

# ENGINEERING PRACTICE REPORT

July 2005

## *Applicant Details*

Name:	Signature and date:
Qualifications: BSc. Experimental Physics MInstP —Institute of Physics CPhys —Chartered Physicist	06/1998 07/2003 07/2003

## *Introduction*

I joined Max Fordham LLP (Consulting Engineers Building Services) in September 1998 as a graduate trainee. During 7 years work with the practice, I have experienced a wide range of projects in both mechanical and electrical disciplines. My degree in Physics and interest in buildings has encouraged a broad interest in the multidisciplinary design of engineering services.

I have worked on a number projects from concept to completion, generated and developed ideas and successfully implemented these on building projects. In so doing, I have established good working relationships with clients and designers who have recognised my work with repeat business. I became a Partner of Max Fordham LLP in 2002 and now manage, supervise and appraise the work of a number of engineers as well as forecast and budget their time and training.

My professional development was continued through the Institute of Physics Professional Formation Scheme and I was granted the title Chartered Physicist in 2003. I now play an active role in the management of the practice, having left the main office on a 2 year secondment to help establish the first regional office.

I returned to the London office in 2005 to lead a new practice venture in Urban Design and Master planning with an emphasis on sustainable engineering.

## *Summary of Career Episodes and Projects*

Date	Description of Project and Role
1999 to 2001	<p><b>Project 1</b>            A new low energy building for an office based research facility. The services design included a 3kWp grid-connected photovoltaic installation.            Responsible for services design and running the project on site.</p>
1999 to 2003	<p><b>Project 2</b>            The restoration and redevelopment of this historic listed theatre in London.            Project engineer in charge of mechanical services.            Site Engineer in charge of overseeing mechanical and electrical services installation</p>
2000 to date	<p><b>Project 3</b>            A new music research facility including recording studios, office space and a surround sound auditorium. The services design included low noise (PNC 15) under seat supply ventilation.            Responsible for the environmental and engineering services design.</p>
2002 to 2004	<p><b>Project 4</b>            A large new building supporting a mix of student support and recreational uses            Project &amp; design engineer for engineering services</p>
2002	<p><b>Project 5</b>            Expert advisor to the DTI</p>
2003 to date	<p><b>Project 6</b>            The refurbishment of a listed building into a private residence            Partner in Charge for engineering services.</p>
2004 to date	<p><b>Project 7</b>            A low carbon re-development of a rural farm into an artists' community.            Development comprises a collection of new and refurbished buildings around DTI            Clearskies funded biomass heat distribution network.            Partner in Charge and design engineer for environmental design, infrastructure and engineering services.</p>
2005	<p><b>Project 8</b>            Leading a new venture to apply sustainable engineering design techniques to urban planning and master planning. In charge of the development of an engineering group producing renewable energy planning statements and sustainability advice.</p>
2005	<p><b>Project 9</b>            A mixed use (350 residential unit) re-development of a central London industrial facility. The project aims to exceed the Mayor of London's current standards for site generated renewable energy through the use of photovoltaic and solar thermal collectors. Proposals also include central heat generation and waste processing.            Responsible for conceptual engineering design and sustainability advice</p>

## Practice Report

Evidence to support the claim for completion of the competencies.	Date task complete	MCIBSE competence objective:
<p><b>Project 1</b></p> <p>I worked on this new office building from RIBA stage C. My first task was to calculate the building heat loss. I produced a spreadsheet to calculate the economical insulation thickness over various building lifetimes. This involved constructing a simple model of the building form, establishing the build-up for each construction element and calculating the average building U-value. I assessed the likely running cost for the building based on a degree days method and studied how the running cost varied in relation to the average U-value. I went on to investigate how varying insulation thickness in various built elements changed the average U-value and collaborated with the quantity surveyor to establish the additional material and labour cost for each solution. I then prepared a report for the client advising that 300mm of mineral wool should be installed in the roof void as the most economic measure over the building design life. This was incorporated into the architect's design.</p>	04.99	B2  D2 E3
<p>I designed the soil and waste pipe work and the ventilation systems in accordance with the British Standard Code of Practice. I designed a novel termination device, integrated into a bespoke cladding panel, which shunted vent pipes together at high level to avoid numerous roof penetrations. I attended the design team meetings and assisted the senior engineer in the production of the tender documentation ensuring the information was issued to programme.</p>	04.99	E1  C1
<p>On site, my responsibilities included developing the design, solving problems and responding to contractor's queries. I attended fortnightly site and monthly progress meetings with the main contractor, design team and client and prepared a progress report. I checked and commented on contractor's installation drawings and undertook regular inspection and witnessing of ongoing installation work.</p>	12.99 - 10.00	C1  D1 D3
<p>I took a new graduate engineer on a tour of the site to show him first fix services installations that helped him visualise how designs are realised.</p>	6.04.00	E4
<p>I held meetings with a specialist contractor to finalise the design of a 3kWp solar photovoltaic array being incorporated on the roof. The client was keen for the output of the panels to be on public display so I designed a wall recess with a bespoke stainless steel and perspex cover panel to accommodate an LCD monitor that displayed real-time monitoring data.</p>	05.00	A1, A2 B3
<p>I represented the practice at the topping out ceremony and gave an oral presentation on the services design to the guests.</p>	07.00	D2
<p>I carried out the final inspections, and assisted the client and quantity surveyor in agreeing the final account and variations while taking into account outstanding defects that the contractor was not rectifying</p>	2.03.01	C2 D1
<p>I participated in a post-occupancy evaluation exercise being undertaken as a postgraduate research project. This involved evaluating the actual energy performance of the building in use and comparing it with my predictions of energy use for the original design. Space temperatures were</p>	05.02	

