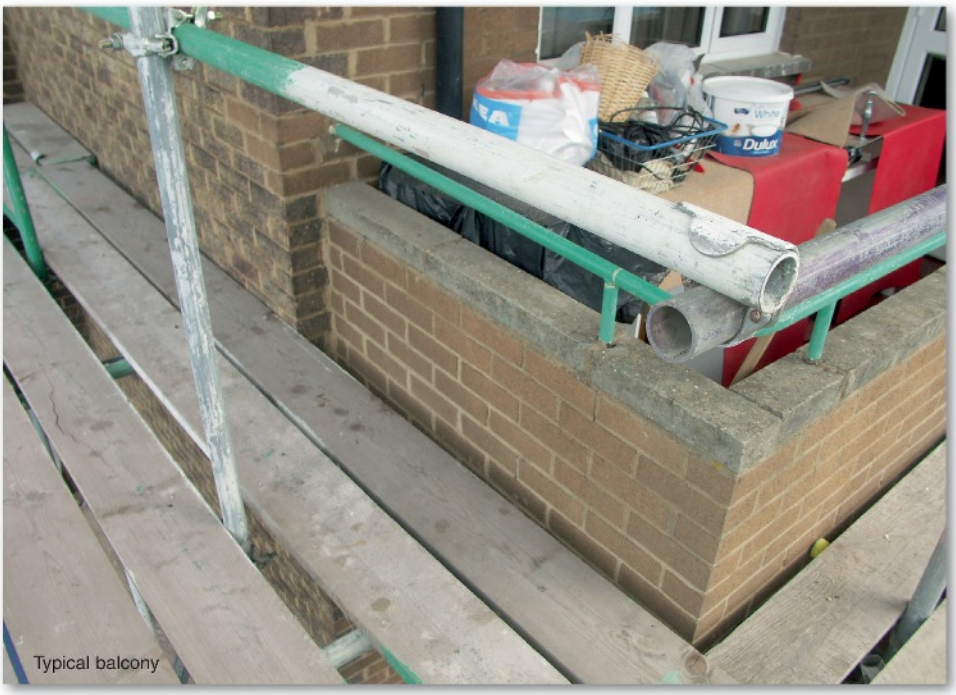
The reinforcements

Mechanical reinforcement techniques originally developed in the marine industry are helping to solve structural defects in low-rise apartment blocks. LABM finds out more.



Typical balcony

An innovative new structural technique, successfully used this year at a housing estate in South London, could provide a cost-effective yet durable solution for local authority assets. The methodology, which involves welding different types of steel to a customised reinforcement plate, actually borrows technology originally developed in the shipbuilding industry. The application's developers believe this can be applied to provide a long-term, less-intrusive solution to cracks and defects associated with walkways and balcony balustrade walls which feature heavily in low-rise blocks built in the 1930s through to the 1970s.

Its application was instigated by a routine refurbishment programme of an eight-storey block of flats in the London Borough of Southwark built in the 1950s. Whist installing scaffolding to the building to effect a package of routine external refurbishment works the contractor discovered a number of cracks to the brickwork of some of the building's private balconies. The issue was brought to the attention of the Council's asset management project team's lead designer, John Wilder who immediately appointed structural engineers to inspect the building and identify the causation.

A detailed inspection was carried out of the balconies' balustrade walls which consist of 1/2" brick thick stretcher bond brickwork with faced brickwork externally, internally reinforced with mild steel rebar's concealed within the render finish topped with a concrete coping stone and a steel tubular handrail supported by tubular balusters imbedded through the coping stones down into the brickwork.

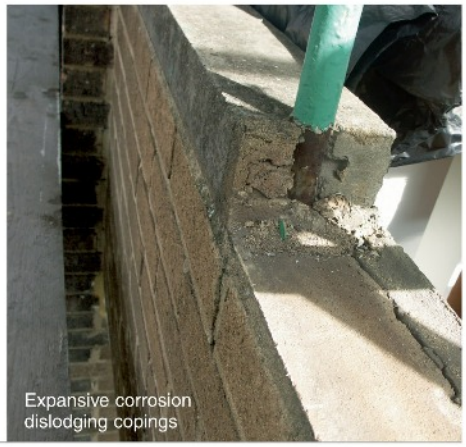
Extensive cracking, which was found in over 60 of the balconies, clearly corresponded with the reinforcing bars that were embedded in the concrete slab adjacent to the brickwork. However, generally, the external bricks and pointing were found to be in good condition with very few spalled pointing or bricks noted.

