

# **Report on the State of Construction History in Britain**

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(N.B. Names followed by (\*) indicate a website that can be easily found using Google.)

## **Summary**

As a formal academic discipline within the higher education system, the state of construction history in Britain is not healthy. Indeed it is now in a worse state than one or two decades ago. There are no University Departments of Construction History and hardly any formal lecture courses in the subject at undergraduate or post-graduate level. Likewise there is no formal research programme in the subject. In general terms the academic discipline is in the hands of a number of individual enthusiasts who have managed to follow their enthusiasm despite everything. Unfortunately, many of these individuals are approaching retirement and there is little evidence of new blood to take up the baton.

On the other hand, there is also good news. The core curricula published by the Joint Board of Moderators which accredits many University engineering degree courses do require them to include some input on the history of the subject, and so the doors are open for those universities that want to pursue this avenue. There is also a large body of research being undertaken in university departments of History of Science and Technology although, as a matter of fact, this does not often embrace subjects related to construction. There are also a number of individuals – often mature students – who undertake independent and sometimes part-time research leading to a PhD. They are usually linked to departments of architecture or history of science and technology, rather than engineering departments.

There is a large and growing 'heritage industry' engaged in restoring and refurbishing old buildings dating from the 1960s back to the twelfth century and beyond. One aspect of this industry is a growing number of post-graduate courses in building conservation which always contain some history of the built environment, though often dealing more with architectural issues than with engineering. Such heritage work generates considerable expertise and knowledge regarding old buildings, and this can usually be tracked down through publications on building conservation and industrial archaeology, as well as in articles the technical and architectural press that report such projects.

Conservation bodies such as English Heritage often commission reports or books on particular buildings of historical note and sometimes on generic themes such as gas holders (Tucker 2000), mills or concrete buildings.

Finally, environmental legislation in Britain (and the rest of Europe) now requires that large construction projects are subjected to an Environmental Impact Assessment. These studies, which are in the public domain, usually require a detailed assessment of archaeology and any buildings of historic importance or significance. Such assessments can constitute a valuable body of historical study.

Taken together, an enormous amount of research into the history of construction, buildings, engineering and various architectural subjects is undertaken in Britain. While some of this is undertaken in academic institutions, most is done in the professional world of building conservation and care for the historic built

environment. For example, while little generic work is undertaken on the engineering behaviour of cathedrals by academic researchers, detailed studies, including physical testing and theoretical analysis are usually undertaken when a particular building is in need of attention. The situation is, then, not so different from that in 1742 when the ‘*Tre matematici*’ and Poleni made their studies of the dome of St Peters cathedral in Rome.

## **Research into construction history in Britain**

The state of construction history in Britain is best reviewed under a number of headings which will enable those people who are active in the field to be traced, and will help would-be researchers and historians to further their studies.

The term *construction history* can be used differently by different people. In this paper it is taken to refer to:

- the construction of buildings which, in principle, can relate to any aspect of building design and construction - structure, construction materials and methods, heating, ventilation, lighting, acoustics, and the building envelope or facade.

In practice, to date, more has been written about building structures and the construction of buildings than the other subjects. This paper does not consider the history of civil engineering subjects such as bridges, tunnels, dams, railways, canals and hydraulic engineering.

## **Universities and Research Organisations**

### ***University-based Research***

There are no formal research programmes in the field of construction history. Nevertheless, academics in a number of different fields do undertake construction history research in universities. This work may occur in any of a number of different departments, ranging from construction to archaeology, for example:

- Jaques Heyman in the Department of Engineering at Cambridge University has undertaken many studies in the history of structural analysis.
- Tom Swailes at the University of Manchester who undertakes research into the properties of nineteenth-century cast-iron beams and columns.
- Henty Louw in the architecture school at the University of Newcastle, who studies several topics including the development of sash windows.
- Bill Addis, formerly of the Department of Construction Management and Engineering, has researched and written widely on the history of the engineering design of buildings.
- Mark Wilson Jones in the Department of Civil Engineering and Architecture at the University of Bath studies Roman architecture, often from a technical point of view.
- James Campbell in the architecture school at the University of Cambridge who has made technical studies of the work of Wren and brick construction, among other subjects.
- Janet Delaine in the archaeology department at the University of Reading has made detailed archaeological studies of Roman construction, notably the Baths of

the Emperor Caracalla and buildings at the port of Ostia, involving in depth study of the engineering design and construction.

Anyone wishing to undertake research towards a PhD must be registered at a university and such individuals can be traced through likely host departments, especially where conservation courses are run.

