

Background

A physicist turned engineer, I now practice in the field of building environmental design, particularly the integrated engineering design of low carbon buildings.

Employment

2002 to Date King Shaw Associates: Principal
1998 to 2002 Buro Happold: Associate Director
1997 to 1998 Capita Greatorex: Associate Director
1994 to 1997 Max Fordham Associates: Partner
1990 to 1994 Max Fordham & Partners: Engineer

Academic Positions

2008 to date University of Bath: Royal Academy of Engineering Visiting Professor of Building Engineering Physics
2007 to 2008 University of Bath: Visiting Professor of Environmental Engineering
2002 to 2007 University of Bath: Visiting Lecturer & Studio Tutor

Professional Qualifications

1999 Member of the Chartered Institute of Building Services Engineers
1998 Member of the Energy Institute
1997 Member of the Institute of Physics
1997 Institute of Physics: Chartered Engineer
1997 Institute of Physics: Chartered Physicist

Education

1987 to 1990 Imperial College, London: Physics BSc ARCS

Awards

2008 Institution of Civil Engineers: The James Watt Medal for the best published work in the journal Energy
2007 Institution of Civil Engineers: The Edmund Hambley Medal for creative design in the field of sustainability
2002 Association of Consulting Engineers: Young Consulting Engineer of the Year

Inventions

Device for improving energy transfer in thermal mass energy storage systems, UK Patent No GB2406341

Selected Publications

An application of mixed mode cooling using Termodeck with CHP, Proceedings of conference: Air Conditioning and the Low Carbon Cooling Challenge, Windsor, UK, 27-29th July 2008. London: NCEUB
Innovate Green Office; A New Standard for Sustainable Buildings, Proceedings of the Institution of Civil Engineers, Energy, Thomas Telford London 2007, Vol160 Issue EN3 pp105-111
Response as a Factor in Comfort Design for Theatres, Theatre Engineering & Architecture, ABTI London 2004, Volume 3 pp10.1-10.6
Energy Alternatives, Patterns: Essays on the Art and Science of Engineering for Sustainability, Buro Happold London 2001, Volume 13 pp 34-36
A New Superstore Environment For The Next Millennium Proceedings of the CIBSE National Conference 1998, CIBSE London 1998, pp1-8

Early Career Summary

After graduating as a physicist I entered the building services profession because of an interest in how buildings actually work. I quickly came to understand that buildings function environmentally as complex, interdependent entities and not as collections of independent systems. This understanding and my scientific background have allowed me to identify and address issues of building energy performance that are not immediately obvious when simply analysed for conventional mechanical or electrical systems.

My career started with Max Fordham & Partners, which gave me tremendous opportunities to understand building services systems at a component level. Detailing installations was considered very important in the practice and my first few years were spent preparing detail designs, specifications and co-ordinated installation drawings, under the supervision of senior engineers, for a variety of projects. The most important of these for my career development was the Savoy Theatre refurbishment: I spent over a year on site as resident building services engineer for this incredibly complex project, assisting the contractors, solving problems and updating the design as site conditions dictated. This period was invaluable in allowing me to understand the issues facing contractors when interpreting and installing our designs. As a result I now have a rare depth of understanding of the buildability of complex building services designs.

Building on this experience I was able to take more of a leading role in developing concept designs for new projects, including the Institute of Medical Sciences for the University of Aberdeen, my first low energy project. During my time with Max Fordham & Partners, I worked on a wide variety of projects, from schools to mass housing and quite a number of theatres, and each time was able to pursue my interest in low energy design. One of the last projects that I undertook, working with Max himself was the environmental scheme design for the Millennium Sainsbury Store at Greenwich which set new standards in retail design and energy efficiency. The building achieved the maximum score possible under the original BREEAM retail assessment; the only building ever to do so, won numerous awards and was the people's choice for the Stirling Prize shortlist in 2000.

I left Max Fordham in 1997 to expand my knowledge of the building services profession outside the select range of projects I had been working on. I joined Capita Greatorex, a commercial engineering practice, as Associate Director working mainly on office and retail fit-outs. This move allowed me to gain a better understanding of the commercial pressures of designing with limited fees, to limited budgets and constrained programmes. This period of my career has provided me with an appreciation of why the construction industry often fails to innovate or even to improve building performance beyond the bare regulated minimum.

