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Deep impact: why post-tsunami wells need a measured approach

L. Lytton

Proceedings of the Institution of Civil Engineers, Civil Engineering, **161**, No. 1, February, 42–48, doi: 10.1680/cien.2008.161.1.42

Following the Asian tsunami of 26 December 2004, the vital domestic fresh-water wells in the coastal zone were either scoured out of the ground entirely or filled with salt water, mud, debris and bodies. Emergency teams naturally exerted huge efforts in trying to restore intact wells, first clearing and then pumping them out. However, it soon became apparent little could be done to rehabilitate the wells in the short term due to the massive intrusion of saline groundwater as well as the fundamentally unsatisfactory nature of local water supply and drainage arrangements. Based on a study carried out on 64 wells in the Ampara district a month after the event, this paper identifies the long-standing issues that need to be solved before a reliable water supply can be established in the coastal zone.

Waste – better to bury it than burn it

B. Butterworth

Proceedings of the Institution of Civil Engineers, Civil Engineering, **161**, No. 2, May, 52, doi: 10.1680/cien.2008.161.2.52

Burning mankind's waste to create electricity is being touted as an important source of 'green' energy, but it still creates carbon dioxide. Bill Butterworth of Land Network International says we should do the natural thing and plough it back into the soil.

Reconnaissance of levee failures after hurricane Katrina

P. Nicholson and F. Silva-Tulla

Proceedings of the Institution of Civil Engineers, Civil Engineering, **161**, No. 3, August, 124–131, doi: 10.1680/cien.2008.161.3.124

A volunteer team of engineers from the American Society of Civil Engineers visited New Orleans shortly after the catastrophic flooding caused by hurricane Katrina on 29 August 2005. Their mission was to make an independent initial

assessment of the failed, US Army-engineered levees and floodwalls, as well as to collect perishable data to help provide answers to one of the worst civil engineering disasters in history. This paper reports on their observations and shows that they compared favourably with the findings of later in-depth investigations, to which the team also contributed valuable forensic data. It highlights the vital role engineering institutions can play in helping both the profession and society understand and learn from disasters.

Sustainable concrete waste recycling

Y. Doshio

Proceedings of the Institution of Civil Engineers, Construction Materials, **161**, No. 2, May, 47–62, doi: 10.1680/coma.2008.161.2.47

Massive volumes of construction waste will be generated by the demolition of older structures such as power stations that were built more than 30 years ago. It is essential to reuse such construction waste from a life-cycle assessment (LCA) perspective and for effective recycling of construction resources. In order to promote reuse, three concepts must be achieved: (a) assurance of safety and quality; (b) reduction in environmental impact; and (c) increase in cost-effectiveness of construction. This paper outlines a review of a system for recycled aggregate concrete produced by the aggregate replacement method, which reduces both the cost and environmental impact from an LCA perspective for concrete waste generated by the demolition of large-scale buildings, such as power stations.

Briefing: Robustness of rainscreen panels

A. Keiller and S. Ledbetter

Proceedings of the Institution of Civil Engineers, Construction Materials, **161**, No. 3, August, 93–96, doi: 10.1680/coma.2008.161.3.93

The use of open-vented rainscreen has a long history beginning with tile-hung walls. More recently larger panels have been employed as the use of rainscreen walling has developed. This expansion has been due to the need to refurbish existing buildings by overcladding them and also due to the advantages of systemised building for new build, not least the rate at which enclosure may be achieved. In new-build construction the rainscreen panels may be used in conjunction with a back wall of masonry or framed construction. Integral walls incorporating a curtain wall system with decorative rainscreen panels are also used.

