When it comes to 'designing out' maintenance in the current programme of school regeneration, a little science goes a long way. Michael Miles, a director at Jones of Oswestry, explains.

# Testing times...


***Superlintels from Jones of Oswestry have been specified to meet the 60-year design life for new accommodation at Northampton School for Girls and other sites within Northamptonshire County Council's extensive PFI schools building programme.***

By 2011, the government expects over 150 schools to be open under its ambitious Building Schools for the Future (BSF). While delivery targets are tough, so are the design criteria being applied to ensure that new school infrastructure will stand the test of time. Whether procured traditionally or through PFI, whole life costings (WLC) have become fundamental to the design of school building stock.

As a key tool in sustainable design, WLC requires specifiers to evaluate not just the initial cost of components, but Net Present Value (NPV). This is the cost over the whole life cycle of the building, taking into consideration the capital cost but also the cost of potential maintenance, repair, replacement and disposal.

Specifiers are under pressure to make accurate assessments of life-cycle costings, not least to keep a rein on 'life-cycle funds', the annual provision for maintenance and replacement of building components.

The risk perceived in life-cycle costing has been cited as a key detractor for investors in the secondary market for PFI buildings, ie, those taking equity in the asset typically when construction is complete. The concern is that the accuracy of life-cycle costing is uncertain as the buildings have not been operational for a long enough period.

Of course, it is extremely difficult to predict the holistic performance of any building design; each is unique in terms of the types, specification, spatial configuration and structural interaction of components.

Assessing the longevity of individual components may be no more exact. Many modern-day evolutions of building products, however technically advanced and rigorously tested, cannot point to a long history of performance either.

Where possible, specifiers should look for products backed by scientifically-based performance data, which will provide more dependable figures for predicted service life.

Defined by well-established scientific principles, post-galvanised steel lintels offer the quantifiable longevity which is of great value to WLC. The designer's responsibility for longevity is also emphasised in the durability standard, BS 7543:2003, and lintel standard, EN 845-2:2003.

Zinc 'weathers' at a predictable, known rate and the behavioural characteristics of steel sections are governed by long-established engineering formulae. In terms of lintel longevity, the thicker the steel, the thicker the zinc coating that can be bonded through galvanizing, and the longer the life of the lintel.

There are three critical considerations in evaluating steel lintel longevity.

Firstly, lintels should be treated as a main structural element, not a maintainable component, as they cannot be inspected, maintained or replaced without significant and costly disruption. This means they should provide a minimum 60- or even a 120-year service life, which coincide with the accepted design life criteria for public sector buildings.

> 'Zinc weathers at a predictable known rate.'

Secondly, lintel durability should factor in prevailing atmospheric corrosion rates, as documented on the Galvanizers Association Zinc Millennium Map.

It not only tells us which areas of the UK are more corrosive atmospherically than others, but also tells us at what rate zinc erodes in any part of the UK.

Of the different corrosion-proofing methods available, zinc galvanising is the only one that can be evaluated in relation to the differential in background corrosivity dictated by geographic location. This ensures lintel protection is not 'over-specified', a key consideration in sustainable thinking and cost control.

In contrast to pre-galvanised material, only post-galvanised steel – where the component is immersed in a tank of molten zinc after fabrication – can assure complete, uninterrupted protection.

Thirdly, heavier gauges of steel plate and the composition of certain superior grades of steel will encourage the bonding of thicker, more uniform zinc coatings.

According to BS EN ISO 1461, material less than 1.5mm thick will produce no more than a 45 microns zinc coating. In contrast, a minimum 3mm thick steel plate will produce around 70-85 microns of protection, which is capable of extending lintel service life to around 60 years in average conditions of atmospheric corrosivity.

But to achieve longer service life, especially in more corrosive environments, a minimum 4mm, 6mm or even 8mm steel plate will be required to produce sufficient thickness of zinc coating to cope.

To save cost without compromising performance, longevity data for post-galvanised lintels can be sufficiently robust to recommend their specification as a viable and cost-effective alternative to stainless steel.