A GUIDE TO CANDIDATES APPLYING FOR MEMBERSHIP AND ENGINEERING COUNCIL OR SCIENCE COUNCIL REGISTRATION VIA THE TECHNICAL REPORT ROUTE (TRR) FOR: CEng, CSci or IEng

If you would like further information, please seek advice from the Membership Department of the Institute

Revised 13th Sept 2011
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MEMBERSHIP DEPARTMENT
CONTACT DETAILS:

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INTRODUCTION

The Institute of Materials Minerals and Mining (IOM3) is licensed by the Engineering Council to award EngTech, IEng and CEng and by the Science Council to award CSci via various routes alongside the Institute grades TIMMM, AIMMM, MIMMM or FIMMM. The “standard route” is for candidates who have the necessary exemplifying qualifications (i.e. an accredited educational base) plus the requisite experience to meet the required competences and commitments set out in UK SPEC or Science Council rules, as interpreted by IOM3 (See Appendices 2, 3 and 4 for details. In terms of education this means:

For CEng or CSci: an accredited MEng/MSc degree or equivalent (see Appendix 7)
For IEng: an accredited Bachelors degree or equivalent (see Appendix 8)

Applicants who have a package of non-accredited qualifications e.g. BEng/BSc, MSc, PhD, etc will have these checked by an accreditation panel to establish equivalence to the necessary accredited base. If you are not sure which case applies to you please contact the Institute for guidance before you apply.

For other applicants there are a variety of routes to gain or demonstrate that you have the equivalence. These are:

1. Engineering Council examinations (no longer available to take for new applicants)
2. Further study e.g. Masters course, PhD
3. Technical Report Route (TRR)

These guidelines cover only the TRR; if you believe the other routes may apply to you please contact the Membership Department. Normally, if you send in a detailed CV beforehand, we can advise the options available to you and this is recommended.

The Technical Report Route (TRR) has been introduced to cover all other applications for IEng, CEng or CSci for applicants who do not have or are not working towards having these exemplifying qualifications (note Eng Tech is not covered by the TRR). The applicant’s Technical Report must clearly demonstrate that he or she has the technical knowledge and understanding of engineering/scientific principles as appropriate, at the same level as their peers who have progressed via the standard routes to registration. Candidates should be aware that the assessment of their synopsis and technical report through to the academic interview stage will be primarily to establish that their knowledge is equivalent to that gained by a formal higher education to the standards set out in the EC publication ‘UK Standards for Professional Engineering Competence’, for IEng and CEng. The Technical Report should be based on a research and/or industrial project/design/process preferably related to the individual’s own relevant workplace/experience, and should also include evidence of the scientific and/or engineering principles involved in the particular project/design/process through the inclusion of theories and calculations to support their submission. The assessment of the submission and the academic interview will thoroughly investigate the candidate’s knowledge of those matters.

The submission of a ‘Management Report’ of a project or process based upon addressing budgets, sourcing equipment, completion dates, staff matters, control of consultants, compliance with international standards, health and safety requirements, etc; is unacceptable for achieving CEng through the TRR route.

1.1 Indicative entry experience

The timescales listed below should be taken as a rough guide only as each case is assessed individually. If you are in any doubt please contact the Membership Department BEFORE you start to apply.
1.1.a. Applying for CEng (for CSci read BSc as opposed to BEng)

<table>
<thead>
<tr>
<th>Academic base</th>
<th>Relevant experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEng or equivalent</td>
<td>indicative 7 years</td>
</tr>
<tr>
<td>HND/HNC</td>
<td>min of 10 years</td>
</tr>
<tr>
<td>None</td>
<td>min of 15 years</td>
</tr>
</tbody>
</table>

1.1.b. Applying for IEng

<table>
<thead>
<tr>
<th>Academic base</th>
<th>Relevant experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundation degree/HND/HNC</td>
<td>min of 5 years</td>
</tr>
<tr>
<td>ND/NC</td>
<td>min of 10 years</td>
</tr>
<tr>
<td>None</td>
<td>min of 15 years</td>
</tr>
</tbody>
</table>

1. THE PROCESS

The flow chart shown in Appendix 1 illustrates the stages in the TRR process. This total process can take up to 2 years from start to completion.

It is advised that applicants who are not currently members should join the Institute as an Affiliate at the time of applying in order to be eligible for the benefits of membership whilst the application for a professional grade and registration as IEng, CEng or CSci progresses.

Applicants should apply for membership using the standard application forms, which can be downloaded from www.iom3.org/membership, and tick the appropriate boxes for the grades applied for. At this stage the information you need to provide is (sections 2.1 – 2.3, 2.5 see detailed notes below):

2.1 Completed application form
2.2 A comprehensive Professional Review Report
2.3 An up to date log of CPD activity
2.4 A synopsis of the proposed Technical Report (see below for details) NOT a full report.
2.5 Payment of the initial application fee £130 Your application will not commence if this is not enclosed
2.6 The name of a mentor who can advise you on your application and the completion of the full report. If you cannot identify a mentor the Institute can help you once the synopsis has been assessed and approved

We strongly recommend that you only apply once you are able to complete sections 2.1-2.6 above and send a single copy of your application to the address found on page 9.

2.1 Completing the application form

Application requires submission of the appropriate application form plus supporting documentation. It is important to complete all sections of the form in the space provided, even if you amplify certain sections in your Professional Review Report. Your application must be printed or written in BLOCK CAPITALS. This form is also available on the Institute’s website www.iom3.org/membership/appform.doc.

SECTION A – PERSONAL DETAILS
Please complete all details in section A, including your membership number (if you are already a member).

SECTION B – TECHNICAL EDUCATION & ACADEMIC QUALIFICATIONS
Photocopied evidence of academic qualifications must be provided. Photocopies must be certified by your sponsor as being true copies.
SECTION C – PRESENT EMPLOYMENT
Please give details of your employer showing your immediate superior and any staff who report to you. This should include any professional qualifications that they hold (e.g. FIMMM, MIMMM, AIMMM, CEng, CSci, IEng, EngTech, other professional qualifications).

SECTION D – REFERENCES
You must have two referees who should be members of the Institute of Materials, Minerals and Mining at or above the grade you are applying for. In the case of those applying for IEng, CEng or CSci registration, referees must also be registered with the Engineering Council or the Science Council, as appropriate, at the same level. Referees must have known you for a minimum of 2 years and must be able authenticate and validate your current knowledge and levels of responsible experience. One of your referees should act as your sponsor. (In exceptional cases, professional members of other engineering or scientific Institutions may be acceptable as referees.) Family members and subordinates within your company are not acceptable as referees.

SECTION E – DECLARATIONS
You and your sponsor must sign the declaration statements at the end of your application form and your sponsor must authenticate all supporting documentation.

Please fill in your details in the boxes provided at the top of the two referee forms, both front and back, including your full name, membership number (if currently a member) and grade for which you are applying. Please fill in the name of your referee at the top of the letter on the front page.

Your two referees must each complete a referee form, providing as much detail as possible, including their own details and signature. You should ask your referees to return the forms to us unless they prefer to give them to you for submission with the application.

