

Lessons learnt



In the wake of the severe floods in the north of England in November, Dr Geoff Edgell, Director, CERAM outlines the sustainability of brick constructions under flooding.

The events in Cumbria, UK, in November 2009 give a stark reminder of what could happen frequently if climate change accelerates. With 314mm of rain falling in one day in Seathwaite, the most since records began in 1914, flooding led to 2.5m of water in the centre of Cockermouth. Six bridges collapsed in total and some were over 100 years old.

Anyone with a professional interest in masonry will be saddened by the sight of the Northside bridge collapsing under the downpour, especially as it is unlikely that it will be replaced by a masonry structure. By the end of the month, following a huge effort by the engineering profession in inspecting 1,300 of the 1,800 bridges in the

county, a further seven were closed for inspection from divers.

When the existing masonry bridges were built, there was no other way of bridging large spans. Bridge piers were needed, which risk scouring from floods and contribute to the vulnerability of the structures. Despite the stock of masonry bridges carrying loads in excess of that intended, it still takes a major incident to cause collapse. Although there will be lessons to learn about bridge inspection, protection and flood defences, there is also one about the durability of masonry.

Prevention and protection

The flood resilience of building materials will once again move up

Sandbag flood defences in Cumbria

the agenda after this incident. The first effort by the Department of Communities and Local Government came in 2007 when it published *Improving the Flood Performance of New Buildings: Flood Resilient Construction*. The document highlights some good ideas, such as the hierarchy aimed at reducing risk that states avoidance (build elsewhere), resistance (prevent water entry), resilience (controlled consequences) and repairable stock. The publication clearly establishes that building location is key and other means are less desirable.

Clay bricks were rated well for flood resilient construction based on



Above: Stone bridge in Cumbria

laboratory tests. There were also one or two statements based on a lack of knowledge and it is hoped these will be corrected.

There is a great deal of experience in the use of clay bricks in wet environments, such as manholes and sewers, which demonstrates their longevity in wet situations. Even at the more porous end of the range, testing by boiling and under freeze thaw conditions, demonstrates resilience to wet conditions.

On a practical basis my grandfather's house survived the 1953 floods in Southend-on-Sea and after a drying out period has performed well to this day.

Backing for brickwork

The technical properties of masonry materials have been shown to be of real benefit in dealing with possible effects of climate change, such as thermal mass. When considering the contribution of heavyweight materials to sustainability of construction, it is found that experts are beginning to advocate, in a technical way, what has been known for a long time through experience.

The Arup study, conducted in the south of England, called Whole Life Performance Research – A Lifecycle Analysis of Carbon Dioxide Emissions from Housing under Climate Change, Examining the Role of Thermal Mass, 2006, demonstrates that overheating is likely to occur earlier in lightweight structures than heavyweight structures. This should not be a surprise, as experience tells that thermal mass evens out temperature fluctuations, and early American studies demonstrate reduced energy consumption. Overheating is an extension of the argument.

Former President of the Royal Institute of British Architects, Max Hutchinson, has encouraged the public to see bricks as a modern method of construction. Going forward with this endorsement, the development at the University of Nottingham of a Code for Sustainable Homes for level four and six buildings may lead to a revival in new build. Initiatives like the Low Energy Victorian House by Camden Council may show what can be done with the problem of improving existing construction, by refurbishing a solid wall semi-detached Victorian house to achieve a 90% reduction in the house's carbon emissions.

In a world of climate change there are lots of linked messages –

- Durability of masonry, now reflected in the Green Guide.
- The flood resilience.
- Desirability of thermal mass, which is increasingly being viewed as a major benefit.
- Reminder of the versatility of brickwork.
- Demonstration that masonry can achieve the upper levels in the Code for Sustainability and attention given to existing stock.

All of these are positive pointers to the role of brickwork in desirable solutions to difficult and new problems.

Authors details

Dr Geoff Edgell, Director, CERAM, Queens Road, Penkhull, Stoke-on-Trent, Staffordshire, ST4 7LQ.
E-mail: geoff.edgell@ceram.com. Tel: 01782 764400.