Following Capita Greatorex I moved to Buro Happold in 1998 in order to be able to work more closely with structural engineers and start to influence the construction of buildings and not just the services installations. I believe that to be able to design building environments properly the building structure and envelope requires just as much attention as the mechanical and electrical installations. I have found that this level of co-ordination is difficult to achieve with conventional separate structural and buildingservices practices.

I left Buro Happold in 2002 in order to start my own practice, King Shaw Associates. The following pages outline in more detail my experience at Buro Happold, since becoming MCIBSE, and since forming King Shaw Associates, all of which is relevant to my application for FCIBSE.

Experience since becoming MCIBSE

Buro Happold

I started at Buro Happold as an associate in the Bath building services group and quickly took over responsibility for a number of ongoing projects, which included concept design for a large hotel in Beirut and the environmental design, specification and site supervision for Edward Cullinan's Gridshell at the Weald & Downland Museum.

The Gridshell project was at scheme design stage and I undertook a review of the work that had been undertaken to date, and overhauled the design to include one of the first uses of a ground labyrinth in lieu of mechanical refrigeration for climate control in the lower ground conservation store. I also re-analysed the thermal performance of the building as an earth shelter, accounting for heat loss to the ground, not just to the air, and introduced insulation between the building retaining structure and the ground in order to raise the internal equilibrium temperature and save energy. This was three years before under-slab insulation became a requirement under the Building Regulations.

With my previous theatre experience I was also key in helping Buro Happold to win the bid to provide engineering for the redevelopment of the Royal Shakespeare Company estate in Stratford-Upon-Avon. I contributed to the extensive feasibility studies for this project as the building services team leader. The relationships that I built up with the client team during this project have resulted in significant ongoing work over the years, both for Buro Happold and for my own practice, King Shaw Associates.

During my time at Buro Happold I was able to consolidate my reputation as an environmental designer. I was approached by a variety of architects, with whom I had developed relationships at Max Fordham, or to whom I had been recommended, and this offered me the opportunity to work on some very significant new projects. As an associate and team leader I took these projects from initial contact, through fee negotiation, planning and direction to design and final delivery. Projects included the refurbishment of the Foundling Museum in London, an extension to StJohn's College in Oxford and the Zetter Hotel in London; all notable projects. However, probably the most important project that I secured for Buro Happold was the new Rolls Royce Factory at Goodwood in Sussex with Nicholas Grimshaw.

I was approached by Grimshaw on the recommendation of the structural engineer with whom we had both worked previously, to collaborate on the design competition being run by BMW for their new factory. We won the competition and I negotiated a contract with BMW to design the building services for a fee of around £650,000. I ran the project, which required a very high level of design co-ordination, not just with the architecture and structure, but also with the factory fit out, which required alignment of German manufacturing requirements with UK standards and practices. I led the engineering of this project, with a team of five engineers, for two years through tender to the start of construction on site, when we passed the responsibility for site supervision to BMW's in house engineering team.

