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Anderton boat lift: restoring the Cathedral of the Canals

M. Clarke
Proceedings of the Institution of Civil Engineers—Civil Engineering, **157**, No. 1, February, 19–25

The Anderton boat lift in north-west England is the world's first boat lift. Built in 1875, the 'Cathedral of the Canals' initially used an innovative system of balanced water rams to transport boats between a navigable river and a 15 m higher canal. It was converted to an electrical pulley system 33 years later but finally succumbed to structural decay in 1983. This paper reports on the complex £7.8 million project to restore and reopen the lift, which has involved installing a modern version of the original hydraulic system within a painstakingly restored iron and steel structure.

Stabilising the Paute river in Ecuador

B. Abril and D. Knight
Proceedings of the Institution of Civil Engineers—Civil Engineering, **157**, No. 1, February, 32–38

Ten years ago a landslide in the mountains of Ecuador killed over 100 people. It also blocked a mountain river, creating a temporary flood reservoir that, a month later, burst through the debris and caused extensive flood damage downstream. The geomorphology of the whole valley was substantially altered and it became unstable, not helped by continued local aggregate mining. This paper reports on the delicate, long-term operation to monitor and stabilise the Paute river valley, including shaving two million m^3 off a mountain and installing a novel system of drop structures on the river bed.

Full circle for UK canals: restoring the South Pennine Ring

K. Paylor, M. Marshall and C. Wearne
Proceedings of the Institution of Civil Engineers—Civil Engineering, **157**, No. 3, August, 116–125

Britain's emergence as the world's leading industrial power in the nineteenth century was highly dependent on its extensive new canal network created by the founders of the UK civil engineering profession. Reopening the network—much of which has been closed for over half a century—is now seen as a valuable catalyst to regenerating Britain's former industrial cities. However, the task presents today's civil engineers with almost as many challenges as the original construction. The £58 million project to reopen the final sections of the trans-Pennine Rochdale and Huddersfield Canals—and thus restore the South Pennine Ring waterway—is a classic example of the flexible and innovative approaches needed to thread new life into today's decayed and congested urban environments.

Flood risk: don't lose sight of Foresight

C. Ward
Proceedings of the Institution of Civil Engineers—Civil Engineering, **157**, No. 4, November, 150

The UK Government plans to publish a new 20-year flood-risk strategy in 2005. Chris Ward of T A Millard says this should not detract civil engineers and society from implementing the recommendations of the *Foresight Future Flooding* report, published in April this year.

Restoring destroyed public utilities

Lieutenant Colonel S. Boyd and Major J. Taylor
Proceedings of the Institution of Civil Engineers—Civil Engineering, **157**, No. 5, May, 48–52

This paper reports on recent lessons learned by the military in restoring destroyed public utilities in Iraq. The lessons could apply equally to other theatres of conflict or large-scale natural disasters. Based on the various bodies engaged in utilities restoration and the critical importance of time, it proposes a three-stage concurrent approach to restoration effort. The paper includes a case study from southern Iraq in which the frantic race to get sufficient power to the local waterworks illustrates both the need for a systems approach and for wide coordination.

Reinstatement of water supplies post-conflict

Lieutenant Colonel J. Pelton and Major C. Hunter
Proceedings of the Institution of Civil Engineers—Civil Engineering, **157**, No. 5, May, 53–58

The Corps of Royal Engineers has been supplying water to the British Army for 150 years. During the Cold War the civilian infrastructure was more developed and the need for front-line water supply projects has diminished. Nevertheless, since the 1990s campaign in the Balkans, with its emphasis on restoration of civilian infrastructure, British military engineers have substantially enhanced their water-development expertise. This paper reviews the Army's capabilities and how they were delivered during the post-conflict reinstatement of water supplies in Kosovo and Iraq.

Restoring the Wilts and Berks Canal: a model for voluntary engineering

D. Van der Cruyssen
Proceedings of the Institution of Civil Engineers—Civil Engineering, **157**, No. 6, November, 4–11

The abandoned 200-year-old, 85 km long Wilts and Berks Canal between Bath and Oxford in southern England is currently being restored by a voluntary trust that includes many volunteer engineers. The inter-relation between design techniques and construction methods is discussed and examples of recent design and construction projects are given, together with comments on some of the more unusual design issues relating to voluntary restoration projects. The challenging extent of work remaining is outlined and the potential for training and research is also discussed.