Photocopies of your academic certificate/s must be provided with your application. (We do not require copies of secondary school qualifications.) For non-accredited first degrees the Institute will ask you for transcripts / synopses of any higher degree courses undertaken, e.g. MSc, PhD.

2.2 Professional Review Report - see ‘Model’ Professional Review Reports in appendices 5 and 6
The Professional Review Report is, effectively, an extended CV, showing your career development. It provides you with the opportunity to demonstrate broad training and experience in the science and engineering of materials, minerals and mining. This should include some quantification of the training undertaken and the responsibilities that you have had during your career.

For each position you have held, you should outline the training you undertook, including attendance at formal training courses and on-the-job training, summarising the materials and techniques with which you have become familiar. You should also provide a description of your function and responsibilities, quantifying these where possible. Be sure to indicate what you have personally achieved and been accountable for as well as your contribution to a team.

Your Professional Review Report should link your career development to the requirements of competence and commitment listed in Appendix 2 for IEng, Appendix 3 for CEng or Appendix 4 for CSci. In your report, indicate in the right hand margin of your text which requirements each paragraph fulfils, as illustrated in the example below:
**Example: July 1999 – May 2001 – Project Leader, Blah Co.**

**Training undertaken:** Financial management, 3 day course with xx training company. Started studies for a Masters degree in business with Open University. Attended 2 conferences; ICS Steelmaking 2000 (attendee) and European Polymer 2000 (presenter – degradation of uPVC). Professional mentor for 2 graduate trainees.

**Job role / Responsibilities:** The role of Project leader involves co-ordination of all projects in the xx sector of the company.

- I was responsible for the control of our budget (£2 mil, annual), staff (various – depending on project, up to 6 technicians, 2 project managers, 2 trainees) and day to day administration. I liaised with customers and our overseas sectors, establishing viable research and projects, producing project proposals and securing funding where required.
- I was also responsible for the management of resources for my group, selection of appropriate team members, assessment of training needs, and am currently the on-site safety officer and risk assessment manager.

It is not expected that you will have gained extensive experience in all areas but it is essential that, over the period of your career, you have gained sufficient experience in the science and engineering of materials, minerals and mining and wider management issues to satisfy the majority of the requirements; in areas where your direct experience has been limited, you should at least be familiar with the issues.

The Professional Review Report will demonstrate your career progression. It should provide information regarding your initial period of training and experience showing your breadth and depth of relevant knowledge and experience.

It should also establish the approximate length of time you have been working at the level of responsibility appropriate to the grade applied for as well as the degree of responsibility that you currently hold.

**Your Professional Review Report must be a maximum of 5 sides of A4 and each page must be numbered.** Documents received over this limit may be returned, delaying your application.

**You must sign your Professional Review Report under the statement:**

*I certify that this Professional Review Report is a true and accurate statement.*

**Your sponsor must authenticate your Professional Review Report under the statement:**

*I certify that I have read the Professional Review Report of (your name) and confirm that, to the best of my knowledge, it is a true and accurate statement.*

**2.3 Format and content of the Synopsis**

- **Introduction** – background and reasons for selection of the proposed topic
- **Key objectives**
- **Challenges encountered**
- **Technical review of the engineering/scientific principles employed**
- **Resolution of the objectives**
- **Conclusions and lessons learnt**

The synopsis should not be more than 750 words and should be printed with double spacing and printed double sided on A4 paper. Any submission not conforming to these requirements will be returned to the applicant. Please submit one copy with your application.

**2.4 Payment**

You are required to enclose a payment of £250 to cover the administration of your application.
2.5 Mentor

The Institute strongly recommends you to use a Mentor during the application process. You should identify a member who knows your work, is already a registered engineer or scientist at or above the level for which you are applying, is located close to you and is familiar with the subject area and the requirements of the Technical Report Route. If this is not possible the Institute will, during the assessment process seek to identify and appoint a suitable mentor. The role of the mentor is:

- Advise on content and subject matter
- Discuss conclusions with you and challenge technical reasoning and assumptions made
- Comment constructively on drafts for the synopsis and Technical Report and advise on any changes which may be necessary
- Advise you on interview techniques and do’s/do nots
- The mentor must not contribute to the technical content or style of the report.
- The mentor will not be involved in any part of the peer assessment process

Once you have completed all the relevant sections of the application please send one copy along with your payment (cheques made payable to the Institute of Materials Minerals and Mining) to the address listed at the end of these notes.

2. ASSESSMENT OF THE APPLICATION AND SYNOPSIS

On receipt of a complete application the next stage is that the application will be assessed by peer review. This will include two scrutineers at or above the grade applied for and from a background as close to the subject area of the synopsis/applicant as practicable. The scrutineers then report back to the Membership Committee who will discuss the case and decide whether to invite you to commence writing up the full Technical Report. If you have not identified a Mentor the Committee will endeavour to identify a suitable candidate to act as your mentor. It is in your interests to identify a Mentor as per Section 2.5 above.

You can expect to hear the outcome within 2 weeks of the Committee date (the Committee typically meets 4 times per year March June September and December).

3. THE TECHNICAL REPORT

As mentioned previously it has to be stressed that the purpose of the TR is to establish equivalence to an accredited educational base and hence it is expected to be an ACADEMIC REPORT not focussing on professional ability or be a management report.

You should only commence writing up the full Technical Report once you have been assessed as above and advised to commence writing up. Any applicants choosing to ignore this requirement risk delaying their application or having it rejected and we wish to ensure that your time and ours is not wasted.

Once you have been approved to write up the TR you have a maximum of 2 years from the date of the letter advising you of this, to submit the full TR. This may be extended in exceptional circumstances at the Institute’s discretion. The TR must be all your own work and you and your sponsor will have to sign the report to this effect.

4.1 Format of the Technical Report

Where possible the format for the TR should be used:
Title page: Name, Address, Membership number, Report Title, Purpose of the report e.g. CEng application via the TRR, date

Executive summary: Summarise the main objectives and conclusions/ findings and achievements

Contents page:

Introduction: should clearly indicate what the report is about and demonstrate clearly your capabilities as a practising competent engineer/scientist

Main body of the report: can be sub-divided but has to show the application and understanding of engineering or scientific principles relevant to IOM3:
- each section should have a clear theme with ideas presented in a logical manner backed up by data, references or other sources
- keep to the subject of the report and avoid repetition. It is better to be concise than wordy
- ensure the report links in to the aims and objectives
- diagrammatical or graphical supporting information is welcome if it is relevant and the applicant is able to discuss this at interview
- any lengthy supporting calculations should be included as an Appendix

Discussion: this is where you develop and apply the arguments based on your materials, minerals or mining engineering and/or scientific knowledge as appropriate dependent on whether you are seeking Engineering Council or Science Council registration as well as Institute membership.

Conclusions: the applicant must be able to provide a considered opinion on their work linked in to engineering or scientific principles. Able to identify lessons learnt and recommend process or materials changes as a result of the work and implementation of these recommendations.

