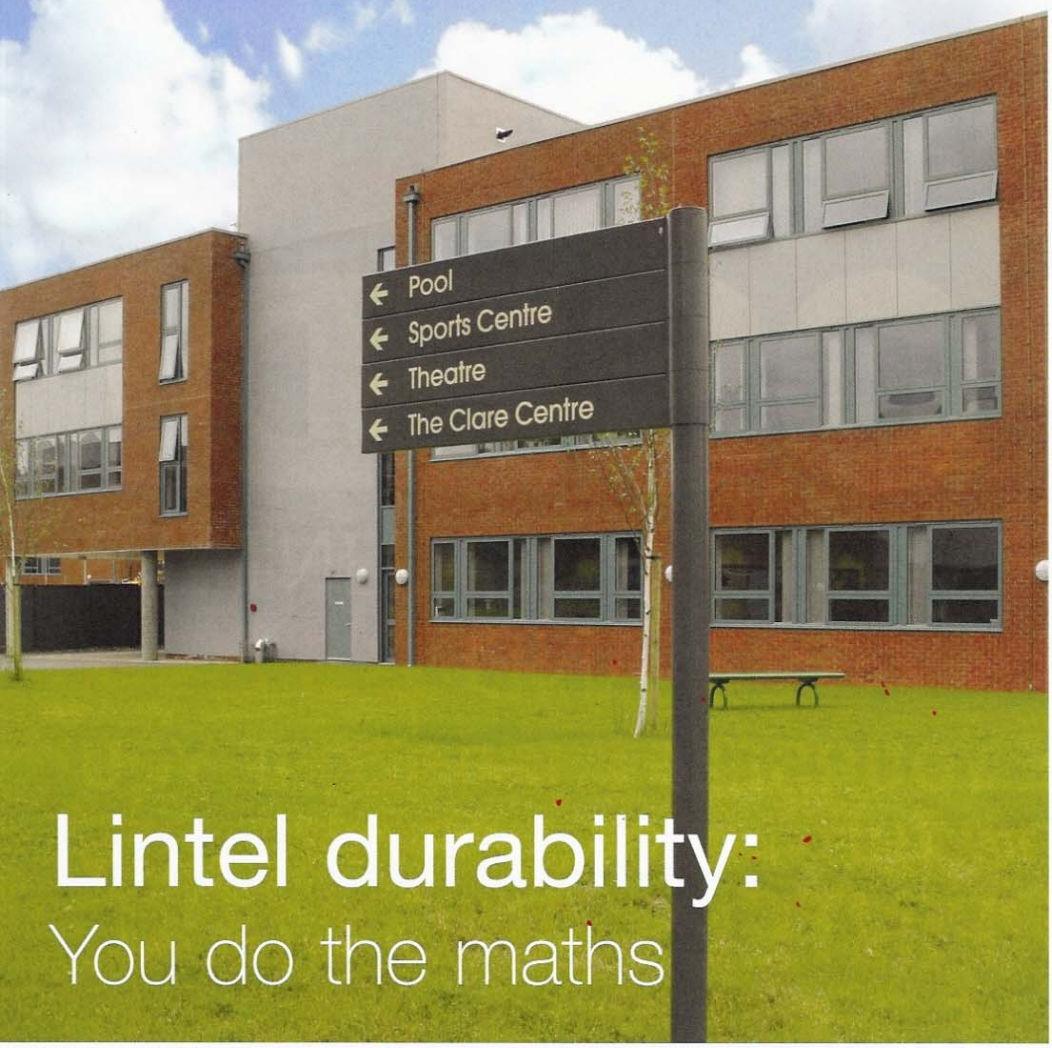

Lintel durability:
You do the maths

Structural engineers, Jenkins & Potter, specified Superlintels with Duragalv 140 post-galvanising as a cost-effective alternative to stainless steel for the Northampton School for Girls PFI project.

THERE ARE SEVERAL BRITISH STANDARDS RELEVANT TO LINTEL SPECIFICATION, BUT NONE GIVES A DEFINITIVE GUIDE TO CALCULATING LINTEL SERVICE LIFE. IT IS DOWN TO THE DESIGNER TO DO THE NUMBER-CRUNCHING AND DEMONSTRATE THAT LINTELS WILL PROVIDE THE REQUIRED LONGEVITY IN RELATION TO BUILDING DESIGN LIFE AND LOCATION.

Michael Miles, Director of the Lintel Specialist, Jones of Oswestry, part of Technogroup, discusses.

