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Editorial

Rajen K. Lavingia PhD
Cadogans, Glasgow, UK

Most structural failures or malperformances are not reported in the technical media for a number of reasons, including legal or financial repercussion or damage to the reputation of the parties involved. As a result, the engineering fraternity is deprived of learning from failures. The Fifth International Conference on Forensic Engineering held earlier this year debated how to overcome these impediments. One of them was to appreciate the information that is able to make its way to the technical or mainstream media and learn from the same. This issue of *Forensic Engineering* discusses five such case studies and a book review.

Almost all catastrophic structural failures lead to financial losses. In addition, they pose a real possibility of personal injury or even fatalities. Engineers need to design structures to avoid exactly these outcomes. Structural redundancies play a significant role in achieving this goal. The paper by Rawska-Skotniczny *et al.* (2013) describes how the progressive collapse of a long-span roof structure, damaged through human error, was avoided owing to inherent multiple redundancies in the structure thereby giving adequate time for the erection of a specially designed auxiliary structure and replacement of the damaged portion of the structural element without affecting the safety of the main structure. The adopted method not only minimised the timescale for repairs but also allowed the functioning of the majority of the building thereby keeping financial losses to a minimum. The case study used by the authors demonstrates that at the time of impending failure a parallel system is better in distributing structural actions than a serial system.

Benn (2013) presents major issues contributing to the failure of a railway bridge following flooding. Of the bridges that have failed over the past 65 years, more than 55% were due to the scour of pier and/or abutment while the remaining failures are attributed to a variety of reasons, such as accumulation of debris, embankment scour and the diversion of the river channel. To prevent such failures resulting in human fatalities, huge financial loss and the disruption of traffic it is necessary to improve the existing procedures for assessment of scour and to increase the vigilance of flood management. Benn also advocates the necessity of including the spatial dimension of the flood risk and asset location while preparing the assessment and management plan.

Several post-tensioned structures constructed at the end of the 20th century have been found to be in a highly deteriorated condition facing potential failure. Clark (2013) identifies the poor quality of grout and/or improper grouting methods of the cable ducts coupled with poor detailing as the primary factors for such conditions. This leads to the corrosion of the externally exposed anchorages, cable ducts and the prestressing cables. The author points out that a lack of regular and prudent inspection and inadequate maintenance makes the situation worse. In order to provide properly trained, skilled and quality-conscious inspectors, several organizations, such as the UK Highways Agency, UK Post Tensioning Association, and Cares, among others, have published recommendations for thorough scrutiny, recording and monitoring leading to final certification of the post-tensioning companies. Furthermore, the author also emphasises the importance of frequent audit testing of materials.

Mass rapid transit systems prevalent in metro cities worldwide sometimes face unfavourable ground conditions. In this context Hwang *et al.* (2013) describe six failures which have occurred in the Asia-Pacific region during the 10-year period between 2000 and 2009. The ingress of groundwater was the main culprit. However, substandard quality control of underground treatment, the unquestioning reliance on computer analysis without the application of sound engineering judgment and the improper management of the potential risks were also identified. The authors advocate the necessity of risk management plans being approved by technically competent independent agencies, while key risk points (those with disastrous consequences) should be approved by an authorised panel of experts for the entire construction process in order to prevent or to minimise such failures.

Water ingress in basements and buried structures is a persistent problem. Its prevention is a difficult and frustrating experience for all those involved in the construction of such structures. A study of a number of water ingress case studies was presented in the August issue of *Forensic Engineering* (Barnes, 2013). This month, Lazarus (2013) in her paper illustrates, through a variety of case studies, that despite following the guidelines provided in the codes and reports, and maintaining good quality control during construction, water ingress occurs because of a variety of unanticipated defects. This leaves unsightly stains and patches on the surface of the walls and slab, creates health hazards and damages cars parked below or sensitive equipment stored within depending upon the structure's use. Rectifying the problem requires additional time and has financial repercussions. Lazarus points out that the major areas of concern are the connection of the basement walls with the basement slab, the development of the shrinkage cracks in the concrete walls and slab, failure of the membrane below the basement slab or in the periphery walls, inadequate capacity of the cavity drained system, improper detailing at interfaces and poor functioning of water bars and the hydrophilic strips. Finally, to minimise the problem of water ingress Lazarus proposes that in addition to formalising the responsibilities of various agencies involved, the client's expectation and the actual performance criteria must be decided before the commencement of the project.

A review of *Failures in Concrete Structures: Case Studies in Reinforced and Pre-stressed Concrete* highlights the importance of reinforcement detailing. The reviewer found it disappointing that the book made no mention of forensic engineering.

The next issue of *Forensic Engineering* will be composed of papers from the Fifth International Conference on Forensic Engineering, including 'Structural unsafety revealed by failure databases' by Karel Terwel *et al.* and 'Learning from confidential reporting' by Alastair Soane. Both provide an insight into the benefits of learning from failures.

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