Emergency water for a refugee camp: a volunteer's perspective

R. Lorenz
Proceedings of the Institution of Civil Engineers—Civil Engineering, **157**, No. 6, November, 27–31

This paper is a personal account by a volunteer engineer supplied to Oxfam by RedR–Engineers for Disaster Relief, to provide emergency water supplies within a refugee camp in Macedonia. Originally planned for 5000 people, the camp grew to over 50 000 people within just a few weeks, requiring a rapid escalation in supply infrastructure despite limited availability of materials and expertise. In addition to being able to design a technically simple yet effective and flexible infrastructure system, the paper highlights the fundamental importance of interpersonal skills when working in crisis situations.

Reuse of materials in coastal and river engineering

J. D. Simm, M. J. Wallis, K. J. Collins and R. Atkins
Proceedings of the Institution of Civil Engineers—Engineering Sustainability, **157**, No. 3, September, 113–121

The increased demand for materials for flood and coastal defences as sea levels rise and rainfall increases should be reflected by a sustainable use of natural resources. Recycled and secondary materials offer significant potential to reduce the demand for primary materials, but the way in which this is done in a sensitive water environment will be of interest to the whole of the construction industry. The paper examines five criteria that should influence choices between materials options for projects: whole-life costs, technical efficacy, impact on the local environment, environmental impact of materials production and procurement policy. The latter is examined in the context of the sensitivity of the procurement of tropical hardwoods, which are in particular demand because of their durability. A case example is given of the reconstruction of the fire-damaged Southend Pier in which reclaimed tropical hardwoods were imported from the Netherlands for most of the work. Finally, two examples of the reuse of tyres in baled form are examined. One example looks at the technical advantages of using these recycled materials in a flood embankment project and the other at a pilot project to examine and try to allay concerns about leachates from the tyre material.

The breast shot water wheel: design and model tests

G. Müller and C. Wolter
Proceedings of the Institution of Civil Engineers—Engineering Sustainability, **157**, No. 4, December, 203–211

Breastshot waterwheels—that is, waterwheels where the water enters the wheel approximately at the level of the axis—were in widespread use in England and Germany during the nineteenth and early twentieth century. Although this type of wheel even today has the potential for the economical and environmentally acceptable exploitation of small hydropower with low heads from 1.5 to 2.5 m, very little is known about its performance characteristics. In order to assess the breastshot waterwheel for hydropower generation, a study of design methods and a series of model tests were conducted at Queen's University Belfast. Sample calculations for a 4 m diameter wheel are given to explain the design principles. Tests on a 1:4 scale, 1 m diameter model gave efficiencies of 78.5% over a broad range of flows. Based on these measurements and observations, improved geometries for in- and outflow were developed, resulting in maximum efficiencies of 87.3%. An initial ecological assessment indicated that waterwheels may have a significantly reduced ecological impact when compared with turbines. The breastshot waterwheel was found to be an efficient and ecologically acceptable hydraulic energy converter with the potential for further development.

Slope stability of earthfill dams: a case study of Kizilca Dam

S. N. Keskin, U. S. Cavus and H. Yıldırım
Proceedings of the Institution of Civil Engineers—Geotechnical Engineering, **157**, No. 1, January, 3–7

It is well known that the construction of a wider impervious core for earthfill dams provides greater piping resistance and a greater resistance to earthquakes, which can cause internal cracks within the core. Also, designing a wide core can minimise construction defects. However, the core width and its location in earth or rockfill dams are actually determined by consideration of factors such as the type of material, piping resistance, geological features, cracking, earthquake considerations and stability requirements. In this study the influence of thickness of the impervious core and the magnitude of the earthquake coefficient on the stability of both upstream and downstream slopes of the Kızılca dam are presented. Because the clay core will be a

compacted fill and the characteristics of the clay core material are very good, with high dry unit weights and permeabilities less than 10^{-10} m/s, hopefully there will be no problems of piping. There will be no seepage or stability problems with the geology of the Kızılca dam site; therefore the problem is only to determine the ultimate choice of the impervious core slopes from the point of view of maintaining the optimum stability of the Kızılca dam's outer slopes, to construct an economical impervious fill, and to determine whether or not the alluvium under the dam has to be removed. That is why, using conventional sliding surface methods, the stability analysis for sudden drawdown and full impounded water-level cases was performed for different core slopes with 1V : 1H and 1V : 0.5H.

