# Bulletin 4

## Building Regulations Part L

01/11/2001

### In Summary

**Part L is changing, and will have a dramatic effect on the specification of all new and replacement windows from next April. The new Approved Documents for Part L are lengthy and complex, but basically boil down to a simple picture - windows will need to have U values of 2.2 (for metal frames) and 2.0 (for non metal). Requirements that Pilkington low emissivity glass, such as Pilkington K Glass™, will help to achieve.**

The long-awaited amendments to Building Regulations Part L have been issued, so we now know exactly what will be required. The detail is contained in two new Approved Documents; Document L1 covering housing, and L2 non-housing. Both can be downloaded from the DTLR's website, on www.safety.dtlr.gov.uk/bregs/brads.htm.

The new Regulations come into force on 1st April 2002. From that point, the energy performance of all new and replacement windows will have to be significantly better than is common practice now. This Bulletin summarises the new requirements affecting windows and glazing.

#### Key contents

- For all building types (housing and non-housing), both new build and replacement, the following maximum Elemental U values will apply

  PVC-U and timber windows 2.0 W/m²K

  Aluminium and steel windows 2.2 W/m²K
- In the case of replacement windows only, an alternative way of complying will be by using glazing with a maximum centre-pane U value of 1.2 W/m²K.

#### The contents in more detail

**1 New Housing**

There are three alternative ways of complying:-

a) Elemental Method

As this is the simplest method, it is likely to be the most popular. Maximum permissible U values are given for individual elements of the building. For windows, external doors and rooflights, a combined (area-weighted average) U value is prescribed. Where the glazing is in metal frames, the permitted U value is 2.2. For PVC-U or timber frames it is 2.0. Any individual window, door or rooflight can have a U value exceeding the prescribed figure as long as the area-weighted average of all of them meets the required level. There is also a requirement that the total area of windows, doors and rooflights does not exceed 25% of total floor area.

The energy performance of a window is dependent on the thermal efficiency of the frame and the glazing. The required U values apply to the whole window, ie frame and glazing. The window supplier/installer will need to demonstrate that the windows achieve the appropriate U value.

This can be done by testing a representative window in a "Hot Box", or by calculation. Alternatively, the U value of a window can be obtained from tables in the Approved Documents, which give window U values for different frame materials and glazing configurations. Table 1 is extracted from the table for windows with PVC-U or timber frames. However, these values are very conservative, and are likely to be higher (that is worse) than U values that would be obtained by measurement or calculation.

Table 1. U values for PVC-U or timber windows with various glazing combinations.

| | Gap between panes | | |
|---|---|---|---|
| | 6mm | 12mm | 16mm or more |
| Double glazing (air filled) | 3.1 | 2.8 | 2.7 |
| Double glazing (low E, $\varepsilon_n$ = 0.2, air filled)* | 2.7 | 2.3 | 2.1 |
| Double glazing (low E, $\varepsilon_n$ = 0.15, air filled) | 2.7 | 2.2 | 2.0 |
| Double glazing (low E, $\varepsilon_n$ = 0.1, air filled) | 2.6 | 2.1 | 1.9 |
| Double glazing (low E, $\varepsilon_n$ = 0.05, air filled) | 2.6 | 2.0 | 1.8 |
| Double glazing (argon filled) | 2.9 | 2.7 | 2.6 |
| Double glazing (low E, $\varepsilon_n$ = 0.2, argon filled) | 2.5 | 2.1 | 2.0 |
| Double glazing (low E, $\varepsilon_n$ = 0.1, argon filled) | 2.3 | 1.9 | 1.8 |
| Double glazing (low E, $\varepsilon_n$ = 0.05, argon filled) | 2.3 | 1.8 | 1.7 |

* $\varepsilon_n$ is the normal emissivity of the low E glass. Pilkington has a range of low E glass, which are listed in table 2, together with their emissivities.

