

Background

The work carried out on the 'Joe's Garage' building as a subcontractor to Armitage Williams consisted of the drilling for, and installation of, thread rod & reinforcing dowels using epoxy resin. The work was carried out by staff employed by NZ Civil and Construction Ltd of which I was General Manager, a Director & half owner.

I have a BSc (Hons) from Swansea University (UK) and am an Engineering Technologist member of the Institute of Professional Engineers NZ. I have been involved in specialist civil engineering contracting for approximately 25 years; with particular interests and experience in heritage structures, post tensioning, rock and ground anchors, specialist grouting and seismic strengthening including FRP.

I emigrated to NZ with my family in 1993 and worked as a project and branch manager for Construction Techniques for 7 years; I left Contech at the end of 1999 and in conjunction with Darryn Oakly formed NZ Civil & Construction Ltd. Fulton Hogan Civil purchased the assets of NZ Civil Group as a going concern in November 2008 and it now operates as a specialist division of Fulton Hogan Civil South with myself as Divisional Manager.

Experience

NZ Civil carried out many projects installing and testing starters for seismic strengthening work; with my own experience pre dating this with work in the UK and for Construction Techniques in NZ.

One of NZ Civil's areas of expertise included specialist site testing work for seismic strengthening work, both pre design and during construction, generally this included dry diamond coring, brick joint shear testing, and pull out tests on mechanical and grouted starters.

Joe's Garage

With reference to the specifics of the Joe's Garage site we do not have full paper job records for the project as not all job files were retained following the sale of the company. Computer file records indicate that the project was repriced for varying methodologies largely due to the presence of cavity wall construction. Our job instruction for the starters is appended

My comments on the Spencer Homes report and photographs are interpretive and are based on a PDF copy of the document with limited definition available; further visual analysis of actual samples would be of benefit in interpreting failure modes.

Workmanship

NZ Civil took care to ensure quality of work and trained staff in the importance of preparation, many of the same staff were involved in testing work or had their work subjected to proving tests as part of our contract work. Our staff had a clear understanding of the importance of the work and the care required in its execution. It is my belief that the work was carried out in a workmanlike manner in accordance with the approved specification.

From the limited evidence available from the PDF report photos I comment

Top photo page 21 shows a fully covered starter with a textured surface and a 'fin' of epoxy consistent with filling into a joint void

Lower photo page 22 shows a fully coated starter with a rough textured surface, indicative of a fully filled drill hole.

Top photo page 23 appears to show a fully coated thread rod with either a 'sag' of epoxy from the sleeve at the cavity or a fin extruded into a joint.

Lower photo page 23 The textured surface of the epoxy is consistent with a fully filled drilled hole.

Starter bar expectations


I am not surprised that the starters do not show significant damage or deformation; based on our job instruction the starter bar sizes were D12 and M16 threadrod, with hole diameters of 18 & 22mm respectively.

A D12 bar has a yield of @ 30kN while the 4.6 grade threadrod would have a yield of @38 kN. Taking a brick shear value of say 2MPa and the drill hole contact areas, the available load development of a fully bonded D12 hole would be 23 kN and for the M16, 32kN.

A quick trawl through some of our brick shear test results and 'back of envelope' calculation indicate lime mortar failure loads around a pair of bricks (double brick wythe) retained by a common starter bar could be expected to vary from 10 – 20kN where there is little dead load (eg mid wall height on a top storey, or the top of a wall under a parapet) or where dead load is relieved by a vertical acceleration component.

Dead loaded joints (with say 3-5m of wall above) could have static brick pull out values in the range of 25 -60 kN

These are very rough numbers as there is a considerable range of strengths depending on the quality of the brickwork and mortar.


Phil Wilby

BSc(Hons) T IPENZ

