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Marine Crescent, Folkestone

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Proof of the excellent natural durability of concrete comes in the shape of Marine Crescent in Folkestone, an early concrete building that has stood just metres from the sea since 1870 and which, following renovation, looks set to celebrate its 200th anniversary with ease.

19th Century construction meets 21st Century regulations

In the late 1860's, when architect John Pope drew up plans for a grand sweep of 14 terraced houses overlooking Folkestone harbour, little could he have imagined that the same building might meet the sustainability standards of the early 21st century.

Fourteen original dwellings converted into 91 contemporary styled apartments, fitting comfortably within the ODPM's minimum target for housing density. Acoustic and thermal values that conform with new Part E and L regulations respectively. And, above all, the re-conditioning and re-use of an existing building that has required comparatively minor remedial work, despite the harsh marine environment in which it is situated.

Concrete plays a part

It's fair to say that, had Marine Crescent not been built of concrete and largely unreinforced concrete at that its structure would simply have been too damaged by the ravishes of time and the sea air to be economically repairable. What is all the more remarkable is how low-quality the concrete used is compared with the modern equivalent, containing no fines as it does and using gravel of up to 20mm in size sourced straight from the beach!

Without fines the concrete has the appearance and consistency of coco pops, and, in a further hallmark of the building's idiosyncrasy, large lumps of chalk, 200mm across, feature as regularly spaced large aggregate in the concrete mix.

The restoration project

In spring 2004, the structural engineer's report on the by-then empty and largely derelict structure indicated that all the walls from a thickness of 150mm up to 450mm (the latter found in the basement) were in a satisfactory condition. Only some minor internal walls of 100mm thickness had in the end to be replaced.

The foundations, built straight onto the shingle, had shown very little movement over the course of 130 years, and despite the fact that the building had no design movement joints, it was felt that the structure's general robustness meant that none

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needed to be added.

Sea-facing balconies at first floor level had been made of concrete containing brick fragments, gravel and fine aggregate plus some small diameter steel bar reinforcement. These were found to be largely in good condition, although corrosion caused by wrought iron balustrades meant that some spalling had taken place towards their edge. The wrought iron brackets supporting the balconies also did not conform to modern building requirements.

But the starkest contrast between different building materials emerged when it came to the condition of the bay windows. Bomb damage during the war destroyed the eastern-most section of the Crescent and it had been built again in solid brick. After 60 years, all the brick bay windows were found to have failed and needed to be completely rebuilt in concrete with a galvanised steel post and frame around the windows.

This however was not necessary for the original concrete bays in the rest of the structure. While damp had entered through cracks in the cement render, the no-fines concrete beneath had weathered relatively well, requiring only a patch and mend approach. This was the same for cracks in internal and external walls, which have been repaired using stainless steel tie-bars, resin bonded and laid horizontally across the line of the cracking. Cementitious Helibond mortar completed the repair.

Given the harsh nature of the location, a suitably robust 50N mix design 5 micro-concrete with Sika Top 77 admixture was selected for infilling larger areas. For smaller repairs, a similar concrete with Monotop 612 admixtures could be made in less quantity. To ensure their future durability, the designers decided to renew the first floor balconies using galvanised steel reinforcement beams that cantilever with reproduction cast iron brackets.

One more remarkable survival from the original building are the timber floor joists, of which it is estimated only 25-30% have needed to be replaced. This is additional hard evidence that the crude but effective no fines concrete has provided an amazing degree of protection from the damp and salty conditions outside.

A bright, quiet future

So what's it going to be like to live in one of the 1 or 2-bed apartments? Quiet for one thing, despite the relatively high density of the conversion. Acoustic tests performed by the contractors showed a performance of 57dB for airborne sound between partition walls, attained naturally by the mass of the concrete's construction. Lower energy bills should also be achieved by virtue of the same reason. The Victorian concrete's thermal capacity will keep the apartments cool in summer and warm in winter, with the highest energy efficiency to be seen in the semi-basements. The conversion of the basements into one-bed apartments ticks off another current sustainability requirement for optimum land-use a further advantage that concrete basement construction offers.

The survival and renewal of Marine Crescent proves two things: concrete structures can easily last longer than the conventional 60-year life-cycle, massively lowering the material's embodied energy and increasing its sustainability credentials. Second, concrete buildings are future proof buildings that can be readily adapted to society's changing demands. There will be an enormous difference between the world of 1870 and the world of 2070, but Marine Crescent should still be standing there gazing out to sea, all the same.

Client: Sapphire Properties UK Limited

Architect: Roger Joyce Associates

Structural Engineer: Christopher Hore Chartered Engineers

Main Contractor: M&B Builders Limited

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