<p>accurately monitored and I assisted in discussions with the building management system specialist to extract data logs from the BMS for comparison. One issue was that the gas use was significantly higher than predicted because the new plant has also been adapted to serve an adjacent existing building. I suggested incorporating a heat meter into the heating main serving the existing building in order to accurately measure its demand however this was beyond the POE budget. Instead it was decided to simply review energy bills for the existing building over a number of years and make an approximation of what the heat demand was. I disseminated the study results around the office to show real building performance against benchmark ECON 19 figures.</p>		<p>B3</p> <p>D2</p>
<p><b>Project 2</b></p> <p>Member of an engineering team designing the refurbishment of Project 2, I prepared and coordinated the services sketch proposals that involved drainage, heating and ventilation, water services, power and lighting. This required some innovative approaches to design since the theatre is a listed building. The new building services installations needed to be sympathetic with the existing architecture, so distribution routes and plant areas were retained and re-used where possible or prioritised to be in areas of new construction to avoid damage to the listed fabric.</p>	03.00	B2
<p>I designed schematics for the water, heating and ventilation systems and calculated pipe and duct sizes.</p> <p>An example of this is the design of a smoke ventilation system to the under stage basement. I researched the Building Regulations Approved Documents for smoke ventilation and determined the performance criteria, for example: air change rate; ductwork integrity under fire conditions, etc. I designed a ductwork layout and, using the HEVACOMP software tool, sized a single ductwork system and two speed fan that provided day-to-day ventilation of the space and increased in duty on receipt of a fire signal to achieve smoke ventilation rates.</p> <p>In the original auditorium design, a moving section of roof over the high level oculus was designed to slide back in order to exhaust warm air. The roof had not opened for a number of years and the architect's proposals retained the existing roof with mechanical ventilation extract, through the oculus at high level. However, during the construction period, funding was offered to restore the moving roof. I quickly had to alter my designs to incorporate an acoustically lined, weatherproof plenum to one side of the opening. The plenum had to allow the mechanical extract ductwork to accommodate the moving roof while maintaining the acoustic integrity of the roof when closed.</p>	08.00	<p>A1</p> <p>B2</p> <p>B2</p>
<p>I briefed and supervised contract technical drawing staff to produce computer aided drawings from my hand drawn sketch designs.</p>	08.00	C3
<p>I was involved in the preparation of the tender documentation and was responsible for the issue of these to tenderers on a strict deadline.</p>	09.00	C1
<p>I acted as a part-time site engineer during the installation of my below ground drainage design. My role included explaining the rationale behind the design and witnessing site testing. The design was complicated due to the confined nature of the site and, for instance, included the negotiations for the renewal of four separate sewer connections.</p>	10.01 — 06.02	<p>C1, C3</p> <p>D1</p>

