

# Dr Paul Jaquin, MEng PhD

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I am currently working for Ramboll Whitbybird as a Geotechnical Engineer in their Edinburgh office. This work is wide ranging, involving the design of geotechnical structures, specification and interpretation of desk studies and site investigation work. Prior to this I completed a PhD at Durham University studying historic rammed earth structures. I developed an improved explanation for the mechanical behaviour of mud brick buildings by considering them as a highly unsaturated soil, allowing enhanced analysis and conservation of historic structures and the development of earth as a modern sustainable construction material. I received a 2.1 in Civil Engineering at Durham University, and was a recipient of the ICE QUEST scholarship. I was sponsored through university by Whitbybird and gained five months structural design experience in their London office.

I am an expert member of ISEAH, the scientific committee which provides technical advice to UNESCO on the conservation of historic earth buildings, and I am currently working with UN-Habitat on the production of guides for rebuilding in Pakistan following earthquakes there.

## Education and Experience

**Geotechnical Engineer** Ramboll Whitbybird **2008 – present**

The main projects I have been involved in have been modelling the impact of tunnelling around Kings Cross St Pancras railway stations in London using PLAXIS finite element software, and the development of an erosion protection scheme for a new Art Gallery on the River Calder in Wakefield. I have scoped, prepared and interpreted desktop studies to interpret the geotechnical parameters for new and redevelopments and have undertaken preliminary design and checking of geotechnical structures. I have scoped and provided information to clients about the use of rammed earth in their projects.

**PhD Analysis of historic rammed earth construction** Durham University **2004 - 2007**

Rammed earth is a building technique common in many parts of the world which involves constructing walls by compacting moist soil between removable formwork. The soil then dries to form a massive monolithic wall. I have visited and investigated historic structures in order to study failure mechanisms and to develop repair techniques. I performed a series of laboratory experiments and have taken the novel approach of treating these earth structures as a highly unsaturated soil. My expertise lies in the unsaturated soil mechanics field of geotechnical engineering, but I have applied this to buildings rather than to more traditional geotechnical structures.

**MEng Civil Engineering** - 2.1 Durham University **2000 – 2004**

**Ermysted's Grammar School Skipton** **1993-2000**

**A Level** Physics, Geography and General Studies grade A, Mathematics grade B. **GCSE** 4 A\* and 6 A

## Previous experience

**Flood modeller and GIS technician** JBA Consulting **Summer 2003**

Working on a large scale flood modelling exercise for the Environment Agency, now incorporated into the UK floodmap and available on the EA website. The project was a 2D river model of England and Wales based on new radar gained topographical data. I corrected river profiles and cross sections in order to make the computer model work more effectively.

**Sponsored summer placement** Whitbybird **Summer 2001 and 2002**

I was sponsored by Whitbybird through university. In summer 2001 I was responsible for the design of the stability walls and transfer beams in reinforced concrete. In summer 2002 I worked on the stability analysis of a 10 storey high block of highly irregular shape.

## Positions held and responsibilities

**Director of Earth Building UK.** I was a founding director of this umbrella organisation to promote earth building.

**Elected expert member of ICOMOS International Scientific Committee on Earthen Architectural Heritage (ISCEAH).**

This scientific committee provides guidance to UNESCO on the conservation and preservation of historic sites, carries out scientific study and promotes the sharing of information on the preservation of the world's cultural heritage.

**Reviewer and expert member of Engineers without Borders (EWB).**

EWB is a charity which provides opportunities for young engineers to make a difference around the world. I review potential student placement projects, and student applications for these placements. I also provide training courses on mud brick construction for students and professionals to learn fundamentals before going into the field.

**Secretary of the Institution of Civil Engineers (ICE) Graduates and Students (G&S) Committee.**

I was secretary to the ICE G&S branch in Newcastle from 2001 to 2006 and was a member of the G&S National Committee of the ICE which aims to promote the views of the younger members within the ICE.

