



Technical Seminar



"Congratulations on organising such a brilliant conference last week. Excellent speakers and everything ran to time, which makes a pleasant change. It was the best conference I have been to for a long time."
[Alison Henry, English Heritage]

"A truly interesting and well organised meeting!" [Prof Johannes Weber, Vienna]

"It was an interesting mix of papers. Whilst sad not to see Gerard there the substitute paper from Vicat was inspirational." [Prof Dave Hughes, Bradford University]

"I would just like to say a big thank you for organising yesterday's conference as I thoroughly enjoyed and found it most informing. I think these topical one day events where chemistry meets research, and also site application, are fantastic."
[Ed Hiam, Lime Green]

Natural Cements for Repair and Renovation of Heritage Structures

27th June 2013

Meeting at the Belgrave Square headquarters of the Society of Chemical Industry, the Institute of Concrete Technology held its summer seminar on 27 June, with the support of SCI and the Building Limes Forum. It attracted 39 participants, from range of countries: Austria, Germany, Ireland, the Netherlands, Poland, Switzerland and the USA, as well as Great Britain.

Professor Peter Hewlett, President of the ICT, introduced the theme of the day and made reference to the SCI's strapline, "where science meets business". He acknowledged that for concrete specialists, dwelling on natural cements for render repairs might seem "heresy", but urged us, with a twinkle in his eye, to "keep it friendly". And so doing, warmly introduced the first speaker, Johannes Weber, from the University of Applied Arts, Vienna.

Prof Weber expressed his pleasure to be back in the "mother country" of cement and took a few minutes to clarify definition and terminology. To set the proceedings in context he described the EU-funded projects RoCem and RoCARE. These were international projects to explore, respectively, the material properties and manufacturing process of Roman cement, and the application of such materials to the repair of historic building stock. Roman cement was produced throughout Europe in the Nineteenth Century and so was both varied and widely applied. He described their common properties and identified applications in masonry mortars, mouldings, rendering and repairs. Cities with a conspicuous legacy of Roman cement buildings include Lviv, Prague, Budapest and Krakow. Perhaps 90% of pre 1920 buildings are rendered, and 25% of these currently need repair. Far from being esoteric, the RoCARE project addressed a pressing need.

Next Christophe Gosselin of Geotest SA, Switzerland, turned to the composition and hydration of Roman cements. Dr Gosselin drew attention to the high clay contents of the marlstones used in Roman cement production, and the presence of variable raw materials. He noted that the finished material was dependant on calcination conditions and that there was no standard of production. Also, that the early age hydration of Roman cements is a very rapid reaction leading to the formation of different hydration products. His paper compared the composition and hydration of different modern Roman cements available on the market and developed within the RoCem and RoCARE Projects.

The day's programme allowed plenty of time for discussion and the Chairman took questions for both the opening speakers at this stage, before breaking for coffee in the exhibition area.

After the break Dave Hughes, formerly Professor of Construction Materials at Bradford, but now enjoying the rewards of recent retirement, addressed the formulating of mortars for use in restoration practice. He referred principally to a research project that compared the performance of Roman and Portland cement mortars, and those based on limes, particularly in so far as they were used for renders and cast elements. Prompted by the small size of patch repairs used at Durham cathedral – necessary as a consequence of the very rapid setting of Roman cements from Whitby – Dave's project was led to the search for a means of slowing the reaction time, resulting in the development of a deactivation process, now known by the acronym 'DARC'. The commercial exploitation of his findings is now being undertaken in Germany for the silo mortar market.

Turning from the laboratory to 'Practical aspects of restoring with mortars based on Roman Cements' Jacek Olesiak of Remmers Polska rehearsed his experience in the historic city of Krakow, where Roman cement was widely used c1870-1914. From private houses to palaces, schools to banks, many buildings were rendered in this naturally ochre material and left unpainted, embellished by ornaments cast in Roman cement. However, they have often been badly repaired and inappropriately painted; Jacek pointed out some examples. Conversely, the Trade Academy of 1904-06 was restored in 2005-07 as the first full restoration to use one of the newly developed RoCem materials. He described the project in detail.