The histories of engineering mathematics and science often overlap with the histories of physics and mathematics and some historians of the latter subjects are not fully aware of the links between their work and engineering history. Such work can be traced through the departments of History of Science and Technology, the largest of which are those at the universities of Cambridge, Oxford, Manchester and Imperial College London. One example of such work is the considerable body of knowledge collected in the mathematics department at the University of St. Andrew's, Scotland. This is made available through an excellent website which gives much attention to mathematicians and engineering scientists who contributed to the development of mechanics ([www-history.mcs.st-andrews.ac.uk/history/index.html](http://www-history.mcs.st-andrews.ac.uk/history/index.html)).

The British Society for the History of Science (BSHS) (\*) is a national umbrella organisation for all research into this field of study. Britain also has many active members of the International Committee for the History of Technology (ICOHTEC) (\*).

#### ***Research institutes***

The Royal Institution (\*) has supported research into science for over two hundred years. The Royal Society (\*) goes back even further and counts Robert Hooke and Christopher Wren amongst its founder members in the 1660. Both organisations have excellent libraries available to non-members by appointment.

Research institutes are sometimes involved in undertaking historical research, albeit not of a purely academic nature. This can sometimes involve the testing of materials and structural elements and may be undertaken in collaboration with Universities which have suitable testing facilities. For example the Building Research Establishment (\*), the Steel Construction Institute (\*), the Timber Research and Development Association (TRADA) (\*), and the Brick Development Agency (BDA) (\*). These organisations also produce some guidance on dealing with their respective materials in historic structures. (E.g. Bussell, 1997)

#### ***Taught courses***

A survey is currently being undertaken by Tom Swailes in the Civil Engineering Department at the University of Manchester into the extent and frequency of lectures on building and civil engineering history. The results, which at present do not look encouraging, are due for publication in late 2004.

Throughout Britain there are over 30 post-graduate courses on building conservation. These can be found through university websites and advertisements in the technical architectural and building press. Such courses rely heavily on lecturers from outside the university sector who give invited lectures in their fields of expertise. Most historians of construction in Britain are involved in giving such lectures in one or more of these courses.

By far the greatest body of historical teaching occurs in the forty departments of History of Science many of which embrace history of technology and medicine. The

history of building construction and engineering, however, does not usually feature prominently in such courses.

### **Professional bodies**

Most British building professionals are members of one of six professional bodies:

- Institution of Civil Engineers (ICE) (\*)
- Institution of Structural Engineers (IStructE) (\*)
- Chartered Institution of Building Services Engineers (CIBSE) (\*)
- Chartered Institute of Builders (CIOB) (\*)
- Royal Institute of British Architects (RIBA) (\*)
- Royal Institute of Chartered Surveyors (RICS) (\*)

Each of these organizations can be a good starting point for historical inquiry. They all have libraries and archives of varying size and richness. Some have groups of members who come together to share their interest in the histories of their professions. Each institution can provide details of professionals involved in historic building projects.

**ICE** - A large and excellent library with an extensive collection of old and classic books as well as much archival material. Proceedings of its meetings date back to 1837. The Panel for Historic Engineering Works (\*) operates regionally throughout Britain to record significant civil and structural engineering works. The ICE produces some guidance on historic construction, e.g. Marsh & Swailes 1998.

**IStructE** - A good library and proceedings dating back to 1921. The Institution's History Study Group (\*) has been one of the most active of its kind in the world since its inception in 1973.

**CIBSE** - A good library and proceedings dating back several decades. A number of members have collaborated in some historical research and maintain a presence on the Institution's website (\*). (Formerly the Institution of Heating and Ventilating Engineers).

**CIOB** - A good library, but relatively little old material. The Institution is host to the Construction History Society (\*).

**RIBA** - An excellent library of books, periodicals and drawings.

**RICS** - A good library. Its members include building surveyors who undertake many condition surveys on historic buildings (but not structural and foundation work).

### **Historical societies**

Construction history is covered in the field of interest of a number of historical societies in Britain. These are run by and for their members who are enthusiasts for the subjects.

The most obvious ones dealing with construction and buildings are these:

The **Construction History Society** (\*), which is affiliated to the Chartered Institute of Building (\*). The society has regular meetings and organizes the publication of a refereed annual journal *Construction History* which contains papers and book reviews.

The **Georgian Group** (\*), **Victorian Society** (\*) and **Twentieth Century Society** (\*) focus on buildings, art and other matters respectively in Georgian (approximately 1714-1837) and Victorian (1837-1903) times, and in the 20th century. Each has regular meetings and publishes a newsletter and journal.

The **Society for the Protection of Ancient Buildings** (SPAB) (\*), the **Ancient Monuments Society** (AMS) (\*), and the **Association for Studies in the Conservation of Historic Buildings** (\*) all cover all periods of history, including the industrial age, and produce journals and other publications.