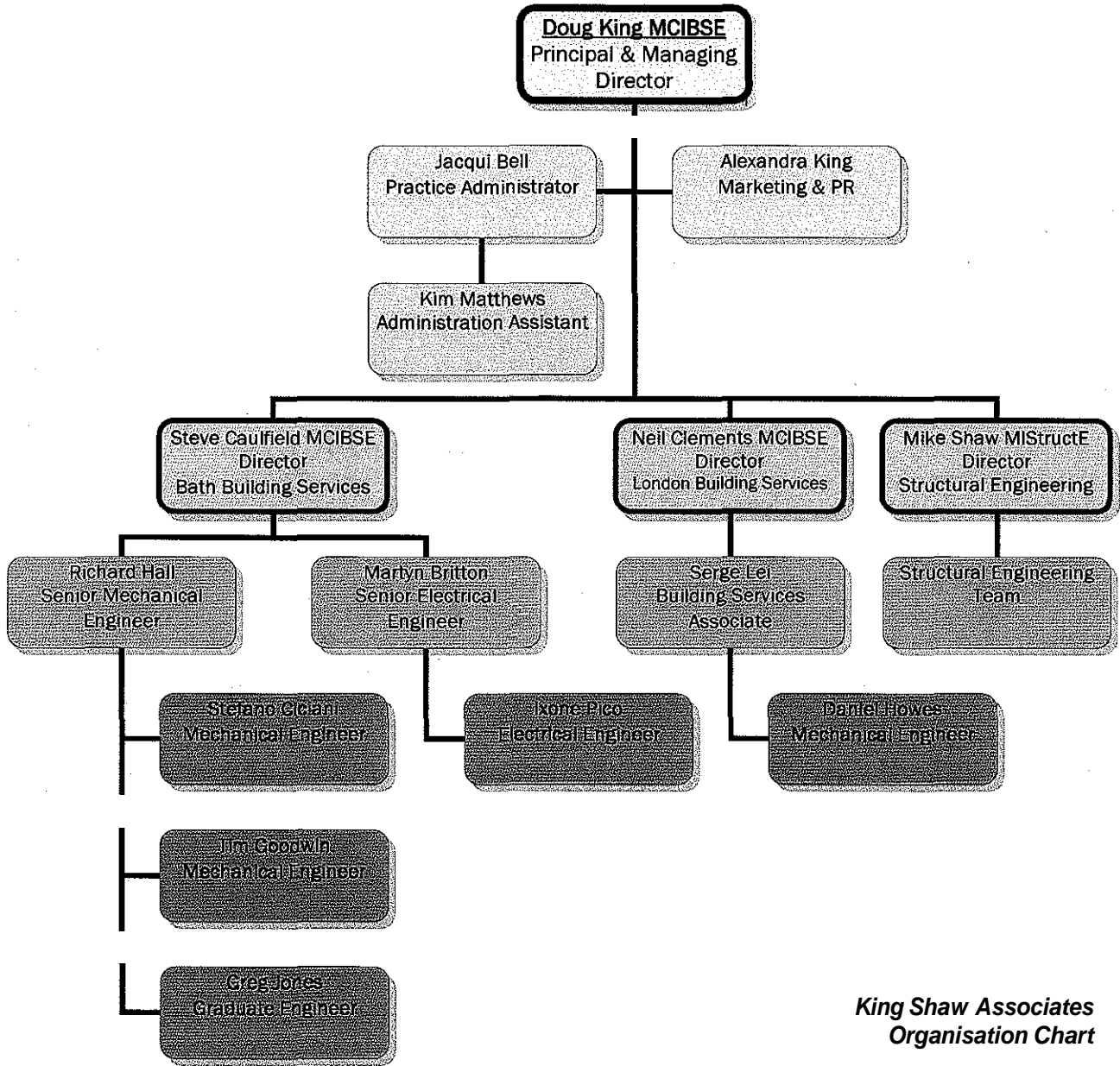
I also worked on two significant overseas projects where Buro Happold were engaged for both structural and building services engineering: The Genzyme Centre in Cambridge, Massachusetts, with Behnisch, Behnisch & Partner Architects, was the first large commercial building in the USA to achieve a Platinum LEED rating. The second was a large performing arts centre for the Renssaler Polytechnic Institute in Troy, New York, also with Grimshaw. Working closely with the structural engineers on these projects, I was able to refine my understanding of the interdependencies of the various engineering disciplines. This allowed me to develop a much better understanding of the impacts of key environmental design strategies, such as using thermal mass, on the construction of the buildings.

With this experience I was able to start to develop a systems engineering approach to environmental building design. Systems engineering recognises that complex products, such as buildings, require many independent systems to function in harmony and focuses on defining the overall performance requirements at an early stage, before proceeding with design synthesis and system validation while still considering the complete problem. In 2002 I became the first building services engineer ever to win Young Consulting Engineer; setting out my belief that the systems approach will have a significant impact on future directions for consulting engineering in a paper for the Association of Consulting Engineers.

At the end of my time at Buro Happold I was managing a team of six engineers with two graduates in the Bath office, who were working on the UK projects with a fee turnover of about £750,000 per annum, whilst I was also travelling fortnightly to the New York office of Buro Happold to contribute to the ongoing US projects, which were being run from there.

