Editorial

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It is again with enormous pleasure that I write the first *Construction Materials* Editorial for 2017 in this second of two special themed editions on earthen construction. Although the level of research and understanding of earthen construction does not, as yet, reflect its global importance as a building material, the situation is healthier than ever. This is reflected by the growing number of research articles on earthen materials published every year in leading international journals, including *Construction Materials*, the growing number of specialist conferences (including TERRA and LEHM series), and the expanding number of universities and colleges including earth building within their teaching. An ever increasing number of countries are establishing their own national earth building associations to promote and represent earth building. The German earth building association, the Dachverband Lehm, has been instrumental in establishing a series of DIN standards for earth building. Meanwhile, EBUKI (Earth Building UK and Ireland) has been successful in setting a national accredited training programme for practical earth building skills.

Clay minerals, a key component of most earth building raw materials, are, in varying degrees, moisture sensitive, swelling and shrinking with changes in water content. To control this movement earth builders have been using different additives for millennia. Plant-based fibres such as straw reduce moisture movement and cracking of mud bricks, cob and clay plasters. Lime is added to improve strength and water resistance as well as reducing moisture movement. Over the past century, Portland cement has become more widely used, especially in low-income countries, as an additive to improve the strength and durability of products such as stabilised blocks, as well as also controlling moisture movements. Five papers presented in this issue of *Construction Materials* reflect some of the many issues that research on earthen construction and materials worldwide is now starting to address.

In the first paper, Latha and Venkatarama Reddy (2017) present a study into the moisture movement (swelling and shrinkage) properties of stabilised earth (soil) products, including adobe, compressed blocks and rammed earth. Adobe blocks are traditionally hand moulded mud bricks, whilst in comparison compressed soil blocks are compacted under higher pressure in manual or mechanical presses. Rammed

earth is formed by compacting earth in successive layers inside temporary formwork, much like modern day in situ concrete. Latha and Venkatarama Reddy (2017) have successfully quantified the levels of moisture movement and shown that cement is effective at limiting swelling and shrinkage.

There is a long and successful heritage of earth building on all inhabited continents of the world and in almost all countries. In some countries, the heritage has continued to this day, whilst in other cases earth building largely ceased with industrialisation. In these later cases, the heritage of earth building has the formed basis for a modern renaissance. Baiche *et al.* (2017) present their findings from a comparative study of traditional and modern earth buildings in Algeria. Structural problems observed in both sets of buildings studied are attributed to a range of shortcomings in design, construction, poor material selection, quality of work and a lack of adequate maintenance and repair. These factors are indeed common to all building materials, and the issues raised by Baiche *et al.* (2017) should help reduce risk of repeat problems occurring in the future.

Like Algeria, India has a long tradition of earth building. One particularly successful source of raw material is referred to as 'Gadhi' soil, which has been used for many years to build traditional houses. To improve the Gadhi soil, local builders have been mixing in a higher plasticity 'black cotton' soil. Using modern analytical techniques, Kondekar *et al.* (2017) have scientifically characterised Gadhi soil for the first time, improving understanding of a valuable traditional material and establishing a database for future studies and development.

The final two papers in this special edition consider the thermal properties of earth materials. Balaji *et al.* (2017) present a study on the thermal conductivity of cement-stabilised compressed earth (soil) blocks. Their results show that thermal conductivity increases with density, clay content and cement content. Measured thermal conductivities of the soil blocks compared favourably with fired clay bricks and concrete. Cob is a traditional form of wall building, in which successive layers of clay soil mixed with straw are stacked and moulded in situ. Unlike rammed earth, cob generally does not require formwork. Although traditional cob buildings are relatively commonplace in south-west England, their thermal resistance is poor, failing to

meet modern building regulations without additional insulation. Griffiths and Goodhew (2017) present a novel study investigating the potential use of an external layer of hemp-lime as an insulating material in cob buildings.

We hope you enjoy the latest issue of *Construction Materials* and as always, we welcome your feedback and thank you for your support.

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