<p><b>Project 3</b></p> <p>I was the project engineer for Project 3. I carried out an initial site survey and met with the client to understand the brief and project specific constraints.</p> <p>I prepared a RIBA stage B and C reports outlining the utility services context and possible servicing solutions and low energy strategies.</p>	<p>01.01</p> <p>10.01</p>	<p>A1</p> <p>B2</p> <p>C1</p>
<p>During the development of the design, I managed and oversaw design work carried out by a graduate engineer in my charge. I prepared a resource schedule for the production of drawings and decided to carry out the electrical services design using HEVACOMP software to generate distribution board schedules and calculate permissible volt drops. This task was made more complex due to the client's provision of a new 415V supply a significant distance away from the building. The length of the submain cable to the building was therefore included in the volt drop calculations and each final circuit required careful examination to reconcile cable size with an appropriate terminal capacity in electrical accessories.</p>	<p>04.02</p>	<p>C3</p> <p>B2</p>
<p>The building design included a southwest facing floor to ceiling glazed façade to marry in with the design of an adjacent building. I proposed and designed a novel translucent, vertically hinged external shutter to reduce solar gain and glare. These polycarbonate 'fins' had a low thermal transmittance so when folded back against the building at night, served to reduce heat loss through the glazing. I worked with a specialist solar shading company, to develop my proposals to enable manufacture. The company then took responsibility for the design, manufacture and installation.</p>		<p>A2</p> <p>B3</p>
<p><b>Project 4</b></p> <p>I attended a competitive interview that won the commission for building services consultancy for Project 4.</p> <p>As the project developed I planned a strategy for the design of the building services. This included a list of the drawings we would produce and a programme for design drawing and engineering resource to integrate with the overall project programme. I continually evaluated my programme against our drawing progress to ensure the timely issue of the information.</p>	<p>01.02</p>	<p>D2</p> <p>C1</p> <p>C4</p>
<p>I designed preliminary mechanical and electrical schematic layouts. Part of the building would be used as a student union venue and had design occupancies of up to 2 persons/m<sup>2</sup>. I paid particular attention to the ventilation systems design. I liaised with Building Control and the licensing and fire authorities to agree the technical standards for the ventilation.</p> <p>I developed a variable volume ventilation solution that jetted air from the perimeter of the room across the ceiling so that ceiling voids could be eliminated and concrete soffits exposed to maximise thermal mass.</p> <p>During the detailed design process I oversaw and was responsible for the work of a graduate engineer carrying out calculations for electricity, water and heat demand of the building.</p>	<p>03.02</p>	<p>E1</p> <p>B2</p> <p>C3</p>
<p>I maintain contact with the client's Facilities Manager post hand-over and together we have developed ways to fine tune the building to reduce energy consumption. A particular example being the occupancy lighting controls which had been omitted by the client in favour of simple switching</p>	<p>2004 - ongoing</p>	

<p>to reduce cost. The facilities manager later established a budget to reintroduce occupancy detection in order to reduce the running costs. With the benefit of studying how the occupants use the building we determined which areas were best suited to incorporation of PIR detectors. When returning to the building recently, I reviewed the Building Management Computer and discovered several defects that had developed since commissioning such as a number of faulty temperature sensors. I highlighted these to the client for him to raise a repair since the defects period was over.</p>		B3
<p><b>Project 5</b></p> <p>I was appointed to give advice to the client. My role included appraising the technical merits of BIPV projects submitted for funding under their grant funding programme. I used my experience of designing the integration of the PV on Project 1 and gave a Powerpoint presentation to the client commenting on the applications that best demonstrated integration and value for money.</p>	03.02	A1, A2  D2, D3
<p><b>Project 6</b></p>		
<p>I was keen to work on a project with a private residential client and worked on this restoration project.</p> <p>The project team comprised of the architect and us only, therefore it required a very different team dynamic. My role was to liaise with the client and run the project while supervising and training a younger, less experienced engineer.</p> <p>The client, felt the services cost was expensive and required a detailed cost estimate. I compiled this on the basis of sketch drawings and an elemental breakdown to justify the costs.</p> <p>I managed the entire design process, the issue of tender drawings and our resource management during the construction phase.</p> <p>A major difficulty on the project was that the restoration required all the engineering services to be concealed however it could not to be chased into the historic fabric. I adopted a European solution to use flexible conduit for electrical wiring and pipework that was all buried in the new floor slabs. I drew details of different distribution layers (electrical, water services and underfloor heating) in the concrete slabs and how the electrical accessories should be integrated into the joinery to avoid damage to the wall. I also researched and specified an innovative wireless solution for the security and fire alarm installation.</p> <p>After researching a number of different control strategies, I decided that the boiler manufacturer's control system was best suited to the project. This was because the client was not technical and would have had more difficulty using a BMS control rather than a simple 'domestic style' arrangement. I liaised with the manufacturer to specify the whole installation. An engineer in my charge successfully implemented the project on site and I maintained a close overview of how our fee was being spent during the project.</p>	2004 — ongoing	B2 C3  B2   A2   B3