Appendices: should be limited to any calculations too lengthy for the body of the report or essential background data

In general the length of the TR will vary depending on the educational base of the applicant. The following guide should be taken as an estimate only and advice should be sought from the Institute and your mentor.

<table>
<thead>
<tr>
<th>Educational base</th>
<th>Applying for</th>
<th>Report length (words)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None relevant</td>
<td>IEng, CEng, CSci</td>
<td>7500</td>
</tr>
<tr>
<td>ND/NC</td>
<td>IEng</td>
<td>5000</td>
</tr>
<tr>
<td>HND/HNC</td>
<td>CEng or CSci</td>
<td>7500</td>
</tr>
<tr>
<td>BSc</td>
<td>CEng or CSci</td>
<td>6000</td>
</tr>
<tr>
<td>BEng</td>
<td>CEng or CSci</td>
<td>2500</td>
</tr>
</tbody>
</table>

4.2 General rules for submission of the TR
- Report must be focussed and logical in presentation
- Care should be taken regarding spelling and grammar
- The maximum word count must be 7500. Reports over this may be rejected and returned for resubmission
- Report should be typewritten in English on double side A4 paper using double spacing and left unbound
- You must sign at the end of your Technical Report under the statement:

**I certify that this Technical Report is all my own work and a true and accurate statement.**
Signed: ___________________________ Date: ___________________________
Your sponsor must authenticate your Technical Report under the statement:
I certify that I have read the Technical Report of (your name) and confirm that, to the best of my knowledge, it is his/her own work and a true and accurate statement.

Signed:      Date:

- One copy to be submitted to the Institute at the address shown later within the 2 year period specified after approval of the synopsis

4. THE NEXT STAGE

After submission of your Technical Report the Institute will identify two TRR “Academic” Interviewers who may be the same two members who acted as scrutineers of the synopsis. They will assess your full Technical Report and complete a TRR scrutineering report which will be returned to the Institute with their recommendations:

- Accept and proceed to Interviews
- to Reject outright
- to Reject but recommend changes which if made and TR resubmitted may lead to acceptance

You will be notified in writing at this stage of this outcome and any recommendations.

If you have been advised that you are being called for Interviews then the format for these will be:

- an Academic Interview to explore your depth and breadth of engineering (for IEng or CEng) or scientific(for CSci) principles. This will always precede the Professional Review Interview (PRI) and if the interviewers deem you have not met the academic standards then you may not be asked to attend the PRI at this time
- a Professional Review Interview (PRI) which will explore your professional abilities and your engineering or scientific competences

These interviews will be held where possible on the same day and as convenient for you as possible, and both interview panels may be made up of the same members. It may not always be possible to hold both interviews on the same day or at a very local centre. You should come to the interviews well prepared and familiar with your application as you will be questioned in detail on this and related matters. The Institute would make a further charge for these interviews of £60 (payable to the Institute of Materials Minerals and Mining) which needs to be paid before the date of the interview, unless arranged at very short notice, in which case payment on the day by cheque would be acceptable. If payment has not been received the Institute reserves the right to cancel the interviews.

After these interviews your interview panel(s) will report back in writing to the Institute and your case will then be assessed in the standard way with the final decision made by the Membership Committee. After the case has been heard at the next Membership Committee meeting you will be written to within two weeks of the meeting with the outcome of your application. Should you be rejected you will be offered constructive advice but you have the right to appeal and details of the process can be provided at the time. If you are accepted, the Institute will confirm registration with the Engineering Council or the Science Council, as appropriate, and make any grade changes necessary, upon payment of any fees due.

If you are unsure regarding any of the procedures included in this document then help is available from the Institute Membership Department as below or from your Mentor. We would recommend seeking help if you are not at all sure about any stage in the process before you commence.

Institute of Materials Minerals and Mining - Membership Department
Shelton House, 12 Stoke Road, Stoke on Trent, ST4 2DR   UK
Tel: + 44 (0) 1782 221717   Email: membership@iom3.org
Website: www.iom3.org
APPENDIX 1

PROCESSES INVOLVED IN THE TECHNICAL REPORT ROUTE

Accredited education?

Yes.

You may be able to apply by standard route. Visit www.iom3.org/membership and check your experience is sufficient to meet the competences required.

No.

Do you have a package of qualifications? e.g. HND, BSc MSc, PhD etc

Yes.

Contact Membership as you may have the equivalent to an accredited education.

No.

Do you have the required experience (see pages 3/4)?

Yes.

Apply. Submit to IOM3:
1. Completed application form (see pages 4-5)
2. Professional Review Report (see pages 5-6)
4. Referees reports (page 5)
5. Payment (page 6)
6. Name of mentor (page 7)

No.

Defer applying until further experience gained.

Initial assessment by peer review. Outcome?

Approved.

Write up full Technical Report and submit within 2 years.

Not approved.

Check with mentor and IOM3 and resubmit if advised.

Accept and invite to Academic Interview

Full report assessed by two “academic” interviewers

Reject. Advise reasons and offer advice, suggest consult Mentor

Academic Interview

Fail. Advise reasons why and ways forward

Recommend changes to Technical Report

Pass. Attend Professional Review Interview

Final assessment by Membership Committee

Defer/reject. Reasons and advice offered

Elect to grade(s) applied for. Register with Engineering Council or Science Council
APPENDIX 2

A GUIDE TO THE COMPETENCE AND COMMITMENT TO BE DEMONSTRATED FOR ASSOCIATE MEMBER (AIMMM) AND INCORPORATED ENGINEER (IEng)

Incorporated Engineers must be competent throughout their working life, by virtue of their education, training and experience, to:

<table>
<thead>
<tr>
<th>A. Use a combination of general and specialised engineering knowledge and understanding to apply existing and emerging technology.</th>
<th>1. Maintain and extend a sound theoretical approach to the application of technology in engineering practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Use a sound evidence-based approach to problem-solving and contribute to continuous improvement</td>
<td></td>
</tr>
<tr>
<td>B. Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate and maintain engineering products, processes, systems and services.</td>
<td>1. Identify, review and select techniques, procedures and methods to undertake engineering tasks</td>
</tr>
<tr>
<td>2. Contribute to the design and development of engineering solutions</td>
<td></td>
</tr>
<tr>
<td>3. Implement design solutions and contribute to their evaluation</td>
<td></td>
</tr>
<tr>
<td>C. Provide technical and commercial management.</td>
<td>1. Plan for effective project implementation</td>
</tr>
<tr>
<td>2. Manage the planning, budgeting and organisation of tasks, people and resources.</td>
<td></td>
</tr>
<tr>
<td>3. Manage teams and develop staff to meet changing technical and managerial needs.</td>
<td></td>
</tr>
<tr>
<td>4. Manage continuous quality improvement.</td>
<td></td>
</tr>
<tr>
<td>D. Demonstrate effective interpersonal skills</td>
<td>1. Communicate in English with others at all levels.</td>
</tr>
<tr>
<td>2. Present and discuss proposals</td>
<td></td>
</tr>
<tr>
<td>3. Demonstrate personal and social skills</td>
<td></td>
</tr>
<tr>
<td>E. Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.</td>
<td>1. Comply with relevant codes of conduct</td>
</tr>
<tr>
<td>2. Manage and apply safe systems of work</td>
<td></td>
</tr>
<tr>
<td>3. Undertake engineering activities in a way that contributes to sustainable development</td>
<td></td>
</tr>
<tr>
<td>4. Carry out continuing professional development necessary to maintain and enhance competence in own area of practice.</td>
<td></td>
</tr>
</tbody>
</table>