King Shaw Associates

I founded King Shaw Associates in 2002 in order to follow my specific philosophy of applying a systems engineering approach to the design of sustainable buildings. In order to achieve this King Shaw is a multidisciplinary practice, even though we are now best known for building services and environmental design.



As Principal I have directed the development of the practice and its guiding philosophy and have led the majority of our design projects. King Shaw Associates has quickly become a well respected practice in the field of integrated sustainable design. We won Consultancy of the Year in the 2006 Building Services Awards, having been a finalist in each of the previous three years. We won Building Services Engineer of the Year in the H&V Awards in both 2007 and 2008. We also won Environmental Initiative of the Year in the 2007 Building Services Awards and Innovation of the Year in the 2007 Sustainable Building Services Awards.

I developed the original business plan for the practice, undertook extensive market research and identified the key opportunities and client sectors for integrated sustainable design. I sourced the necessary funding, advice and support in order to set up the business and started to recruit engineers, starting with Mike Shaw, my structural engineering partner, with whom I had previously collaborated at Buro Happold on the Genzyme project. I have developed the business to a turnover of over one million pounds, with offices in London and Bath, now employing sixteen people, eleven of whom are building services engineers. I now have three partners in the business and I

am presently driving the review and development of our business strategy in order to define and plan for our long term future.

I designed and introduced our quality and environmental management systems and obtained ISO approval for them within two years of starting the business. I also wrote our original staff handbook, design guide and health and safety policy. More recently I have implemented new project planning, time and cost management systems and initiated our involvement in Investors in People. I have also engaged us with business benchmarking exercises, including the annual ACE Benchmarking Programme and the Construction Industry KPIs.

I engage actively in research on most of my projects. I have recently patented a device to maximise heat transfer in hollow core concrete slabs when used for ventilation in an application similar to Termodeck. Over the years I have delivered a number of projects that have demonstrated the novel application of a technology or have been the first of a kind, a few examples are given in more detail below. Wherever possible I publish the results of my research or design work and the selection of publications listed above indicates the wide range of my interests. I am also a regular reviewer for the ICE Journals Energy and Engineering for Sustainability. Finally, I am a regular contributor at a wide variety of industry conferences and seminars as well as providing CPD lectures through a number of organisations.

Many of the projects engineered by King Shaw Associates have won awards in their own right or have led to industry awards for the practice. In addition to the awards for work undertaken in the practice under my supervision, I have also personally been awarded a number of prizes for my development of sustainable buildings or practices and for work I have published.

University of Bath

For the past six years I have been teaching sustainable and environmental design in the Department of Architecture & Civil Engineering at the University of Bath, studio tutoring and occasionally lecturing. I have helped establish a new research group at the University for the Engineering & Design of Environments, bringing together existing and new staff with an interest in environmental design. Over the past 2 years I have also been helping to start up a postgraduate MSc in Environmental Design to provide a route into environmental design and building services for graduates with first degrees in other construction disciplines.

In January 2007 I was appointed as a Visiting Professor by the University of Bath in recognition of the leadership I was providing to environmental design within the department. In October 2008 I was appointed Royal Academy of Engineering Visiting Professor in Building Engineering Physics, with a substantial grant from the Royal Academy of Engineering and a consortium of leading industry partners. This appointment will allow me to make a significant increase in my involvement, and to contribute to the strategic development of building engineering physics at the University of Bath.

Development Plan

My development plan has changed radically over the last few years. Just two years ago my plan included achieving recognition for the work that King Shaw Associates was producing, for my teaching contribution and for my professional contribution. Since then King Shaw Associates has achieved national recognition with several awards, whilst I have become a Professor and have submitted my application for FCIBSE.

My plans now relate to widening my contribution within the industry and education. I have recently been invited to join the RIBA Validation Panel, the body that monitors and approves the teaching of architecture in universities and architectural schools. I am a member of the industrial liaison committee for the MEng in Civil & Architectural Engineering at Bath University. I aim to use these opportunities to expand my capabilities as a teacher, by learning from methods used at other universities and applying my influence as a member of the Industrial Liaison Committee and Professor in the Environmental Design Research Group to apply this to the courses at Bath.