The engineers therefore concluded that the defects had been produced by moisture admitted by the brickwork that had caused corrosion of the reinforcing bars and handrail balusters. The corrosion of the embedded mild steel reinforcing bar and handrail balusters had resulted in the formation of ferrous oxide that had expanded thus dislodging and cracking the brickwork and render around it. While there was deemed to be no immediate threat to the health and safety of the tenants, the engineers suggested that the defect would cause the balconies to eventually become unstable.

The project team opted for an innovative solution proposed by structural defect-specialists, Action Wall Ties, who proposed a solution that used a combination of stainless steel and re-working the existing mild steel handrail. They suggested diamond drilling to remove the corroded baluster, further drilling the height of the wall and introducing a non-corroding stainless steel rod that would be welded to a stainless steel fixing plate. The original handrail could then be welded to the fixing plate thus providing a long-term sympathetic solution rather than a 'workaround.'

Weather-proof

The welding of stainless steel to mild steel to produce a robust, weather-proof reinforcement had first been used in the marine industry to weld components that are intermittently submersed in seawater and therefore required to be corrosion-resistant such as deck components, propeller shafts and submerged items



Expansive corrosion dislodging copings

including pipelines, grills, pumps, winches and storage vessels. Action Wall Ties were able to demonstrate how this technique of welding dissimilar materials had been used at a nearby estate to repair similar defects caused by corrosion to embedded handrail balusters in balustrade walls was undertaken.

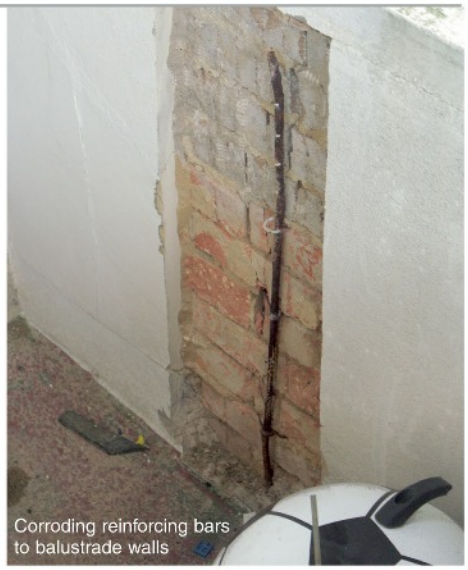
Work started in October 2010 to repair 66 defective balconies. The embedded handrail balusters were cut at coping stone line and remaining removed from the brickwork. Any damaged bricks were replaced the stainless steel fixing rods and plates, which were custom fabricated by the company, were injected with grout into a new 25mm hole created by diamond drilling the full height of the balustrade walls of the balconies. The original treated balusters were then welded to the stainless steel fixing plates ready for decoration by others.

The rebar reinforcing imbedded in the render was located, cut at concrete level and removed from the wall and the disturbed area treated and the render made good. The coping stones were made good and secured with resin bonded fixings.

"The in-situ technique was good value for money and we believe it provides us with a sound investment," says John Wilder, "Not only does it provide us with a genuine long-term solution to the defect but it also enabled us to minimise disruption to the occupants while maintaining the architectural integrity of the building."

This technique has been and can be applied to similar structural defects caused by expansive corrosion of mild-steel fixings such as reinforcing bars, handrail balusters and decorative panels found in walkways and private balconies which are prevalent in low-rise apartment blocks built in the 1930s.

■ With thanks to Action Wall Ties for preparing this article



Corroding reinforcing bars to balustrade walls

For more information on Action Wall Ties and its mechanical reinforcement techniques please mark Readerlink 072