The **International Council on Monuments and Sites** (ICOMOS) is a non-governmental organisation, currently with 118 national committees worldwide. In 2003 it established the **International Scientific Committee for the Analysis and Restoration of Structures of Architectural Heritage** (ISCARSAH). ICOMOS-UK formed its corresponding national Committee in 2004, with a membership drawn from those active in building conservation and historical studies.

In principle, buildings may be the subject of any themed historical society from aircraft to weaving. They all hold regular meetings and publish periodicals with collections of papers. In practice the societies with the most frequent overlap with construction are these:

- The **Newcomen Society** (\*) which deals with the history of engineering and technology.
- The **Association of Industrial Archaeology** (\*)

Throughout Britain there are many local industrial archaeology societies which often publish newsletters and can lead quickly to people interested in particular industries or sites.

## **Museums, libraries and archives**

The Museum of Science and Industry in London (The 'Science Museum' (\*)) has many original artefacts related to buildings and some archival material. The Science Museum Library (\*), currently located adjacent to Imperial College in London University is due to relocate to Western England soon. It contains a huge collection of books and periodicals. The National Railway Museum at York has archives relating to railways buildings as well as rolling stock. So too do the archives of Network Rail – many records of railway structures, including many original drawings, are held in four centres for England and Wales (but not Scotland) – London (Waterloo Station), Birmingham, Swindon, and York.

A number of city, county, and regional museums also have collections of artefacts related to construction history. They often also have valuable and extensive archives related to businesses and individual buildings in the local area. Of particular importance for the nineteenth century are the cities of Birmingham, Leeds and Manchester.

Britain has a great many museums related to its industrial and cultural heritage. Many of these are housed in contemporary buildings such as mills which are themselves museum exhibits. They also usually have collections of relevant archival material. A good example is Belper North Mill (\*) in Derbyshire which was the most advanced building of its type when built in 1806.

Particular mention must be made of Ironbridge Gorge Museum (\*), not only for its unique buildings and the Iron Bridge itself, dating from 1779, but also for the large collection of archival material and the many historical studies which are undertaken there.

The National Archives (\*), through the Public Record Office (\*) at Kew in west London, hold a huge collection of archive material including records of public construction, railway and canal companies, and much more.

Other libraries and archives have grown up where certain industries or building types prevail, such as naval dockyards at Chatham Historic Dockyard (\*) in Kent, commercial docks at The Museum in Docklands (\*) in London, materials testing at The Kirkaldy Museum (\*) in London, and hospitals at The Wellcome Trust (\*) in London. The Royal Engineers Museum (\*) at Brompton Barracks, Chatham holds records and material covering the activities of the construction 'arm' of the British army, whose military engineering - for example the use of iron in buildings - was often ahead of its civil engineering counterpart.

Some individuals or engineering firms are of sufficient historical importance that dedicated archives have been established. Examples are the archive at Bristol University devoted to Isambard Kingdom Brunel, and that at Churchill College, Cambridge devoted to Ove Arup and the firm of consulting engineers he founded.

### **The building conservation industry**

Britain's built heritage is generally under the guardianship of organizations such as English Heritage (\*), Historic Scotland (\*) and CADW (the Welsh equivalent) (\*). Many old buildings are owned and cared for by the National Trust (\*) or more specialised trusts, or are privately-owned. Such organizations publish well-researched guides about individual buildings (e.g. Fountains Abbey (\*) in Yorkshire) and studies of generic building types such as cathedrals, textile mills, and dockyard and naval buildings.

In addition, extensive records including drawings, photographs, and reports on buildings and other structures are held by the National Monuments Record Centre of English Heritage (\*), and the Royal Commissions on the Ancient and Historical Monuments of Scotland and Wales (\*).

These organisations compile many reports and guides which are written by professionals involved with the restoration of old buildings and are based on considerable research and life-long enthusiasm.

### **Unaffiliated, individual researchers**

Finally, there exists a large number of knowledgeable and enthusiastic amateurs who study and write about the history of many different aspects of construction history. Inevitably they are difficult to find except by the traces they leave, for instance in lectures to various historical societies, and the papers and books they write. Such individuals are best found in the indices to the various periodicals published by organizations mentioned above. Some of their names appear in the following list of references.

