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TAKING A HOLISTIC APPROACH TO CURTAIN WALLING

By John Stamp, technical consultant, Kawneer Architectural Aluminium Systems

The CO_2 emissions route of the enhanced Part L does offer architects more scope in choosing the best range of components to achieve the overall solution. However, the task is complicated by the fact that specifiers can no longer use the elemental method of compliance such as U-values to meet their target. The whole building has to comply, not the components.

A range of factors therefore need to be considered such as air leakage and thermal bridging and they all have to be calculated in relation to the overall shape and size of the building.

In turn, the revisions to Approved Document Part L–L1A have forced materials manufacturers to reassess their product offering because they can no longer say their materials are Document L compliant. This radical change in calculation has obligated them to plan ahead as well as produce more innovative products to meet specifier demands.

The new route to compliance stipulates a 20% (with a target of 18kg/m^2) reduction in CO_2 emissions over the 2002 regulations. To help deliver these targets the Government has developed a carbon emissions calculation using Standard Assessment Procedure (SAP) which is now the only method of demonstrating compliance and has to be adhered to for dwellings below 1000m^2.

When it comes to the building envelope, airtight construction is an essential element for manufacturers' window systems and curtain walling. Air leakage can make a significant difference to the CO_2 emissions by reducing heat loss, and sample testing is therefore mandatory under the new regulations.

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Air leakage arises principally from poorly designed interfaces between cladding packages. A whole building air leakage test checks that those interfaces and other sources of air leakage are correctly sealed.

According to the Centre for Window and Cladding Technology (CWCT), uncontrolled air leakage is easily the biggest single factor causing heat loss and high-energy consumption in buildings in the UK. The Building regulations recognise this and Part L2 places emphasis on reducing overall envelope air leakage and, more importantly, proving this has been done on a project-by-project basis.

Part L2 uses air permeability to assess air leakage in a building – air permeability being the average volume of air that passes through $1m^2$ of the building envelope (including external and party walls, floors and roofs) when the building is pressure tested to 50Pa.

The worst acceptable leakage rate is $10m^3/(h.m2)$ @ 50Pa for non-domestic buildings other than dwellings with a gross floor area of more than $1000m^2$ – but lower values will often be needed to achieve CO_2 emission target. For buildings that achieve lower air leakage rates it is possible to balance energy savings from improved sealing against greater conduction losses/gains associated with higher U-values.

Architectural aluminium systems company Kawneer had been planning for these changes for a number of years and early in 2004 its 1202 drained curtain wall system achieved air pressure test results (as part of a whole building pressurisation test) of 2.16 $m^3/h/m2$ at a rate of 50Pa. The installation, at Gyle Square, Edinburgh, was tested by Oxfordshire-based testing house Building Sciences and to date was the best air pressure test they had ever witnessed.

The company's technical experts are working closely with the CWCT and the CAB on their document detailing how to calculate U-values for curtain walls. This document forms a second tier to approved Document L and demonstrates the results you will get with different combinations of glass and curtain walling.

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Kawneer is keen to keep up to date with the developments and also to influence the decisions. Similarly, it is working with all the other manufacturers and partners to ensure an industry standard for aluminium products is maintained.

Airtightness and compliance with Part L revisions also relies on the quality of construction of curtain walling and associated systems. It is therefore important for manufacturers to work with approved installers who have been trained extensively on the products they are working with.

During research and development, Kawneer continually analyses its products to ensure they can meet U-frame values that are comparable with the competition. These are then tested against typical configurations of frame and glass to ensure they will meet the requirements. They have also developed a software package called KaluCAD to calculate the overall window values for their dealers – information that they can pass onto the architect to aid his overall computation.

The revisions to Part L make a distinction between new and existing dwellings – any existing window or door that has a U-value less than 3.3W/m^2K should be replaced. Systems companies like Kawneer are producing window units that are thermally broken to ensure compliance with Document L.

Energy use in buildings is heavily governed by energy transfer through the building envelope. Reducing the energy lost by conduction through the envelope is an important aspect in the design of energy-efficient buildings.

As well as air leakage, energy is gained or lost from a building by either radiation or convection from its outer surface. Energy transfer through a building envelope may cause heat gain or heat loss, either of which may lead to increased energy use in a building, depending on the external climate which in the UK will vary seasonally.

Energy-efficient facades have to be insulated to keep the external surface at nearly the same as the external temperature. They have to be sealed to prevent gross air leakage to reduce the mass transfer of losses and gains. Internal surfaces also have to be shielded to reduce radiation losses/gains from and to internal surfaces and allow sufficient daylight to reduce energy used for artificial lighting.

Calculation of the amount of energy lost by conduction through the building envelope is an important part of any method of assessment or compliance checking procedure. An airtight building requires less power to control the quality of the internal environment, thus reducing the annual running costs, providing energy savings of between 40-60%.

The next big change to Part L is due in 2010 when further significant reductions are predicted by the Government. The amendments to Approved Document Part L–L1A have forced materials manufacturers to reassess their product offering and become more innovative. In future there is bound to be more focus on continually updating products to meet specifier demands in line with legislation.

***** Kawneer has a RIBA-approved CPD that specifically covers the new Part L regulations and the impact they have on glazed aluminium facades.

“Approved Document L 2006 – Its Impact on Glazed Aluminium Facades” helps specifiers understand the revisions and their impact on new and existing buildings, and the surrounding issues.

The presentation discusses the implications of climate change, the drivers for change, the changes themselves and how they pertain to windows, doors and curtain walling in new and existing dwellings or buildings.

And while it does clarify the new regulations’ radical new approach, with a focus on CO_2 emissions via air leakage, it also emphasises the opportunities that now exist for greater design flexibility and increased emphasis on ensuring standards are met in practice.

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