Physical properties of demolition waste material

I. Chidiroglu, A. K. Goodwin, E. Laycock and F. O'Flaherty
Proceedings of the Institution of Civil Engineers, Construction Materials,
161, No. 3, August, 97–103, doi: 10.1680/coma.2008.161.3.97

Demolition waste materials, such as crushed concrete and bricks, have been utilised by the UK construction industry for applications such as the production of concrete, low-level backfill and road sub-base. There has been increased research into the properties of the recycled aggregates in the past decade but it mainly concentrates on the strength of these types of materials through shear box and triaxial tests. Little research has been undertaken on the physical properties of recycled materials, such as particle shape, water absorption and freeze–thaw resistance. This paper addresses the investigation of the physical properties of demolition waste materials for the purpose of re-use as engineering fill. It presents the physical characteristics of three types of commercially crushed concrete and brick materials, two of them being similarly based crushed concrete materials with different degrees of processing and one being crushed brick. Characteristics such as particle size distribution, particle shape, large-scale compaction, resistance to freeze–thaw and aggregate impact, and crushing values were established. The results show that there are similarities and differences between the two concrete-based materials. The characteristics of the brick-based materials are significantly different from the crushed concrete materials.

Recycling surfacing materials back into thin surfacing systems

J. C. Nicholls, I. Carswell, I. Widyatmoko, R. C. Elliott, J. Harris and R. Taylor
Proceedings of the Institution of Civil Engineers, Construction Materials,
161, No. 3, August, 105–112, doi: 10.1680/coma.2008.161.3.105

The need to recycle thin surfacing systems is more critical than for many other generic surfacing materials because they contain a high quantity of relatively scarce aggregates with high skid-resistance properties. Laboratory investigations and site trials have been successfully undertaken to assess the feasibility of incorporating reclaimed surfacing materials in these systems. The trials were on an access road to an asphalt plant and on two heavily trafficked sites on the UK road network and included the use of polymer-modified binders and up to 30% reclaimed asphalt in the mixed asphalt. The trials demonstrate that 10% reclaimed asphalt can be easily added to new materials without processing the reclaimed asphalt. As the proportion of reclaimed asphalt increases up to 30%, greater care needs to be taken on assessing grading compatibility and how to treat the residual binder present in the reclaimed asphalt as a proportion of the 'active' binder content in the recycled surface course layer. The use of reclaimed asphalt in the surfacing has also been monitored on a major motorway contract.

Sulfate resistance of mortar containing simulated FGD waste

J. M. Khatib, P. S. Mangat and L. Wright
Proceedings of the Institution of Civil Engineers, Construction Materials,
161, No. 3, August, 119–128, doi: 10.1680/coma.2008.161.3.119

This paper is part of a wide-ranging research project on the optimum use of waste from the dry and semi-dry flue gas

desulfurisation (FGD) processes in concrete. It reports on the sulfate resistance of mortars containing a typical simulated desulfurised waste (SDW). Two binder systems were investigated: (a) cement and SDW with replacement levels of 0 to 70% and (b) cement (10%), slag (20–90%) and SDW. The influence of SDW content (0–70%) on sulfate resistance was evaluated. Specimens were exposed to 2.2% sodium sulfate solution and 2.44% magnesium sulfate solution. The results showed that replacing cement with increasing levels of SDW improved the sulfate resistance in each sulfate solution. This was attributed to the dilution of C3A and CH due to the reduction in cement, pore refinement and the formation of ettringite during early periods of hydration. Mortars containing cement, slag and SDW exhibited superior sulfate resistance in sodium sulfate solution. When immersed in magnesium sulfate solution, they underwent some deterioration due to the reaction with the C–S–H, CH and C–A–H phases. At SDW contents above 20%, resistance to magnesium sulfate was satisfactory.

Sustainability of land remediation. Part 1: overall analysis

M. J. Harbottle, A. Al-Tabbaa and C. W. Evans
Proceedings of the Institution of Civil Engineers, Geotechnical Engineering,
161, No. 2, April, 75–92, doi: 10.1680/geng.2008.161.2.75

A comparative assessment was carried out of the technical and environmental sustainability of five different contaminated land remediation projects completed in the UK between 1997 and 2002. The remediation technologies employed were in situ stabilisation/solidification, soil washing, ex situ bioremediation, cover system and excavation, and disposal to landfill. A further objective of the assessment was to highlight areas of sustainability concerns for the individual technologies and projects. The assessment is based around four principal criteria defined by the authors. Each project was assessed using both an overall multi-criteria analysis, detailed in this paper (Part 1), and a study of the detailed impacts on an individual project basis, detailed in Part 2.