Jacek's presentation was highly visual and prompted considerable debate on the advisability of painting and sealing against moisture ingress. Animated discussion continued into the adjoining Garden Room where there was an admirable lunch and time to visit the accompanying exhibition. Exhibitors included suppliers Cornish Lime and Lafarge Tarmac, consultant Fugro Aperio, and the ICT.

After lunch, in a presentation entitled 'Salt resistant mortars', Dr Barbara Lubelli addressed the issue of the compatibility of original and repair materials. She identified salt crystallization damage as one of the most common causes of decay for bedding, pointing and rendering mortar but observed that the phenomenon had not been adequately explained. Previous practice in resolving the problem has been directed to increasing the strength of the mortar, the replacement of lime with Portland cement, or on reducing the moisture transport capacity by the addition of silicone-based water repellents. Barbara's research has started to explore new possibilities for improving the durability of mortars to salt damage and obtaining that are compatible with historical buildings.

Paul Livesey confessed that, as a Portland cement man, he had 'seen the light' some year ago in Sunderland and persuaded Castle Cement to introduce a wider range of lime-based products. (The scene of his conversion – the Stadium of Light!) He described a spectrum of binders, from agricultural lime to hydraulic lime, natural cements to Portland, and gave a chronological account of their development. He focused on the pioneering period from Smeaton through to the perfection of the Portland cement production process and introduction of the rotary kiln. Speaking authoritatively and elegantly, he indicated the contributions of Semple and Higgins in eighteenth century Britain, James Parker (the patentee of Roman cement, to Vicat in France. Commercial production of natural and artificial cements grow apace in Britain, and interestingly Paul showed an historical photograph of the cement works at Whitby which was the very same location that had been illustrated earlier with a modern picture by Dave Hughes. The account came to a natural climax with Joseph Aspdin's 1824 patent for Portland cement and his son's discovery of the importance of clinkering in the 1840s.

Describing Scotland as geographically diverse, with varied building styles in consequence, John Hughes introduced Aberdeen as the city of granite. Locally, it seems, there have been problems with dampness in nineteenth century buildings. In 30-40% of cases dampness appears to be down to use of the wrong pointing materials. To test this assumption, and investigate what would make an appropriate re-pointing and repair material, the University of the West of Scotland won a couple of research projects that John duly described. However, there are still unresolved questions and Portland cement is not consistent with Scottish conservation practice, so Aberdeen Council is now looking at natural hydrated lime. May be, John wondered, Roman cement could be the answer?

Standing in for the scheduled speaker at very short notice, event sponsor Phil Brown of Cornish Lime described the application of Roman cement in practice, drawing on the prime example of Hadlow Tower, a grand folly that was rendered originally with mortar based on Roman cement from Sheppey. The restoration project got under way in 2009, using Vicat materials, pigmented with stone dust as required. Concentrating on the practical, Phil said that Roman cement feels quite different on the trowel – you have to use it to know – and that it is applied in three coats: 'fresh on fresh'. Reciting the craftsman's cri de coeur: "There's never time to do it right; but there is to do it twice", Phil was delighted to claim that the men at Hadlow had got it right first time.

Then, leading into the open discussion session, there was an impromptu addition to the programme. One of the participants, Michael O'Reilly, was one such craftsman and had come armed with a set of photographs of his highly skilled work on recent projects. A five-minute slide show followed, with pictures of renovation work in Buckinghamshire and at Slapton church in Cambridgeshire. Michael shared with the audience his personal and very positive views on the use of Roman cement for restoration.

Winding up the debate, Professor Hewlett summarised the day's proceedings, commenting on themes such as the pros and cons of sealing Roman cement render, and noting the material's variability, and expressing a pleasant surprise in the degree of interest and expertise this niche sector had generated in recent years.

Echoing these sentiments, the feedback from speakers and audience alike has been generous – see previous page.

*Report: Edwin A.R. Trout
Photos: Raman Mangabhai*

As a footnote, the *Daily Telegraph* of 27 July carried a feature entitled 'Towering works of restoration, which described the shortlist for the English Heritage Angel Awards. Included, with a prominent photograph, was the Hadlow Tower.