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Masonry

Chairman
C. Melbourne

Reporter *H. W. H. West*

This proved to be a very popular event with the Godfrey Mitchell Theatre full and late inquiries having to be turned away. There were four main presentations and contributions from the floor. The event was chaired by Professor Clive Melbourne (University of Salford), representing both the Structural and Building Board and the British Masonry Society.

Dr Geoff Edgell (CERAM Building Technology) presented an investigation into the strength and stiffness of the Victorian viaduct at Waterloo. He explained that, as part of the Jubilee Line extension project, new escape and ventilation shafts are planned under the viaduct. The alterations to the viaduct structure necessitated an assessment of the *in situ* strength of the existing brickwork. In addition to the more usual 100 mm diameter cores, 300 mm diameter cores were taken which afforded the opportunity of large-scale axial compression tests. From other lengths of the cores, brickwork cubes were also cut and tested in compression. Solid masonry panels using modern materials, which had been selected because of their similarity to the site brickwork, were constructed and tested in compression.

Working with large-scale cores proved invaluable in assessing the *in situ* properties and in aiding selection of the modern equivalent of alternations and refurbishment.

Professor Clive Melbourne (University of Salford) traced the development of masonry arch bridge construction from antiquity to modern times and offered some insight into the behaviour of these complex three-dimensional structures using recent laboratory and field tests to demonstrate principles. He showed that multi-span masonry arch bridges collapsed by the formation of mechanisms which relied upon interactions not only with adjacent unloaded spans but also on the spandrel/wing wall and pier geometry. In the case of multi-ring brickwork arches he showed the importance of ring separation in determining the bridge load-carrying capacity. He concluded his presentation by considering the effects of skew. He advanced the notion that such bridges must be considered as three-dimensional structures with fracture lines extending around the barrel and releases, manifesting themselves in the form of axes of rotation and 'ball joints'. Piers would also be subjected to torsion under this form of loading

Mike Hitchens (Whitby Bird & Partners) presented data collected during the rehabilitation of Winterton House, a 25-storey building at Witney Market in London's East End.

The only element of this 1960s building worth keeping was the steel frame and even that needed enhancing to support floors heavy enough to comply with the modern building regulations. 'Off-the-frame brickwork' provided the solution: by locking the brickwork to the steel frame with a major steel roof level transfer structure, Mike Hitchens explained that three further steps could be taken. Firstly, by prestressing the steel frame against the new brickwork, the upper steelwork was put in tension and this provided the extra load-carrying capacity for the floors; secondly, by fixing the steel frame to the brickwork the two could move together and thus overcome the perennial problem of differential movement; and finally, the steel brickwork contribution provided extra stiffness to the core.

The construction sequence and details were presented and the prestressing of the exposed roof frame was discussed. The building has now been monitored for over two years and the results were presented, showing the clear responses of the building to the seasonal changes. The predicted behaviour was confirmed by this instrumentation.

Les Allen (Prestressed Structures (UK) Ltd) presented six case studies of unusual structures to illustrate the significant benefits which can be gained by making full allowance during structural analysis for the geometric properties of the general arrangement of brickwork. He went on to show that load-carrying capacity could be further enhanced by reinforcing, prestressing or securing composite action. His examples included a retaining wall, a car showroom, a church, a fire station, slender drill towers and a three-storey flat. The last-named structure incorporated a vertically prestressed wall to provide a clear opening. The action of the vertical prestress was demonstrated using a model.

There were several contributions and questions from the capacity audience. Most notable was that by Hugh Samuel (independent consultant) who described his recent work on the Waterloo tunnel which involved the computer

Structural and Building Board, ICE and the British Masonry Society Joint Half-day Meeting

modelling of the tunnel in the soil. He showed that the longitudinal stiffness was significant and that this model had given good results.

There was unanimous agreement that the meeting had been very successful. Your reporter commends to the Institution that a joint meeting with the British Masonry Society should be an annual event.