 lamp-lumens per circuit Watt. Efficacy calculation must include power consumed by any transformers or ballasts.

Note: this does not apply to the normal lighting necessary for general building use (previous requirements apply).

Display Lighting Controls.

Connect display lighting to dedicated circuits that can be switched off when the display lighting might not be required. E.g. timer switches to turn display lighting off outside of open hours (except for displays to be viewed from outside through display windows).

Energy Meters.

Aim is to enable building occupiers to assign at least 90% of the estimated annual energy consumption of each fuel to the various end-use categories (heating, lighting etc.)

Reasonable provision in existing buildings is to install energy metering systems in the building services provided as part of the building works in accordance with recommendations in CIBSE TM39.

In addition to this:

(a) Meters should be provided to enable performance of any LZC system provided as part of the works to be separately monitored: and

(b) in buildings with a total useful floor area of more than 1000m2, the metering system should enable automatic meter reading and data collection.

Commissioning and Providing Information.

On completion all fixed building services should be properly commissioned with all parts and controls working adequately – Regulation (20C) requires that the installer provides a notice confirming that the fixed building services have been commissioned in accordance with the CIBSE Commissioning Code M on Commissioning Management and for ductwork air leakage testing, this should be tested in accordance with Heating & Ventilation Contractor's Association guide DW/143 – A Practical Guide to Ductwork Leakage Testing.

The commissioning 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 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.

Approved commissioning specialists:

HVCA Systems - Membership of the Commissioning Specialists Association or the Commissioning group of the HVCA

Lighting Control Systems – persons accreditated under the Lighting Industry Commissioning Scheme.

Ductwork leakage testing - Membership of the HVCA specialist ductwork group or the Association of Ductwork Contractors and Allied Services. Testing to be carried out in accordance with the procedures set out in Heating & Ventilation Contractor's Association guide - DW/143.

Providing Information.

On completion of the works, you must ensure contractors provides the owner with sufficient information about the building, the fixed building services and their maintenance requirements is that the building can be operated to achieve the intended fuel and power conservation provisions (e.g. provide a Building Log-Book).

Building Log-Book.
Provide a building log-book in accordance with CIBSIE TM31 Building Log-book Toolkit or amend any existing log books that may exist (provided its format is compatible with the TM31 format).

If you decide to use a different form of log-book, then the information contained and formatting must be equivalent to TM31.

A simple summary format suitable for day to day use must also be provided and it can cross reference to other documents e.g. Operation & Maintenance Manuals / Health & Safety files etc.

It should provide details of:
(a) Any newly provided renovated or upgraded thermal elements or controlled fittings.

(b) Any newly provided, fixed building services, their method of operation and maintenance.

(c) Any newly installed energy meters, and

(d) Any details that collectively enable the energy consumption of the building and building services comprising the works to be monitored and controlled.

Continuity of Insulation

Ensure you design to avoid thermal cold bridging at joints / openings and sealing must be provided to prevent unwanted air leakage through the new elements. For larger projects you must submit a report from a suitably qualified person confirming appropriate design details / building techniques have been adopted and that the work has been carried out in a way to achieve reasonable conformity.

Suitable guidance to follow:
(a) Domestic style construction – TSO Robust Details catalogue.
(b) Cladding systems – MCRMA Technical Note.
BRE IP 1/06 guidance to demonstrate that proposed details deliver an appropriate performance level.

Examples of Continuity of Insulation and Airtightness.

All gaps between elements must be sealed to reduce unwanted air leakage, e.g. follow robust detail sealing as described below:

- *Ensure wall, floor and roof insulation is continuously linked or overlapped to avoid creation of cold bridges. Watch your detailing where roof and floor structures abutt external walls and ensure all residual gaps are insulated.*
- *Provide vapour control barriers on the warm side of any insulation – this can include insulated ground floor construction (follow appropriate manufacturer's detailing requirements).*
- *Ensure all lintels are insulated and that walls are not constructed out of differing thermally performing materials.*
- *Use joist hangers to support timbers or seal all junctions of structural timbers/ steel etc where built into an external wall with mastic sealant.*
- *Mastic seal all junctions of doors / windows and walls and under the edges of skirting boards / architraves.*
- *Seal around all services penetrations through the external structure, seal all junctions of walls / ceilings with ducting and close off the tops of all vertical ducts e.g. s.v.p boxings.*
- *It is important that all gaps have the appropriate sealant and or gap fillers provided suitable for the gap size and degree of movement anticipated.*
- *For drylining ensure continuous ribbons of adhesive are provided to fix dry lining at perimeters of external walls, openings, around services e.g. socket outlets etc.* ***The sealing of dry lining on dabs is very important, as it is a key area of air leakage.***

  IMPORTANT NOTE – Ensure adequate precautions are taken to prevent condensation in the replaced or altered construction elements.