These are expanded on the following pages.
A Use a combination of general and specialised engineering knowledge and understanding to apply existing and emerging technology

A1 Maintain and extend a sound theoretical approach to the application of technology in engineering practice.
This could include an ability to:
• Identify the limits of own personal knowledge and skills
• Strive to extend own technological capability
• Broaden and deepen own knowledge base through new applications and techniques

A.2 Use a sound evidence-based approach to problem-solving and contribute to continuous improvement
This could include an ability to:
• Establish users’ requirements for improvement
• Use marketing intelligence and knowledge of technological developments to promote and improve the effectiveness of engineering products, systems and services
• Contribute to the evaluation and development of continuous improvement systems

B Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate and maintain engineering products, processes, systems and services

B.1 Identify, review and select techniques, procedures and methods to undertake engineering tasks.
This could include an ability to:
• Select a review methodology
• Review the potential for enhancing engineering products, processes, systems and services, using evidence from best practice
• Establish an action plan to implement the results of the review

B.2 Contribute to the design and development of engineering solutions
This could include an ability to:
• Contribute to the identification and specification of design and development requirements for engineering products, processes, systems and services
• Identify problems and evaluate possible engineering solutions to meet client needs
• Contribute to the design of engineering solutions

B.3 Implement design solutions and contribute to their evaluation
This could include an ability to:
• Secure the resources required for implementation
• Implement design solutions, taking account of cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact
• Identify problems during implementation and take corrective action
• Contribute to the evaluation of design solutions
• Contribute to recommendations for improvement and actively learn from feedback on results

C Provide technical and commercial management

C1 Plan for effective project implementation
This could include an ability to:
• Identify the factors affecting the project implementation
• Prepare and agree implementation plans and method statements
• Secure the necessary resources are secured and confirm roles in project team
• Apply the necessary contractual arrangements with other stakeholders (client, subcontractors, suppliers, etc)
C.2 Manage the planning, budgeting and organisation of tasks, people and resources
This could include an ability to:
- Operate appropriate management systems
- Work to the agreed quality standards, programme and budget
- Manage work teams, coordinating project activities
- Identify variations from quality standards, programme and budgets and take corrective action
- Evaluate performance and recommend improvements

C.3 Manage teams and develop staff to meet changing technical and managerial needs
This could include an ability to:
- Agree objectives and work plans with teams and individuals
- Identify team and individual needs and plan for their development
- Lead and support team and individual development
- Assess team and individual performance and provide feedback

C.4 Manage continuous quality improvement
This could include an ability to:
- Ensure the application of quality management principles by team members and colleagues
- Manage operations to maintain quality standards
- Evaluate projects and make recommendations for improvement

D Demonstrate effective interpersonal skills

D.1 Communicate in English with others at all levels
This could include an ability to:
- Contribute to, chair and record meetings and discussions
- Prepare letters, documents and reports
- Exchange information and provide advice to technical and non-technical colleagues

D.2 Present and discuss proposals
This could include an ability to:
- Prepare and deliver appropriate presentations
- Lead and sustain debates with audiences
- Feed the results back to improve the proposals

D.3 Demonstrate personal and social skills
This could include an ability to:
- Know and manage own emotions, strengths and weaknesses
- Be aware of the needs and concerns of others
- Be confident and flexible in dealing with new and changing interpersonal situations
- Identify, agree and work towards collective goals
- Resolve conflicts and create, maintain and enhance productive working relationships

E Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment

E.1 Comply with relevant codes of conduct
This could include an ability to:
- Comply with the rules of professional conduct of own professional body
- Work constructively within all relevant legislation and regulatory frameworks, including social and employment legislation

E.2 Manage and apply safe systems of work
This could include an ability to:
- Identify and take responsibility for own obligations for health, safety and welfare issues
- Ensure that systems satisfy health, safety and welfare requirements
- Develop and implement appropriate hazard identification and risk management systems
- Manage, evaluate and improve these systems
E.3 Undertake engineering activities in a way that contributes to sustainable development
This could include an ability to:
• Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously
• Use imagination, creativity and innovation to provide products and services which maintain and enhance the quality of the environment and community, and meet financial objectives
• Understand and encourage stakeholder involvement

E.4 Carry out continuing professional development necessary to maintain and enhance competence in own area of practice
This could include an ability to:
• Undertake reviews of own development needs
• Prepare action plans to meet personal and organisational objectives
• Carry out planned (and unplanned) CPD activities
• Maintain evidence of competence development
• Evaluate CPD outcomes against the action plans
• Assist others with their own CPD
Chartered Engineers must be competent throughout their working life, by virtue of their education, training and experience, to:

### A. Use a combination of general and specialised engineering knowledge and understanding to optimise the application of existing and emerging technology.

1. Maintain and extend a sound theoretical approach in enabling the introduction and exploitation of new and advancing technology and other relevant developments
2. Engage in the creative and innovative development of engineering technology and continuous improvement systems

### B. Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems.

1. Identify potential projects and opportunities
2. Conduct appropriate research, and undertake design and development of engineering solutions
3. Implement design solutions and evaluate their effectiveness

### C. Provide technical and commercial leadership.

1. Plan for effective project implementation
2. Plan, budget, organise, direct and control tasks, people and resources.
3. Lead teams and develop staff to meet changing technical and managerial needs.
4. Bring about continuous improvement through quality management.

### D. Demonstrate effective interpersonal skills

1. Communicate in English with others at all levels.
2. Present and discuss proposals
3. Demonstrate personal and social skills

### E. Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.

1. Comply with relevant codes of conduct
2. Manage and apply safe systems of work
3. Undertake engineering activities in a way that contributes to sustainable development
4. Carry out continuing professional development necessary to maintain and enhance competence in own area of practice.