Table 2. Emissivities of Pilkington low E glass range.

| Product | Normal emissivity $\varepsilon_n$ |
|---|---|
| Pilkington **K Glass™** | 0.15 |
| Pilkington **Optitherm™** | 0.09 |
| Pilkington **Optitherm™** SN | 0.04 |
| Pilkington **Optitherm™** S2 | 0.02 |

The shaded boxes in table 1 highlight the configurations which will achieve U2.0 or better. **It can be seen that** Pilkington **K Glass™ in double glazing with a 16mm air cavity, will enable a PVC-U or timber window to achieve U2.0.**

b) Target U value Method
By use of a rather complex formula, this gives the designer a target heat loss figure for the whole house. It takes into account the efficiency of the heating system, so is principally a method of trading off fabric insulation with boiler efficiency, thereby giving some limited flexibility on design. However, to ensure adequate daylight levels, window area should not go below 17%. The formula also allows solar gains to be taken into account, rewarding the use of larger areas of glazing on southerly facades.

c) Carbon Index Method
This is a development of the "SAP" method which is in the current Regulation. Basically it is a very complex prediction of the total $CO_2$ emissions resulting from the house's energy consumption. The designer will have to demonstrate that the house achieves a Carbon Index of 8.0 or greater. It offers the highest degree of flexibility of the three methods.

**2 Existing Housing**
The most radical aspect of the new Regulation is that replacement windows in existing buildings will now be brought within the scope of Part L. This means that every window that is replaced will have to achieve a U value similar to that prescribed for new housing under the Elemental Method. Specifically the requirement will apply to any window, rooflight or door having more than 50% glazing (ie replacement doors having less than 50% glazing will not need to comply). Exceptions can be made only in the case of replacement windows in historic buildings. Therefore replacement PVC-U or timber windows will need to have a U value of 2.0, and metal windows 2.2. An acceptable alternative will be to use glazing having a centre-pane U value no greater than 1.2, irrespective of frame performance.

Because this will increase several-fold the number of window installations needing to comply with Building Regulations, the current system of approval and policing will have insufficient capacity. A system based on self-certification, backed up by random inspections, is therefore being developed for the installation of replacement windows. Details should emerge in the coming months.

**3 New Non-housing**
There are three alternative ways of demonstrating compliance. The Elemental Method is the most straightforward, requiring area-weighted U values 2.2 and 2.0 for metal and non-metal windows respectively. Maximum areas of windows and rooflights are prescribed, which vary according to building type, but they are all the same as in the current Regulations. Display windows and shop entrance doors are exempt from the U value requirements.

There are two other methods, each of which is based on estimating the total $CO_2$ emissions of the proposed building. If target levels are achieved, the design is permitted. These methods therefore allow a much higher degree of flexibility in window U value and area than does the Elemental Method.

**4 Existing Non-housing**
When any window, door or rooflight is being replaced, its U value must achieve the same performance as listed in the Elemental Method, in other words 2.0 for PVC-U or timber windows and 2.2 for metal. Alternatively the requirement can be satisfied by a glass centre-pane maximum U value of 1.2, and the effect of the frame ignored. Exceptions are permitted in the case of historic buildings.

**5 Conservatories, atria and sun-spaces**
In Approved Document L1, the wording of the section on conservatories is similar to that in the current Regulations. For the first time however, the Regulations will apply to all building types, not just housing. Therefore requirements also appear in Document L2. Basically a conservatory will not need to achieve specific U values if it is unheated or is "separated" from the host building by eg doors. However, if the conservatory opens out into the building, without separation, it is effectively an extension, in which case the new Elemental U values will apply.

**Window U values**
The new Approved Documents explain how window U values are to be obtained, in order to demonstrate that compliance with Part L is achieved. Manufacturers' certified U values are the preferred proof of performance. These can be by measurement in a "Hot Box", to BS EN ISO 12567-1:2000, or by calculation to BS EN ISO 10077:2000. The window tested or simulated should be to the configuration specified in GGF Data Sheet 2.2.

As an alternative, the U value for a given frame/glass permutation can be read from tables of indicative U values in the Approved Documents. However, these are rather cautious, and tend to give somewhat higher (ie worse) U values than would be obtained by testing or simulation using a recognised computer program.

For example, table A1 in ADL1, indicates that a PVC-U window incorporating a 16mm air gap and low E glass of emissivity 0.15 (eg Pilkington **K Glass™**) would have a U value of 2.0, whereas Hot Box tests conducted on a wide range of standard PVC-U windows incorporating Pilkington **K Glass™** in a 4/16/4 air-filled double glazed unit, show U values of the order of 1.8 - 1.9 are achieved. So, although Pilkington **K Glass™** would enable the window to satisfy Part L in either case, the window manufacturer may choose to undertake a Hot Box test in order to demonstrate superior performance.

**For information on Building Standards (Scotland) Regulations Part J, please see Bulletin 3.**

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For more detailed background and information visit our website: **www.pilkington.com** and see the New Building Regulations section on the building products UK homepage. This includes summaries of manufacturers' Hot Box test reports on windows whose U values have been shown to meet or exceed the new Part L requirements.

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