Wouldn't life be easier if lintels came with a label stating how long they will last in any given location and application?

In fact, in an age when sustainable design demands we consider life cycle assessments of products and account for life cycle energy burden, all building products should be clearly marked with a 'best before' date. Construction is largely a mathematical exercise, after all, slave to dimensional tolerances and governed by scientific principles. So why should we be any less rigorous when it comes to doing the sums and validating product life expectancy, especially for structural, load-bearing elements?

It is here - classifying the structural significance of a lintel – that we face the first major issue in assessing lintel service life. Should they be considered a 'lifelong' or maintainable element?

Steel lintels are designed to the same principles as the structural steelframe; this allows them to carry several storeys of brick and block across spans up to10m+. So like the steelframe, they need – at a minimum - to maintain their integrity for the design life of the building.

The HAPM Component Life Manual, a widely cited reference on product service life, differs on this point. It requires lintels to provide '35 years to first maintenance'. But should designers accept products that could potentially incur costly and disruptive maintenance, or more likely replacement, just over halfway through a 60 year building design life, the minimum for new and social housing? It's a 'durability risk' that surely designers and their clients would rather design out.

Accurate durability assessment makes a crucial contribution to the management of risk in any building project. Knowing how long products will last and what maintenance they may need helps in evaluating Whole Life Costs, including life-cycle funds for maintenance and replacement of components. It minimises the uncertainties and risks for all stakeholders in developing and operating built assets.

Worryingly, too many designers are still vague when it comes to assessing lintel durability, working under the misconception that simple compliance with standards makes a lintel fit-for-purpose.

Lintel specification, BS EN845-2:2003*, lists a number of protective coating specifications for steel lintels, but gives no clues to their relative longevity.

It acknowledges that lintel corrosion protection depends on, among other things, 'the degree of exposure and climatic conditions'. BS 7543:2003 'Guide to durability of buildings and building elements, products and components', lists in detail the factors, notably local atmospheric corrosivity, that will accelerate the weathering – and diminish the longevity - of a lintel's protection system.

Regional corrosivity levels for the UK and corresponding zinc weathering rates are defined on the Galvanizers' Association Zinc Millennium Map. These rates are key to evaluating if a lintel's galvanising specification will sustain its structural integrity for the design life of the building.

Superlintels with Duragalv 70 post-galvanising, for spans up to 6m, were specified by lead consultants and architect, HKS, to meet minimum 65 years PFI design life for the external envelope at the University Hospital of North Staffordshire, Stoke.

The maths is quite simple. For instance, a steel lintel destined for an area of average (category 3) corrosivity will be subject to a zinc erosion rate of 1.5µ per annum. This means it needs a minimum 90 microns zinc coating to meet a minimum 60 year design life.

But there are other variables to factor into the equation, to maximise the reliability of lintel service life figures and minimize the risk of durability failure.

Post-galvanising allows the control and totality of zinc coverage essential to achieving required service life.

The lintel is 'hot dipped' in molten zinc after fabrication to ensure a continuous, metallurgically bonded coating, including corners, edges and hidden surfaces. Pre-galvanised lintels are prone to cuts and damage during fabrication that create areas of reduced protection that cannot be fully restored with supplementary paint.

Calculated protection: Superlintels are made of minimum 4mm thick steel and hot dip post-galvanised with a choice of Duragalv zinc coatings for a cost-effective fit with project design life and location.

The thickness of the coating developed during post-galvanising can be adjusted for a more accurate and cost-effective match with lifespan and location needs. But thicker steel will be needed to bond thicker coatings. For example, a minimum 4mm thick steel plate is needed to develop higher specifications of zinc coating (70+ microns).

All this provides a rigorous formula for specifying lintels with dependable and measurable longevity. Sound durability figures will reduce the costs of over-specification and the risk of durability failure, help budget control, and facilitate sustainable construction by minimising under and over-specification.

TOM WILSON, ASSOCIATE WITH JENKINS & POTTER, COMMENTS:

"As structural engineers, it is important that we consider and validate the longevity of individual structural components during the early stages of projects to enable us to ensure that the functionality and design life requirements established by our clients will be met. In addition, and particularly in relation to the more demanding criteria of public sector projects, we must fully appreciate the impact on the functionality of a building should intermediate maintenance be required to structural elements during its design life. By validating a component's durability we can be confident of achieving modern and sustainable construction."

Jones of Oswestry **Enquiry 50**