These are expanded on the following pages.
A Use a combination of general and specialised engineering knowledge and understanding to optimise the application of existing and emerging technology

A1 Maintain and extend a sound theoretical approach in enabling the introduction and exploitation of new and advancing technology and other relevant developments. This could include an ability to:
- Identify the limits of own personal knowledge and skills
- Strive to extend own technological capability
- Broaden and deepen own knowledge base through research and experimentation

A.2 Engage in the creative and innovative development of engineering technology and continuous improvement systems
This could include an ability to:
- Establish users’ needs
- Assess marketing needs and contribute to marketing strategies
- Identify constraints and exploit opportunities for the development and transfer of technology within own chosen field
- Promote new applications when appropriate
- Secure the necessary intellectual property rights
- Develop and evaluate continuous improvement systems

B Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems

B.1 Identify potential projects and opportunities
This could include an ability to:
- Explore the territory within own responsibility for new opportunities
- Review the potential for enhancing engineering products, processes, systems and services
- Use own knowledge of the employer’s position to assess the viability of opportunities

B.2 Conduct appropriate research, and undertake design and development of engineering solutions
This could include an ability to:
- Identify and agree appropriate research methodologies
- Assemble the necessary resources
- Carry out the necessary tests
- Collect, analyse and evaluate the relevant data
- Draft, present and agree design recommendations
- Undertake engineering design

B.3 Implement design solutions and evaluate their effectiveness
This could include an ability to:
- Ensure that the application of the design results in the appropriate practical outcome
- Identify the required cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact of the outcome
- Determine the criteria for evaluating the design solutions
- Evaluate the outcome against the original specification
- Actively learn from feedback on results to improve future design solutions and build best practice

C Provide technical and commercial leadership

C1 Plan for effective project implementation
This could include an ability to:
- Identify the factors affecting the project implementation
- Lead on preparing and agreeing implementation plans and method statements
- Ensure that the necessary resources are secured and brief the project team
- Negotiate the necessary contractual arrangements with other stakeholders (client, subcontractors, suppliers, etc)
C.2 Plan, budget, organise, direct and control tasks, people and resources
This could include an ability to:
- Set up appropriate management systems
- Agree quality standards, programme and budget
- Organise and lead work teams, coordinating project activities
- Ensure that variations from quality standards, programme and budgets are identified and that corrective action is taken
- Gather and evaluate feedback and recommend improvements

C.3 Lead teams and develop staff to meet changing technical and managerial needs
This could include an ability to:
- Agree objectives and work plans with teams and individuals
- Identify team and individual needs and plan for their development
- Lead and support team and individual development
- Assess team and individual performance and provide feedback

C.4 Bring about continuous improvement through quality management
This could include an ability to:
- Promote quality throughout the organisation and its customer and supplier networks
- Develop and maintain operations to meet quality standards
- Direct project evaluation and propose recommendations for improvement

D Demonstrate effective interpersonal skills

D.1 Communicate in English with others at all levels
This could include an ability to:
- Contribute to, chair and record meetings and discussions
- Prepare letters, documents and reports
- Exchange information and provide advice to technical and non-technical colleagues

D.2 Present and discuss proposals
This could include an ability to:
- Prepare and deliver appropriate presentations
- Lead and sustain debates with audiences
- Feed the results back to improve the proposals

D.3 Demonstrate personal and social skills
This could include an ability to:
- Know and manage own emotions, strengths and weaknesses
- Be aware of the needs and concerns of others
- Be confident and flexible in dealing with new and changing interpersonal situations
- Identify, agree and work towards collective goals
- Resolve conflicts and create, maintain and enhance productive working relationships

E Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment

E.1 Comply with relevant codes of conduct
This could include an ability to:
- Comply with the rules of professional conduct of own professional body
- Work constructively within all relevant legislation and regulatory frameworks, including social and employment legislation

E.2 Manage and apply safe systems of work
This could include an ability to:
- Identify and take responsibility for own obligations for health, safety and welfare issues
- Ensure that systems satisfy health, safety and welfare requirements
- Develop and implement appropriate hazard identification and risk management systems
- Manage, evaluate and improve these systems
E.3  **Undertake engineering activities in a way that contributes to sustainable development**

This could include an ability to:

- Operate and act responsibly, taking account of the need to progress environmental, social and economic outcomes simultaneously
- Use imagination, creativity and innovation to provide products and services which maintain and enhance the quality of the environment and community, and meet financial objectives
- Understand and encourage stakeholder involvement

E.4  **Carry out continuing professional development necessary to maintain and enhance competence in own area of practice**

This could include an ability to:

- Undertake reviews of own development needs
- Prepare action plans to meet personal and organisational objectives
- Carry out planned (and unplanned) CPD activities
- Maintain evidence of competence development
- Evaluate CPD outcomes against the action plans
- Assist others with their own CPD
APPENDIX 4

A GUIDE TO THE COMPETENCE AND COMMITMENT TO BE EMMONSTRATED FOR PROFESSIONAL MEMBER (MIMMM) AND CHARTERED SCIENTIST (CSci)

Chartered Scientists must be competent throughout their professional lives using a combination of their knowledge, training and experience to be able to:

<table>
<thead>
<tr>
<th></th>
<th>Deal with complex scientific issues, both systematically and creatively, make sound judgements in the absence of complete data and communicate their conclusions clearly to specialist and non specialist audiences.</th>
<th>Typically in a scientific context this will include the ability and commitment to;</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Use a combination of general and experiential knowledge, understanding and skills to be able to optimise and engage in the application of existing and emerging science and technology.</td>
<td>Identify potential projects and opportunities through a knowledge of the field of practice and current market needs; Conduct appropriate research to enable the design and development of scientific projects/processes; Know and manage personal strengths and weaknesses; Identify the limits of own personal knowledge and skills; Be confident and flexible in dealing with new and changing situations.</td>
</tr>
<tr>
<td>A2</td>
<td>Use theoretical and practical methods in the analysis and solution of problems.</td>
<td>Carry out experimental work and/or advise on and manage the work of others; Collect, analyse and evaluate relevant data and offer possible solutions; Present solutions to technical and non scientific audiences; Communicate with colleagues at all levels.</td>
</tr>
<tr>
<td>A3</td>
<td>Communicate effectively</td>
<td>Exchange information and give advice to scientific and non-scientific audiences; Prepare and deliver appropriate presentations; Prepare letters, reports and proposals.</td>
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</table>

B | Exercise self-direction and originality in solving problems, and exercise substantial personal autonomy in planning and implementing tasks at a professional level; | Typically in a scientific context this will include the ability and commitment to; |
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<tbody>
<tr>
<td>B1</td>
<td>Plan and organise projects effectively</td>
<td>Identify potential projects and opportunities through a knowledge of the field of practice and current market needs; Identify factors affecting project implementation; Ensure necessary resources are in place for effective project implementation; Gather and evaluate feedback, acting where appropriate.</td>
</tr>
<tr>
<td>B2</td>
<td>Work effectively in a team</td>
<td>Organise and lead work teams, coordinating project activities; Identify, agree and work towards collective goals; Create, maintain and enhance productive working relationships; Be aware of the needs and concerns of others.</td>
</tr>
<tr>
<td>B3</td>
<td>Use effective influencing and negotiating skills</td>
<td>Conduct appropriate research to influence the design and development of scientific projects and processes; Have sound knowledge of project costs and the ability to negotiate appropriate project funding.</td>
</tr>
<tr>
<td>C</td>
<td>Continue to advance their knowledge, understanding and competence to a high level and demonstrate a commitment to CPD</td>
<td>Typically in a scientific context this will include a commitment to;</td>
</tr>
<tr>
<td></td>
<td>*Registrants seeking revalidation will be required to satisfy the CPD Standards for Chartered Scientist</td>
<td>Comply with the rules of professional conduct of own professional body; Work constructively within all relevant legislation and regulatory frameworks; including social and employment legislation; Apply professional work ethics.</td>
</tr>
<tr>
<td>D</td>
<td>Demonstrate an understanding and commitment to Health and Safety and environmental issues related to employment</td>
<td>Typically in a scientific context this will include the ability and commitment to; Operate and act responsibly, taking account of environmental and socio-economic factors.</td>
</tr>
<tr>
<td>E</td>
<td>Comply with the relevant Codes of Conduct</td>
<td>Typically in a scientific context this will include the ability and commitment to; Comply with the rules of professional conduct of own professional body; Work constructively within all relevant legislation and regulatory frameworks; including social and employment legislation; Apply professional work ethics.</td>
</tr>
</tbody>
</table>
APPENDIX 5