### **Publications**

### **Refereed Periodicals**

*Construction History*

*Industrial Archaeology Review*

*Proceedings of the Institution of Civil Engineers*

*The Structural Engineer*

*Transactions of the Newcomen Society*

### **Journals and Newsletters**

Most historical societies publish journals and newsletters for their members. While not refereed, these often contain valuable information and help identify people interested in particular subjects. Examples are the Newsletters of the *Georgian Group*, the *Victorian Society*, the *Twentieth Century Society*, the *Panel for Historic Engineering Works*, the *Society for the Protection of Ancient Buildings*, the *Ancient Monument Society*, and the *Association for Studies in the Conservation of Historic Buildings*.

### **Books**

Addis, Bill, *Building: 3000 years of Design, Engineering and Construction*, New York & London: Phaidon, 2007.

Addis, W., *Structural and Civil Engineering Design*, Vol.12 of series 'Studies in the History of Civil Engineering'. Aldershot: Ashgate (Variorum), 1999.

Addis, W., *Structural Engineering - the Nature of Theory and Design*. Chichester: Ellis Horwood, 1990.

Bowley, Marion, *The British Building Industry: Four Studies in Response and Resistance to Change*, Cambridge University Press, 1966.

Bowyer, Jack, *History of Building*. London: Crosby Lockwood Staples, 1973.

Clifton-Taylor, Alec, *The Pattern of English Building* (4th Edn.), London: Faber and Faber, 1987.

Bussell, M., *Appraisal of existing iron and steel structures*. Steel Construction Institute, 1997.

Davey, Norman, *Building in Britain*, London: Evans Brothers, 1964.

Giles, C. & Goodall, I.H., *Yorkshire Textile Mills 1770-1930*. Royal Commission on the Historical Monuments of England. London HMSO, 1992.

Hay, G.D. & Stell, G.P., *Monuments of Industry: an illustrated historical record*. Royal Commission on the Ancient and Historical Monuments of Scotland, 1986.

Heyman, Jacques, *Arches, Vaults and Buttresses: Masonry Structures and Their engineering*. Aldershot: Ashgate (Variorum), 1996.

Hudson, Kenneth, *Building Materials*, Vol.9 in series 'Industrial Archaeology'. London: Longman, 1972.

Innocent, C.F., *The Development of English Building Construction* (reprint), Shaftesbury: Donhead, 1999.

Mainstone, Rowland J., *Developments in Structural Form* (2<sup>nd</sup>. Edn.). Oxford: Architectural Press, 1998.

- Mainstone, Rowland J., *Structure in Architecture: History, Design and Innovation*. Aldershot: Ashgate (Variorum), 1999.
- Marsh J O, Swailes T., *Structural appraisal of iron-framed textile mills*. Institution of Civil Engineers, Design and Practice Guide, 1998.
- Newby, Frank (Ed.), *Reinforced Concrete up to 1914*, Vol.11 of series 'Studies in the History of Civil Engineering'. Ashgate (Variorum), Aldershot, 2001.
- Nisbet, James, *A Proper Price: Quantity Surveying in London 1650-1940*. London: Stoke Publications, 1997.
- Nisbet, James, *Fair and Reasonable: Building Contracts from 1550 - a Synopsis*. London: Stoke Publications, 1993.
- Powell, Christopher (1996) *The British Building Industry since 1800: an economic history*. 2nd edn. London: Spon.
- Skempton, A.W., (Ed.) *Biographical Dictionary of Civil Engineers in Great Britain and Ireland, Volume 1: 1500-1830*. London: Thomas Telford, 2002.
- Skempton, A.W., *Civil Engineers and Engineering in Britain, 1600-1830*. Aldershot: Ashgate (Variorum), 1996.
- Stratton, Michael, (Ed.) *Structure and Style*. London: Spon, 1997.
- Strike, James, *Construction into Design: the Influence of New Methods of Construction on Architectural Design 1690-1990*. Butterworth-Heinemann, 1991.
- Sutherland, R.J.M. (Ed.), *Structural Iron - 1850*, Vol.9 of series 'Studies in the History of Civil Engineering'. Aldershot: Ashgate (Variorum), 1997.
- Sutherland, R.J.M. et al. (Eds.), *Historic Concrete: Background To Appraisal*. London: Thomas Telford, 2001.
- Tann, Jennifer, *The Development of the Factory*. London: Cornmarket Press, 1970.
- Thorne, Robert, (Ed.) *Structural Iron and Steel, 1850-1900*, Vol.10 of series 'Studies in the History of Civil Engineering'. Aldershot: Ashgate (Variorum), 2000.
- Tucker, Malcolm, *London Gasholders Survey: the Development of the Gasholder in London in the later nineteenth century*. Report for English Heritage, 2002.
- Yeomans, David, *Construction since 1900: Materials*. London: Batsford, 1997.
- Yeomans, David, *The Trussed Roof*, Aldershot: Scolar Press, 1992.