At school I was Deputy Head boy and captain of the rugby 2<sup>nd</sup> XV. I was a member of the cross country club, and represented the school at swimming, orienteering and athletics.

## Teaching

During my PhD I was a demonstrator in the civil engineering laboratory, teaching undergraduates some of the fundamentals of engineering such as concrete design, mechanics of solids and soil mechanics. I provide courses on earth building to Engineers without Borders and other organizations. I have informally mentored around 6 MEng and MSc students following completion of my PhD to allow further development of research in this field.

## Consultancy

I have provided advice to the UN-Habitat offices in Pakistan and Nairobi regarding reconstruction projects. In Pakistan there is to be a large degree of rebuilding following the 2005 and 2007 earthquakes, I am providing advice on engineering aspects of the rammed earth construction. In Nairobi, I am providing technical assistance for documents on sustainable building in Africa.

## Publications

I have published the fields of numerical modelling, laboratory techniques and the conservation of historic sites, both in academic journals and the popular press. A number of my photographs have been used in books, magazines and interpretive panels at sites around the world. I am currently writing a book about the conservation of earth buildings, to be published by the Building Research Establishment. A full list of my publications is available on the accompanying page.

## Software

I am an expert user of Plaxis and Strand7 finite element software which I used for much of my PhD. I am an accomplished user of the Solidworks 3D drawing package and of AutoCAD. I spent around three months using the Arc map suite of software while working at JBA Consulting and have also used MapInfo products. I am an expert Microsoft Word, Excel and Powerpoint user. I have experience writing html, I maintain the *Historic Rammed Earth* website, providing information on rammed earth and other earth building which receives around 70 hits per day.

## Languages

Intermediate German, Basic French, Spanish, Arabic and Russian.

## Interests and activities

I am a keen runner and compete regularly. I have run six full marathons and two half marathons. I also compete in triathlons and mountain marathon events. I enjoy being outdoors and am a keen mountain biker and climber. I have a passion for travel and have travelled in much in Europe. I recently climbed Stok Kangri in the Indian Himalayas (6121m) and have mountain biked the Tour du Mont Blanc and the Annapurna Circuit. In spring 2008 I was part of a team rebuilding a castle in Morocco and have become skilled earth plasterer. I was a Scout leader for 5th Skipton Scouts for a number of years and have organised and run a large number of Scouting activities.

## Publications

### PhD Thesis

Jaquin, P. A. **Analysis of historic rammed earth construction.** Durham University, 2008

### Refereed Journal

Jaquin, PA, Augarde, CE, 2009 **The strength of rammed earth materials**, *Geotechnique*. Published online ahead of print February 2009.

Jaquin, PA, Augarde, CE, Gerrard, CM, 2008 **Rammed earth construction techniques in Spain**, *International Journal of Architectural Heritage*. Volume 2 Issue 4.

Jaquin, P. A. 2008 **Study of historic rammed earth structures in Spain and India.** *The Structural Engineer*. Volume 86 Issue 2. January 2008. Winner of IStructE Rowen Travel Award 2006.

### Conference Proceedings

Jaquin, P. A. 2009. **How mud bricks work – using unsaturated soil mechanics principles to explain the material properties of earth buildings.** *Engineers without Borders UK research conference*. The Royal Academy of Engineering, 20<sup>th</sup> February

Jaquin, P. A. 2008. **Development and spread of the rammed earth technique.** *Lehm 2008, 5<sup>th</sup> International Conference on earthen architecture*, Koblenz. 9-12 October

Jaquin, P. A. 2008 **Unsaturated characteristics of rammed earth.** *Proceedings of the 1<sup>st</sup> European Conference on Unsaturated Soils*. Durham. 2-4 July

Jaquin, P.A. Augarde, CE, Gerrard, CM, 2007 **Rammed earth construction techniques in Spain**, *International Symposium on Earthen Structures*, Bangalore. 22-24 August

Jaquin, P.A. Augarde, CE, Gerrard, CM, 2006 **Analysis of Rammed Earth**, *Structural Analysis of Historical Constructions*, New Delhi. 6-8 November

Jaquin, P.A. 2006 **Analysis of Historic Rammed Earth Construction.** *9th Young Geotechnical Engineers Symposium*, Belfast, September

Jaquin, PA, Augarde, CE, Gerrard, CM, 2004 **Analysis of Rammed Earth structures for modern use and conservation**, *International Seminar, Structural Analysis of Historical Constructions*, Padua.