‘Model’ Professional Review Report

Application for Professional Member and Charted Engineer through the Institute of Materials

<table>
<thead>
<tr>
<th>Applicant Name:</th>
<th>Membership Number:</th>
</tr>
</thead>
</table>

**Junior Engineer**

A Company
January 1997 – March 1999

**Training Undertaken:**
- National Diploma - Metallurgical Engineering (physical metallurgy)
- Paint Manufactures Course – Basic Technology
- Corrosion Protection of Steel
- Coating Inspector Level A1 & SP1
- Attended corrosion institute meetings at quarterly intervals

Received direct in-service training for:
1. Coating inspection and testing with specific emphasis on surface preparation, coating application, curing times, testing and failure analysis, quality control documentation, on site quality assurance and third party inspection and testing.
2. Corrosion testing and failure analysis of carbon and stainless steel as well as reinforced concrete structures.
3. Detailed design, installation supervision, operation and maintenance cathodic protection systems for steel in concrete, buried and submerged metallic structures

**Job Role / Responsibilities**

The role of the junior engineer was to perform all the necessary inspection, investigation, data collection, calculations, reporting, and detailed design for review by the senior engineer prior to submission.

I was responsible for the third party quality assurance and control during protective coating application, corrosion auditing and pre design testing of reinforced concrete, sub-sea and buried pipelines and jetty structures, failure analysis of coatings and materials, installation, testing, commissioning, and operation of cathodic protection systems.

This entailed detailed document control, reporting, detailed design calculations, planning and negotiation for third party quality assurance testing on site as well as instrumentation and testing skills for testing and operational equipment.

**Site Project Manager**

XXXXXXX – UAE
1999 - 2000

**Training Undertaken:**
- Basic Corrosion – NACE International – home study
- Time Management – home study

Received direct in-service training for:
- Detailed design, installation supervision, operation and maintenance of cathodic protection / prevention systems for new build sea water intake and discharge structures as well as associated concrete support structures, steel pipe work and tank bases.

**Job Role / Responsibilities**

The role of the site project manager was to ensure the continuous, efficient and effective operation on site during the installation of the cathodic protection components and to maintaining and document quality throughout the project.
I was responsible for resource management (materials and personnel), design review, client liaison, planning, interfacing with the construction teams and addressing all design deviations and or problems on site.

I was responsible for 9 cathodic protection engineers who were in turn responsible for 32 installation electricians and supervision of the construction staff.

<table>
<thead>
<tr>
<th>Project Engineer</th>
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<tr>
<td>XXXXXXXX Ltd – UK</td>
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<tr>
<td>2001-2003</td>
</tr>
</tbody>
</table>

**Training Undertaken:**  
MSc Corrosion Control Engineering (part time)  
Reading technical documentation and articles relevant to my field

**Job Role / Responsibilities**  
The role of the project engineer was to generate new work through quotations, perform detailed designs, general project management, cost control, quality assurance and control, installation training, supervision, testing, commissioning, operation and maintenance of cathodic protection and corrosion control systems.

I was responsible for detailed design, procurement, shipping, invoicing, document control, correspondence, specific personnel training and supervision during in the installation phases followed by testing, commissioning, client training and handover of completed systems.

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## Project Engineer

**Training Undertaken:**  
MSc Corrosion Control Engineering (part time)  
1 Day Passport to safety  
3 Day Health and Safety Supervisor CCNSG  
Attending Corrosion Prevention Association (CPA) meetings and seminars  
Reading technical documentation and articles relevant to my field

**Job Role / Responsibilities**  
The role of the project engineer was to identify and develop new markets initiate enquiries, produce quotations, negotiate and secure new projects, perform detailed designs, general project management, cost control, quality assurance and control, installation training, supervision, testing, commissioning, operation and maintenance of cathodic protection and corrosion control systems.

I was responsible for management of the manpower services which included identification and development of new clients, preparing and controlling the annual budget (£200,000), personnel, project and financial management of small scale inspection and maintenance contracts.

In addition to this I continued my role as project engineer developing and servicing new large scale projects.

I initiated, produced, and delivered education programs directed at increasing the awareness of cathodic protection in the industry. These were delivered as either a dedicated one week long course to existing clients, or a one hour lunch time taster presentation to prospective clients.

I also produced technical articles and marketing material for new products, and services.

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**Corrosion Management - Team Leader - XXXXXXXX Ltd**  
October 2006- present

**Training Undertaken:**  
MSc Corrosion Control Engineering (part time)
Attending Corrosion Protection Association (CPA) meetings
Reading technical documentation and articles relevant to my field
Teaching a cathodic protection model as part of an MSc course at the University of Leeds

Job Role / Responsibilities
Senior Corrosion and Cathodic Protection Engineer
Asset Management and Engineering - Discipline Manager for XXXX Highway Agency Structures

- To lead the development and implementation of the Group’s corrosion management capability, coordinating with colleagues (often more senior than me) in other UK offices and other countries of operation to ensure the highest technical standard of service through incorporation of corrosion management expertise.
- Provide specific project management and corrosion engineering skills to projects.
- To expand and develop the corrosion control capability of the business as a whole with an aim to provide more sustainable solutions to existing and new structures.
- To increase the awareness of corrosion and corrosion control within the organisation and to clients through education, presentations, personnel interaction.
- To identify where corrosion control technology can be used to improve current practice and or produce innovative new methods of design or construction.
- To monitor projects and identify where specialist corrosion management services may be of benefit. To identify and explore new corrosion control markets.
- To ensure where corrosion control technology can be used to improve current practice and or produce innovative new methods of design or construction.

I am responsible for developing and producing detailed corrosion control solutions by producing detailed and concept designs for corrosion control systems, detailed materials and installation specification documentation, undertaking third party design reviews, providing in-house and client based education of corrosion control techniques, producing and publishing technical and educational articles.