Hull wastewater flow transfer tunnel: recovery of tunnel collapse by ground freezing

D. A. Brown
Proceedings of the Institution of Civil Engineers—Geotechnical Engineering, **157**, No. 2, April, 77–83

The Hull Urban Wastewater Treatment Directive (UWWTD) Flow Transfer Works Contract commenced in January 1998. The scheme required the construction of 10·5 km of 3·6 m internal diameter segmental tunnel alongside the north bank of the Humber estuary between West Hull Pumping Station and a new outfall at Saltend to the east of the city. Completion was programmed for November 2000. In November 1999 the works were ahead of programme and progressing well. However, while tunnelling between shaft T3 on the east side of Hull Marina and shaft T2, some 1146 m to the west, on the opposite side of the marina, a 100 m section of the new tunnel collapsed. Following a four-month period for investigation and review, a recovery scheme was agreed and works commenced in March 2000. This report describes the design of the chosen recovery option and the use of ground freezing with liquid nitrogen to provide a stable environment in which to rebuild the tunnel.

Wastewater flow transfer tunnel: design and construction

A. Machon and S. Stevens
Proceedings of the Institution of Civil Engineers—Geotechnical Engineering, **157**, No. 3, July, 101–106

This paper discusses the design and construction of a 10·5 km long, segmentally lined, flow transfer tunnel. It covers the detailed lining and shaft designs, selection criteria for the tunnelling machines, shaft and tunnel construction methods, and specialist ground treatment. The paper discusses several construction problems encountered with shaft sinking and tunnelling, and describes how these were resolved. Particular note is made of caisson sinking of shafts and the design of the tunnel entry and exit portal eyes. Jet grouting in the varying ground strata around these portals and on other areas of the contract is considered.

Public toilets: the need for compulsory provision

C. Greed
Proceedings of the Institution of Civil Engineers—Municipal Engineer, **157**, No. 2, June, 77–85

There is no mandatory requirement for local authorities to provide public toilets. Yet, it is argued, they are a vital component in creating accessible, sustainable and comfortable cities for all. In this paper the reasons for compulsory standards are explained, and the underlying problems of current provision and regulation are investigated. The nature of a spatial toilet strategy in respect of the adequate distribution and location of public toilets is outlined. Changes in the regulatory and organisational aspects of public toilet provision are proposed that would result in a better standard of facilities for twenty-first century needs.

Reservoirs as leisure resources—and their value

G. Nickolds
Proceedings of the Institution of Civil Engineers—Municipal Engineer, **157**, No. 2, June, 97–101

As well as their public water supply function, reservoirs can also provide a valuable recreation resource and substantial economic benefits to the surrounding community. These in turn are capable of providing additional benefits to the operating company. This paper explores these benefits with particular reference to the development and management of Carsington Water, on the fringe of the Peak District National Park in Derbyshire.

Evaluation of UK waterway regeneration and restoration

G. Maeer and G. Millar
Proceedings of the Institution of Civil Engineers—Municipal Engineer, **157**, No. 2, June, 103–109

Following the original boom of Britain's network of navigable rivers and canals during the Industrial Revolution, the waterways fell into decline following the Second World War. Now this trend has been reversed, under the care and management of British Waterways. This paper outlines the restoration work undertaken, and the economic benefits are illustrated by means of a recent case study on the Kennet and Avon Canal.

Sustainable urban development and drainage

J. B. Ellis, L. Scholes, D. M. Revitt and J. Oldham
Proceedings of the Institution of Civil Engineers—Municipal Engineer, **157**, No. 4, December, 245–250

The recent Barker Report on housing supply has identified serious shortages which partly result from slow planning decisions and conservative interpretations of Planning Policy Guidance 3 (PPG3) development rules. Increased and wider stakeholder interests and associated consultation times are also stretching out medium- to large-scale development approval times. Sustainable development design for high-density masterplanning, based on enhanced lifestyle and environmental parameters and which incorporate sustainable drainage systems are proposed, which bring together the apparently contradictory objectives of PPG3 development and PPG25 flood risk regulations.