<b>Project 7</b>		
<p>A firm of architects asked me to work on this project as a result of the relationship that we had developed on a previous project. I met with the client and wrote a fee proposal based on the ACE B(2) form of agreement. I argued that the quality approach the client and architects were adopting merited us providing detailed and coordinated drawings as an additional service and we were then successfully appointed on this basis. I subsequently had to liaise and agree with the client's funders, their requirements for a collateral warranty. I have carried out the design myself in order to continue to develop my detailed design skills.</p> <p>A key element of the brief was low carbon emissions. I proposed the provision of a biomass heating plant for the development and researched the options for a biomass fuel supply in the locality of the site. I compiled a 'Clear Skies' DTI funding application for the installation, which successfully secured additional funding for the client. A key part of the application was to secure the involvement of a 'partnership' contractor who would provide technical advice on the installation. I single-handedly compiled tender information and managed the tender process, performing interviews and making recommendations to the client. I reviewed the available boiler technology to identify the most suitable product for this application</p> <p>Working with the project architect, we developed a building form that would minimise heat loss yet provide good daylight for the artists' studios. The quality of daylight is of particular concern to artists therefore I worked with a building physics specialist to model a light shaft that would introduce sky light to the ground floor studios. One interesting outcome was the need to choose a specularly reflective finish to the inside of the shaft to maximise the light transmission. I proposed that this could be achieved with simple and low cost white ceramic tiles.</p>	2004 — ongoing	<p>B2 D2</p> <p>A1, A2 E3</p> <p>C2</p> <p>B2</p>
<b>Sustainable Urban Design Group</b>		
<p>I contributed a chapter to a new practice book called 'Sustainable Urban Design —An Environmental Approach'. The chapter covers suitable approaches to the use of resources and treatment of waste in urban developments of the future. I researched a range of information sources as well as developing my own in-house project work, to compile an authoritative account of current best practice.</p> <p>Doing this work, I developed an interest in the impact of environmental design in the urban design context. Following discussions with my colleague Randall Thomas, we identified an opportunity for my role to change to concentrate my time heading a new venture to develop our business in low energy planning.</p>	2005 — ongoing	<p>A1</p> <p>B1</p>
<p>Having discussed this new approach with a number of architects and clients, I was invited to submit a fee proposal for the provision of sustainability consultancy to a developer client for a mixed use development. My work involved research into the new regional and local planning legislation for 10% renewable energy generation on site. I developed a strategy for demand reduction by researching domestic energy demand and investigating the impact and cost of efficiency measures such as triple glazed windows versus double glazed, increased thickness of insulation, and heat recovery mechanical ventilation. I also</p>		<p>C1</p> <p>E1</p>

designed a solar thermal array to provide 40% of the site's hot water demand and used the RETScreen analysis tool to model and predict the performance of the array.		E3
My research paper based on our work on this project was accepted for publishing at the Sustainable Buildings Conference in Tokyo. The paper discusses planning legislation for renewables in London.	03.05	E3, E4
I have subsequently prepared a number of OJEU responses and competition submissions, including several for urban projects in France where I have been able to use my fluency in French.	05.05	D3
Most recently, I participated in an event that involved travelling abroad with a delegation of architects, engineers and academics to investigate solutions for carbon reductions at the building scale. The purpose of the event is to help British businesses improve their competitiveness by enabling technology transfer between countries. Over the period of one week, we visited a wide range of buildings with the aim of understanding novel techniques for reducing energy use and disseminating these in the UK with the publication of a report, a section of which I presented at a seminar event. I wrote several articles on the buildings we visited for the report and was responsible for collating and editing a section of the final publication.	06.05	A1  D3, E3

<b>Technical Lectures and Seminars</b>		
I regularly attend technical presentations given by manufacturers and follow an ongoing programme of dissemination lectures given by engineers in the practice. Lectures have included:		B1 D2
'Modern Condensing Boilers' by MHS.	9.03.00	"
' T5 fluorescent lighting' by Fagerhult.	5.04.00	"
'Requirements for Electrical Installations' by J.P. Whiting	17.04.00	"
'New Water Regulations' by Honeywell.	30.08.00	"
'Natural ventilation in building design' 1 day workshop at the Institute for Multi-phase Flow, University of Cambridge.	18.01.01	"
Attended a 1 day course on 'Control of Solar Shading' at the Building Research Establishment to keep abreast of changing Building Regulations legislation.	10.07.02	"
New Photovoltaic Technologies by BP Solar	12.05.04	"
Master Planning Symposium	23.02.05	"

<b>Practice Administration</b>		
I attended site Health & Safety induction and became a member of the office subcommittee that inducted graduates staff to H&S and CDM responsibilities. I gave presentations to the office on H&S on building sites.	1998 - 2003	E2
In order for the partnership to obtain and retain ISO 9001 Quality Assurance certification, I compiled a quality assurance plan for my projects and continue to implement these plans as necessary.	Continuing	C3, C4
Following my contribution to the Sustainable Urban Design book, I have been employed by the publisher, Spons Press, to critically evaluate new	2002-04	

publications on sustainable engineering topics. I have also refereed several papers published in a scientific journal and provided professional review of an MPhil dissertation.		A2
I maintain a keen interest in the construction industry press; regularly reading engineering and architectural journals and newspapers. I recently published an article about anaerobic digestion in an architectural journal.	Ongoing	A1 E3, E4
Most recently, I have been responsible for interviewing and recruiting new graduates as trainee engineers in the practice.	2005	C3, D3

Sponsor's name: _____.	
Sponsor's signature: _____	Date: ____ / ____ / ____.