Sustainability of land remediation. Part 2: impact assessment

M. J. Harbottle, A. Al-Tabbaa and C. W. Evans
Proceedings of the Institution of Civil Engineers, Geotechnical Engineering,
161, No. 3, June, 117–127, doi: 10.1680/geng.2008.161.3.117

A comparative assessment was carried out of the technical/environmental sustainability of five different contaminated land remediation projects completed in the UK between 1997 and 2002. The remediation technologies employed in those projects were in situ stabilisation/solidification, soil washing, ex situ bioremediation, cover system, and excavation and disposal to landfill. A further objective of the assessment was to highlight areas of sustainability concerns for the individual technologies and projects. The assessment is based around four principal criteria defined by the authors. Each project was assessed using both an overall multi-criteria analysis, detailed in Part 1 of this paper, and a detailed impact assessment, detailed here in Part 2.

The properties of Lias Clay for landfill liners

A. Binns, P. N. J. Robinson, and C. S. Eccles
Proceedings of the Institution of Civil Engineers, Geotechnical Engineering,
161, No. 4, August, 197–207, doi: 10.1680/geng.2008.161.4.197

The design and specification of a landfill clay liner require compromises to be made between the requirements of low hydraulic conductivity (permeability), adequate shear strength, sufficient interface shear strength (when the clay is used in a composite liner), minimal shrinkage during service, and sufficient ductility to accommodate tensile and shear strains, which may increase permeability. This paper focuses mainly on the first three requirements. The results of construction quality assurance (CQA) from four landfill sites and the results of ground investigations from two landfill site extensions are reported. Proposals are made for a methodology to derive a specification, and for assessing the results of CQA tests. Undrained and effective stress strength parameters are presented for recompacted Lias Clay. The interface shear strength of clay against a geomembrane or geotextile is shown to be dependent upon the density and moisture content of the clay and normal pressure.

Behaviour of lime-slag-treated clay

R. James, A. H. M. Kamruzzaman, A. Haque and A. Wilkinson
Proceedings of the Institution of Civil Engineers, Ground Improvement, **161**, No. 4, November, 207–216, doi: 10.1680/grim.2008.161.4.207

This paper describes the strength and microstructural behaviour of lime-slag-treated clay. The microstructure was investigated using X-ray diffraction (XRD) and scanning electron microscopy (SEM), and the strength of the treated clay was measured using the unconfined compressive strength (UCS) test. Untreated clay was prepared in the laboratory by mixing commercially available kaolin and bentonite, while hydrated lime and ground granulated blast furnace slag (ggbs) were used as binders. XRD analyses of lime-slag-treated clay showed the existence of numerous reaction products such as calcium silicate hydrate (C–S–H), calcium aluminium silicate hydrate (C–A–S–H), and hydrotalcite (HT), which facilitated the strength

increment. For a fixed proportion of lime, the relative intensity of pozzolanic reaction products was found to increase with increasing slag content. Slag was found to be very active to promote the pozzolonic reaction with lime, as evidenced from the presence of crystalline reticular (C–S–H) and platy (C–A–S–H) cementitious products in the SEM images. The role of lime in the activation of slag was also seen to have an upper limit whereby excess proportions failed to provide significant additional benefit. The UCS of lime-slag-treated clay was found to be higher in comparison with lime or slag alone with the same replacement ratio. This was due to the formation of more crystalline cementitious products, which accelerated the bridging (cementation) effect between lime-slag and clay particles.

Construction and demolition materials management in Hong Kong

A. T. Yeung
Proceedings of the Institution of Civil Engineers, Municipal Engineer, **161**, No. 1, March, 43–49, doi: 10.1680/muen.2008.161.1.43

The management of construction and demolition materials is a problem being tackled by many government agencies worldwide. The problem is particularly acute in Hong Kong due to rapid economic development and urban renewal over recent decades, and the situation is aggravated by the dense population on a small plot of usable land. The Hong Kong Special Administrative Region (HKSAR) government is implementing many initiatives in both public and private sectors to handle the ever-increasing municipal problem. Some of these strategies and practice are reviewed in this paper. The effectiveness of these initiatives is being closely monitored by the HKSAR government and adjustments are being made from time to time as required.