LOW IMPACT MATERIALS: CASE STUDIES

UNFIRED CLAY BRICK

The WISE Building

RIBA Award Winner 2011 - Wales

Developer:	Centre for Alternative Technology
Architect:	Patrick Borer & David Lea Architects
Contractor:	Frank Galliers Ltd
Completion:	June 2010
Location:	Machynlleth, mid Wales
Interviewee:	Pat Borer Architect

Living quarters (A Sutton, BRE)

The WISE (Wales Institute for Sustainable Education) building is at the Centre for Alternative Technology (CAT). The complex is set over three storeys and contains: 24 en suite study bedrooms; a 200 seat 7m high rammed earth lecture theatre; workshops, seminar rooms and a laboratory; a restaurant and bar. The project was 50% EU-funded through ELWa (Education and Learning Wales) with the remaining funds sourced from a variety of other sponsors including private charities as well as a mortgage from the Ecological Building Society.

Restaurant and bar with unfired clay brick walling (A Sutton, BRE)

WHY WAS UNFIRED CLAY BRICK CHOSEN?

1. One of the CAT's main aims is to lower energy use through more efficient construction. Unfired clay bricks:

- are extremely low in embodied energy
- provide thermal mass for passive solar gain
- provide good sound insulation between teaching spaces
- are laid in the same way as brick (and hence are familiar to all contractors)
- will re-cycle easily on demolition
- demand less labour than rammed earth

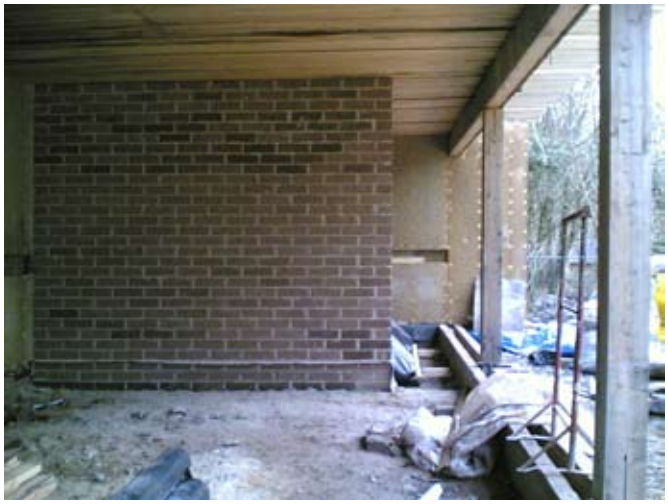
2. CAT had previously produced its own rammed earth blocks on site and so wanted to test industry bricks.

Rammed earth lecture hall and thermal store/corridor (A Sutton, BRE)

WHAT ISSUES WERE FACED AND OVERCOME?

The main issue was the first contractor's unfamiliarity with the non-durable nature of unfired clay brick; specifically, the need for wet weather protection, which habitual working practices in concrete or fired brick do not allow for. The time spent learning these practices on the project had not been factored into the construction cost and as a result stretched the resources of the first contractor too thinly for them to complete the project satisfactorily, hence the need for a second contractor for whom this was not too onerous.

After rendering the brickwork is strong and stable. There have been no shrinkage cracks, though as with many non-load bearing structures they had to be tied at the top to prevent movement.

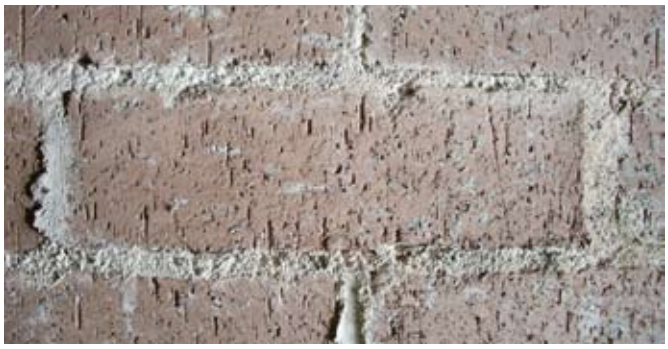


Internal wall of unfired clay brick (P Borer)

WHAT ARE THE PROS AND CONS?

The first contractor commented on the relative weight and delicacy of the material, though this is counter-balanced by its more workable nature.

As a non-durable, unprocessed material made from clay it is not very valuable and so theft is unlikely.



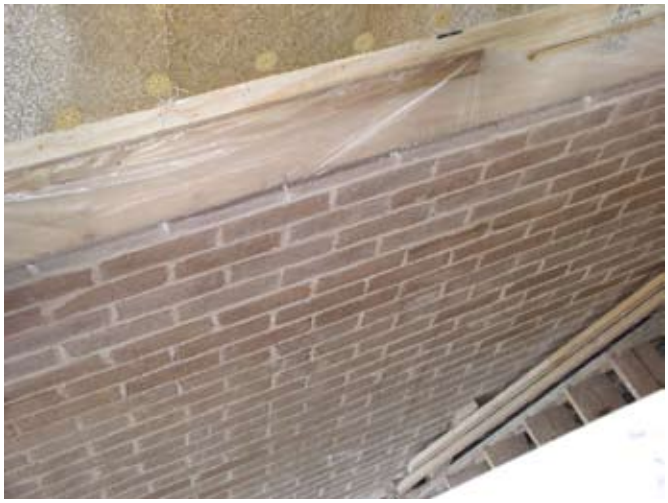
Close up of unfired clay brick in stretcher bond format (P Borer)

WOULD YOU USE IT AGAIN AND, IF SO, WHAT CHANGES WOULD YOU MAKE?

Yes. CAT has previously used rammed earth blocks for a cavity wall with no problems, and we would do it again. We have even used them successfully on external walls with a lime render finish, though this demands a temporary roof structure.

If we use them again, we would try using the blocks as a 100mm partition (we laid them flat – 178mm thick). Also we have only used them here in a non-loadbearing capacity; in our view they could easily support normal building loads of up to 7N, similar to lightweight block.

We may also use a clay mortar to bed the bricks; the contractor this time preferred a hydraulic lime/sand mortar.



Internal wall next to staircase (P Borer)

WHAT WAS THE ELEMENTAL COST?

We were charged £40.83/m^2 for labour and material in 2006. I would say that they were more expensive than concrete block (not including the environmental cost) but perhaps comparable to decent brick. Overall it was not unreasonable given the project aims.

This case study was produced as part of the University of Bath's EPSRC funded Knowledge Transfer Account, a working partnership between BRE and the University of Bath. Further information on unfired clay bricks/blocks is provided in a BRE Information Paper that can be purchased in hard copy from www.brebookshop.com and downloaded free from www.bre.co.uk. Four other case studies and Information Papers are also available on straw-bale, hemp-lime, natural fibre insulation and cross-laminated timber.

Contributors: Andy Sutton & Dan Black (BRE), Pete Walker (University of Bath), Pat Borer (Patrick Borer and David Lea Architects)

Contact: blackd@bre.co.uk, May 2011.

UNIVERSITY OF BATH

EPSRC Pioneering research and skills

bre