Personal certification:
I certify that this Professional Review Report is a true and accurate statement:
Candidate Name: Signature: Date:

Sponsor certification:
I certify that I have read the Professional Review Report of [Candidate name] and confirm that, to the best of my knowledge it is a true and accurate statement:
Sponsor Name: Signature: Date:
APPENDIX 6

Extended Professional Review:

Candidate Name:  
Membership Number

1st November 1999-present Senior Scientist, Smart Materials Group

Generic description of role: Technical leader for research and development programmes in the field of smart materials and associated systems. Projects vary in size from £20k to £300k over timescales of 8 weeks to 3 years. Role includes customer presentation and liaison, and the writing of commercial and military funded proposals, including descriptions of technical risk. Bidding work also includes the construction and negotiation of non-disclosure (NDA) and intellectual property (IP) agreements, in association with the IP and Contracts Departments. In addition to driving technical strategy I am also responsible for project management, the generation of safe working practices (including, risk, COSHH and PUWER assessments and the instigation of maintenance schedules) and the general supervision of staff (including mentoring where appropriate) Teams vary in size from 3-13 people. Mentoring activities include placement students, a PhD student and members of staff regarding their career progression. All work is performed to conform to quality standards (accredited to ISO 9001:2002). During this time I have served as the Secretary for the Smart Materials and Systems Committee of the Institute of Materials, Minerals and Mining. I have increased both the depth and breadth of my technical knowledge substantially during this period, both via on the job training and by attending formal courses and conferences.

Due to the varied nature of the work involved in this position, this section has been broken into project areas, to better indicate how the Engineering Council Requirements have been met.

‘Rapid Prototyping of Multivariate Structures’ (3 year research programme).

Training undertaken: Attendance at MRS Spring Meeting 2000. On-the-job training learning about various printing techniques and the chemistry and behaviour on inks.

Job role/responsibilities: Responsible for writing original research proposal, obtaining industrial and academic support, and presenting such at customer and peer reviews. Technically led project and acted as lead researcher from inception to completion, managing a team of 5 people. Additionally, supervised student placement for this programme and liaised with Original Equipment Manufacturer (OEM). Technicalities of programme included specifying the requirements for a novel ink jet printer to enable the deposition of liquids containing a solid loading (primarily ceramic) for the production of functional and structural 3D components from CAD files. Studies performed into the optimum methods, binders, dispersants and solvents required to produce inks with the correct viscosity for printing. Research into suitable release materials to be removed during ceramic sintering and suitable electrodes to survive such high temperature. To facilitate production of functional devices, investigated sintering additives that could be incorporated into the ink to lower the sintering temperature of the main ceramic investigated, lead zirconate titanate (PZT). All work performed on time, to customers’ satisfaction and within budget. This has led to subsequent work that cannot be disclosed herein as it is the subject of two current patent applications. During project, became Liaison Officer for a Joint Grant Scheme Project being undertaken at UMIST.

‘Advanced High Performance Actuators’ (3 year research programme funded by MoD)

Training undertaken: On-the-job learning to fully understand the mechanisms and principles behind the operation of magnetic shape memory alloy materials.

Job role/responsibilities: Technical leader for a team of 9 people. Responsible for setting up collaborative work between the company and equipment supplier to relate underlying characterisation and design work to specific applications. Regularly prepare presentations and review reports for customer. Responsible for controlling budgets for individual work packages. Technicalities of project include studying magnetic shape memory alloys and single crystal piezoelectric materials for a range of military applications including missile fin actuation, sonar transducers and micro-air vehicles. A full benefits study was performed based on operational requirements, to ensure these emerging technologies could offer the benefits to these applications that they promise. Work to date has included the design and fabrication of unique testing equipment to allow full electromechanical characterisation under varying conditions of magnetic/electric drive field, temperature and applied stress. A full test plan has been
produced. Future work to include the production of design guidelines for each type of device and the production of a series of lab-based demonstrators.

**Sonar Related Programmes:** ‘A Study of 1-3 Composite Stacks for Low Frequency Operation’, ‘Low Cost Planar Hydrophones’, Low Cost Wideband Array’ (parts of 3 year research programmes’ and ‘Synthetic Aperture Sonar’ (production project).

**Training undertaken:** Attended 5 day course ‘Introduction to and Fundamentals of Sonar’ at the University of Bournemouth. Attended ONR workshop at PENN State University as a materials expert. On-the-job training to learn more about the military requirements for different sonar devices.

**Job roles/responsibilities:** Solely responsible for low frequency stack work. To obtain a resonance device at low (<200kHz) frequencies, thick pieces of ceramic are required. The thicker the ceramic, the higher the drive voltage required. To avoid using too high a drive voltage, a transducer can be made using layers of active material, each of which can be driven under a low voltage. This work involved developing fabrication routes to produce novel stacked transducers exploiting the benefits of piezoelectric/polymer composites.

Responsible for budgets for Planar Hydrophone and Wideband Array work. Technically led and project managed both activities, responsible for a team of 13 people and co-ordination of work across two sites.

Lead researcher under the Planar Hydrophone project for activities developing injection moulded ‘1-3’ piezoelectric ceramic/polymer composites for hydrophones. Such composites are of interest in the field of both military and commercial sonar, due to their potentially improved sensitivity compared to existing solutions. Such devices, however, will not be accepted in service unless their properties are proven in sea trials, and if processing routes can be developed to reduce unit production cost. Work included improving processing routes to provide improved properties (such as increased sensitivity and reduced pressure dependency), increase turn-around of devices and reduce cost. Transducers were produced and tested in sea trials. Results showed they offered significant improvements over existing array technology. Technology is now to be included in a Technology Demonstrator Programme. Discussions have been held with ceramic manufacturers to set up a memorandum of understanding for the transfer of this technology should they be selected as the preferred option for future systems. Additional work performed by team members under this project included the development of novel ‘3-3’ piezoelectric/polymer composites.

Lead researcher under Wideband Array programme for the characterisation of traditional and emerging sonar materials under realistic operational temperatures (down to -10°C). Additional activities performed by the team included the prototyping of a unique wideband transducer by the combination of parts displaying different resonance characteristics. All work was regarded as technically excellent at customer milestone reviews.

Worked in partnership with colleagues at Winfrith site to develop and produce ‘1-3’ composites for synthetic aperture sonar. A dice and fill route was used to enable changes in array geometry to be made easily. Technically responsible for designing composites to provide the required frequency and capacitance response of the devices. Subsequently trained 3 staff members in the production of said devices to enable large batches (of the order of 160 pieces) to be produced. Responsible for handling budgets and ensuring the quality of work produced, including the instigation of a batch card system for recording details. Devices tested in sea trials with excellent results and entire system currently undergoing testing by the US MoD.
‘Market security based projects’ (multiple Commercially-funded programmes)

Training undertaken: On-the job training to learn how to use screen printing techniques to pattern unusual materials with high resolution features.

Job role/responsibilities: Responsible for technically leading and performing development work on market security projects, aimed at anti-counterfeiting technologies, including regular customer reviews and presentations. Worked closely with customers to adapt to constantly changing environment. Unable to provide specific details due to sensitive nature of work. Quality of work has resulted in multiple follow-on projects and substantial group income. Personally awarded bonus in recognition of producing high quality work for an important customer under extremely tight timescales.

‘Control of Active Smart Structures’ (Euclid funded 3 year programme)

Training undertaken: Gained understanding of aerodynamic structures and performance requirements. Learnt to operate wind tunnel at the University of Hertfordshire, with associated data-logging equipment. Presented work at Ferroelectrics 2005 and was awarded Best Poster Prize.