### Posters

Jaquin, P. A. **Development and spread of the rammed earth technique.** *Lehm 2008*, Koblenz, Germany, October 2008

Jaquin, P. A. **Analysis of Historic Rammed Earth Structures** *Presentations by Britain's Top Younger Scientists and Engineers*, Houses of Parliament, London, October 2006

Jaquin, P. A. **Historic Rammed Earth Construction** *Institution of Structural Engineers Young Researchers Conference*, London, September 2006. Gained second prize in the poster competition.

### Popular Press

Jaquin, P. 2007 Rammed earth floors. *Green Building Magazine*, 17 (3) Green Building Press.

## Photographs

**Grains de bâtisseurs**, a 5 year exhibition at Cité des sciences et de l'industrie, Paris. Interpretive panels and accompanying book. March 2009

Schmap.com interactive maps and guides. May 2008

**Two historic rammed earth building** photographs in *The Rammed Earth House*, Easton, D. Chelsea Green Publishing Company. August 2007

**History and development of the rammed earth technique**, Interpretive panels at Desert Living Centre, Las Vegas. For Aldrich Pears. August 2007

**Ancient Wisdom for the Contemporary Architect**, Interpretive panels at Turtle Bay Exploration Park, Redding, California

**World Heritage** magazine, published by UNESCO. Feature on earthen architecture. January 2008

**Abenteuer und Reisen** German Travel Magazine, September 2007

**Tunza** magazine, published by UN Environment Program. July 2007

## Presentations

**The science of sandcastles.** September 2009 (forthcoming). *Orkney Science Festival*. Kirkwall

**How to make mud bricks.** February 2009. *Engineers without Borders Construction in Development course*. Imperial College, London.

**The earth building industry around the world.** January 2009. *Earth Building UK inaugural meeting*. University of Bath

**Rammed earth.** 6 August 2008. *Ramboll Whitbybird Technical Highlight*. London

**Rammed earth.** 28 July 2008. *Ramboll Whitbybird Lunchtime seminar*. Edinburgh

**Unsaturated characteristics of rammed earth** 4 July 2008. *1st European Conference on Unsaturated Soils*. University of Durham

**School of Engineering Research Day** 25 June 2007. *Soil Mechanics group presentation* University of Durham. Winner of the poster competition.

**Rammed earth.** *Eden Valley Green week*. September 2007

**Modelling rammed earth using soil mechanics principles.** 23 November 2006 Advanced Mechanics Research Group seminar series, University of Durham

**Analysis of Historic Rammed earth** 9 November 2006 *Structural Analysis of Historic Constructions 2006* Indian Institute of Technology, Bangalore

**Analysis of Historic Rammed Earth** 26 June 2006 *School of Engineering Research Day*. University of Durham. Second prize poster competition

**Historic Rammed Earth structures in Spain** 02 May 2006 *Archaeology Department seminar series*. University of Durham

**Rammed earth structures** 05 April 2006 *ICE Graduates and Students Papers competition*. Newcastle. Second prize.

**Analysis of Historic Rammed Earth** 14 March 2006 *IStructE Young Researchers Conference*. London

**Analysis of Historic Rammed Earth** 13 March 2006 *House of Commons Presentations by Top UK Younger Scientists and Engineers* London

**Analysis of Rammed Earth structures for modern use and conservation** 11 November 2004 *Structural Analysis of Historic Construction 2004* University of Padova.