I also plan to increase my research and publication effort in order to disseminate the knowledge that I have of successful sustainable strategies for building construction and operation. I would also like to expand my influence to a much wider range of projects by acting as a Client Design Advisor or CABA Panel Reviewer, where I feel that I can provide a great deal of assistance to design teams struggling with the concepts of sustainability.

Selected Recent Projects

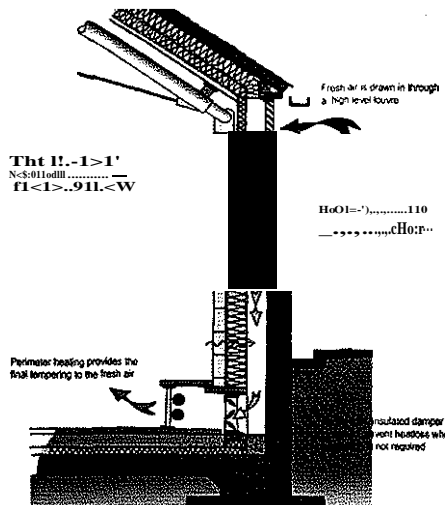


The Royal Albert Hall, London, 2005 to date

For the past three years I have been undertaking research into the poor performance of the recently installed air conditioning system and designing a ten year programme of renewals and improvements to the main building infrastructure.

In order to understand the performance issues I have been studying the interaction between the air conditioning and the building's natural response. This has involved devising experiments that would allow us to evaluate and understand the thermal response of the building and the air movement in such a large void. Techniques involved thermal imaging surveys, air movement tracing and lots of temperature monitoring.

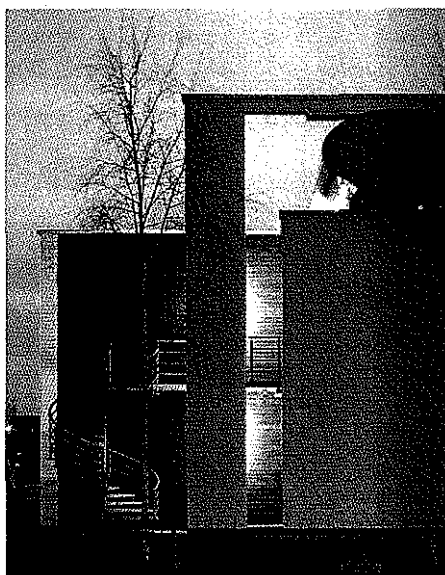
I have concluded that the volume of the auditorium is so great that the air conditioning system has virtually no influence on the space which is instead dominated by radiant temperatures and naturally buoyant flows, drawing in uncontrolled air by infiltration. The addition of cold, conditioned air to the lower part of the auditorium has upset the natural balance of the building leading to complete separation of the body of air in the auditorium by an inversion layer.



Clore Education Centre, Hampton Court Palace

The first new building at Hampton Court in over 200 years had to be something a bit special. A single storey pavilion was built to create a courtyard behind the existing visitor building. The centre will provide a range of teaching and spaces and cater for over 100,000 school visits and 10,000 adult learners each year.

Naturally the building was designed for low energy, utilising natural ventilation and daylight, but for this project I also designed a unique zero heat-loss wall, a variation on conventional dynamic insulation. A featureless brick wall was required for architectural reasons and a change in level prevented the direct admission of air for low level displacement ventilation due to surface water run off. The solution was to create an air path over the face of the insulation thus recovering escaping heat.



Innovate Green Office, Leeds

A major recent project of mine was awarded the highest ever BREEAM score of 87.55%. The building demonstrates a whole range of novel techniques for reducing resource consumption and carbon emissions in construction and use but, significantly, without resorting to renewables.

The building is mechanically ventilated using Termodeck for climate control with CHP tri-generation. A novel plant operating strategy, akin to ice storage, utilises the thermal storage capacity of the Termodeck to maximise the plant efficiency. The offices achieve 4.5% average daylight factor so electric light is only required for 20% of the working year. A vacuum drainage system is installed utilising harvested rainwater for the toilet flushing, eliminating the use of treated mains water to convey sewage, whilst the overall volume of sewage discharged from the building will be reduced by 75%.

The annual emissions from the building services are predicted to be less than 22kgCO₂/m², a reduction of over 80% compared to previous office buildings by the same developer, saving over 350t of CO₂ per year.