Option for Design Flexibility.

When constructing an extension you could use an average U value across the extension's thermal envelope that is the same as if the prescribed U values had been used for each individual element. This means that a better value in the walls can be used to trade off against a worse U value in the roof.

Area weighted U-value of all the extensions elements is to be no greater than that of an extension of the same size / shape that complies with the new U-value standards and glazing area restrictions.

Calculation formula –

{(U1 x A1) + (U2 x A2) +(U3 x A3) +……etc)} divided by {A1 + A2 + A3 +……etc)}

U = U-value of element of the same construction (but no worse than the limits in Table 3 below).

A = internal area of the element.

TABLE 3 - Limiting U-Value Standards (W/m2.K)		
Element	**(a) Area-weighted average U-value.**	**(b) Limiting U-value of individual elements.**
Wall	0.35	0.70
Floor	0.25	0.70
Roof	0.25	0.35
Windows, roof lights, roof windows and doors	2.2	3.3

A further alternative is to use Simplified Building Energy Model (SBEM) calculation tool or other approved simulation programme; to show that the building and extensions calculated CO2 emissions is no greater than for the building plus a notional extension complying with the new thermal standards. Table 3 minimum standards must however be complied with.

Where the building is over 1000m^2 - the building used for calculation of both the actual and notional extension should incorporate any improvements required by 'Consequential Improvement'.

Where additional upgrades are proposed in the actual building to compensate for lower performance of the extension – all upgrades must be no worse than the limits in Table 7 (b).

IMPORTANT PROCEDURAL ISSUES FOR FIT-OUT WORKS / LARGE EXTENSIONS / MODULAR BUILDINGS.

1) In buildings erected in compliance with Building Regulations before 6th April 2006 – any fit-out works must comply with ADL2B requirements.

2) Buildings such as shell and cored office buildings or business parks built in accordance with these new energy efficiency requirements may require a different approach to the fit-out works. The fit-out must comply with ADL2B's energy efficiency requirements and any '*fixed building services'* to be installed must have efficiencies no worse than those assumed in the calculations showing the existing buildings compliance on the shell approval (there is no need to improve beyond these provisions).

   'Fixed Building Services' means: any part of, or any controls associated with:
   (a) Fixed internal or external lighting systems, but not emergency escape lighting or specialist process lighting: or
   (b) Fixed systems for heating, hot water service, air conditioning or mechanical ventilation.

3) Large extensions (i.e. extensions having a *'total useful floor area'* greater than 100M²: and greater than 25% of the 'total useful floor area' of the building) – should be treated as new build and comply with ADL2A.

   'Total useful floor area' – total area of all enclosed spaces measured to the internal face of the external walls. The area of sloping surfaces e.g. stairs, galleries, raked auditoria / terraces to be taken as plan area. Include all areas occupied by partition walls/columns chimneybreasts and internal structural of party walls. Exclude non-enclosed areas e.g. open floors/covered ways and balconies.

   Consequential improvements would still apply to buildings over 1000M² total useful floor area.

4) Extensions constructed using sub-assemblies obtained from centrally held stock or from a disassembly or relocation of buildings at other premises must comply with ADL2A(New Build) and Regulation17D (consequential works) e.g. School extension of pre-fabricated portable buildings.

Conservatories.

This applies to non-exempt conservatories. Conservatory is defined as having N.L.T three quarters of its roof area and N.L.T one half of its external wall area made of translucent material.

REQUIREMENTS:

a. There is to be thermal separation between the building and conservatory, i.e. walls, doors and windows to be insulated to at least the standard of the existing building, doors and windows to be fully draught sealed.

b. Provide independent temperature and on/off controls to any heating system (refer to previous controlled services notes).

c. Glazed elements to comply with the following:

Window, roof window and roof light	U-value = 2.0W/m2.K or Window energy rating – Band E; or Centre - pane U-value = 1.2W/m2.K
Doors with more than 50% of their internal face area glazed.	U-value = 2.2W/m2.K or Centre-pane U-value = 1.2W/m2.K
Other doors	3.0W/m2.K

d. Thermal Elements must comply with the following:

Wall	0.35(2)
Pitched roof – insulation at ceiling level	0.16
Pitched roof – insulation at rafter level	0.20
Flat roof or roof with integral insulation	0.25
Floors	0.25(3)

If a highly glazed extension is not ***thermally separated*** from the dwelling – it will be considered to be a conventional extension and must therefore fully comply with the regulations requirements.

NOTE: If the conservatory fails the minimum requirements for translucent materials, but satisfies all other of the above – then you must provide performance calculations to show that the performance is no worse than a conservatory of same size and shape i.e. the average weighted U-value of the proposed elements is no greater than a conservatory complying with the above.