Job role/responsibilities: Responsible for ensuring the successful completion and delivery of the programme. I took on the responsibility for both co-ordinating the international research effort and for taking forward one of the practical demonstrators. This project aimed to practically demonstrate the benefits of replacing conventional actuators with solid-state systems. The project co-ordinator and lead researcher left the company and handed the project over to me with 6 months left to run. I was responsible for producing the working prototype, including a number of design iterations to overcome problems with the original, and incorporating rapid prototyping techniques for a number of key components. One prototype was produced and tested in a wind tunnel. A second, more effective design was produced as a result of these trials. Organised two demonstration days to key stakeholders (one in the UK one in France). Due to the success of this project, I have prepared a collaborative follow-on proposal to take the technology higher in technology readiness level is now being constructed.

‘Single Crystal Materials for High Performance Transducers and Actuators’ (MoD Precursor project)

Training undertaken: Gained programming skills in Microsoft Access (Database construction and Visual Basic) having not used this programme before.

Job role/responsibilities: Successfully led precursor project across 2 sites. Work delivered on time and within budget. Work included a comprehensive literature review to populate a database containing information on the research, production and use of the emerging field of single crystal piezoelectric materials.

‘i-Well project’ (Multiple commercial projects for a major Oil and Gas customer, value several hundred £k)

Training undertaken: Gained understanding of flow regimes and environmental conditions within oil pipelines.

Job role/responsibilities: Responsible for leading initial technology down-select and feasibility study for a remote power harvesting project, involving a team of 8 people. Presented results to customer, leading to award of follow-on prototyping project, working closely with the customer to ensure requirements fully met. Responsible in second phase for liaising across 3 sites to enable the set-up of specialist trials equipment and for participating in experimental design and testing phases. Technologies developed based on piezoelectric technology and galvanic cells. Work now into third phase. Project has been recognised internally as ‘exceptional’ and has been awarded a Divisional ‘Star Award’.

‘Ultracane’ (Commercially funded product development)

Job role/responsibilities: The Company was approached by Sound Foresight Ltd (a spin-out Company from the University of Leeds) to assist with the development of a tactile aid for the visually impaired. The aid consists of a traditional white cane with acoustic transducers integrated into the handle. The transducers transmit an acoustic pulse which is reflected back from objects in the path of the user.
Information is fed back to the user via vibrating buttons in the handle. The current design incorporates a forward looking sensor and a forward overhead sensor; the feedback from the latter overrides other signals necessary to prevent the user from walking into low-hanging objects. Personally responsible for identifying options for the tactile feedback, down-selecting the most appropriate, identifying suppliers, prototype testing, design iterations to ensure correct level of feedback response (including vibrational damping) and assisting in the transfer of technology to the manufacturer (ensuring supply chain etc.). Worked closely throughout project with electronics designers, manufacturer and design house; as a result the ‘Ultracane’ is now available as a product.

‘Automotive development work’ (Commercially funded development)

**Job role/responsibilities:** Customer point of contact. Initially became involved with customer as a technical advisor on a small study. Built a strong relationship with the customer, resulting in the generation of a collaborative project for a major automotive manufacturer, addressing the issues of improving fuel consumption on suburban utility vehicles (SUVs). Responsible for creating non-disclosure and intellectual property agreements, and establishing the contract. Technical responsibility delegated to colleague with greater expertise in the field.

**Teaching Company Scheme**

**Job role/responsibilities:** Research Organisation Technical Supervisor for Teaching Company Scheme Associate, developing ‘1-3’ composites for commercial side-scan sonar.

1**th April 1997- 22**nd October 1999 Research Engineer.

**Training undertaken:** Attended formal graduate training courses, including report writing, presentation skills, time management and statistical design of experiments. Trained in numerous manufacturing methods for the production of composite arrays. Techniques included the use of high-speed dicing saws, resin infiltration and pressing techniques. Trained in cleanroom operation and photolithographic production techniques, including HF acid safety and first aid. Trained in use of diamond deposition kit and safety aspects of microwave operation.

**Job role/responsibilities:** Responsible for the co-ordination of the Brite-Euram funded programme ‘Three-dimensional Acoustic Imaging Arrays’. Responsibilities included preparing manpower and cost statements for the European Commission, co-ordinating and compiling technical reports and liaising with project partners in France, Italy in the UK. Technical work involved designing specialist composite arrays for medical imaging based on computer simulations by French colleagues. Processing routes were identified and optimised for the imaging arrays, the acoustic matching layers (to provide smooth acoustic propagation into the body), and the interconnects to link to the drive electronics (including supervising work performed by technicians in our manufacturing facility). I was also responsible for developing and supervising a work package for a French PhD student on a 6 week placement to our company. Additional technical work included using techniques to measure properties of piezoelectric materials in accordance with IEEE standards. Routine use of technical drawings, both preparing and interpreting and using the facilities of the in-house drawing office. Additional projects included trouble-shooting problems with the processing and quality of micromachined devices and the growth of synthetic diamond films.

1**th March 1994-31**st January 1995 Sandwich Placement Student, Kobe Steel Europe Ltd.

**Training undertaken:** Trained in the use of Scanning Electron Microscopy (SEM) and Cathodoluminescence (CL) characterisation techniques.

**Job role/responsibilities:** Primary area of responsibility was to characterise the diamond films produced by the group. Trained and supervised colleagues in the use of the SEM. Responsible or producing monthly marketing reports for colleagues in the US and Japan.

**Personal certification:**
I certify that this Professional Review Report is a true and accurate statement:

Candidate Name: ____________________________ Signature: ____________________________ Date: ____________________________

Sponsor certification:
I certify that I have read the Professional Review Report of [Candidate name] and confirm that, to the best of my knowledge it is a true and accurate statement:

Sponsor Name: ____________________________ Signature: ____________________________ Date: ____________________________
APPENDIX 7

General Learning Outcomes Masters Level (CEng / CSci)

The range of general learning outcomes described for graduates from Bachelors programmes will also apply to graduates from MEng programmes. In respect of general transferable skills, the following enhanced outcomes should be expected of MEng graduates:

- The ability to develop, monitor and update a plan, to reflect a changing operating environment;
- The ability to monitor and adjust a personal programme of work on an on-going basis, and to learn independently;
- An understanding of different roles within a team, and the ability to exercise leadership;
- The ability to learn new theories, concepts, methods etc in unfamiliar situations.

Specific Learning Outcomes

In respect of the specific learning outcomes, MEng graduates will also be characterised by some or all of the following (the balance will vary according to the nature and aims of each programme):

Underpinning science and mathematics, etc.

- A comprehensive understanding of the scientific principles of own specialisation and related disciplines;
- An awareness of developing technologies related to own specialisation;
- A comprehensive knowledge and understanding of mathematical and computer models relevant to the engineering discipline, and an appreciation of their limitations;
- An understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in engineering projects.

Engineering Analysis

- Ability to use fundamental knowledge to investigate new and emerging technologies;
- Ability to apply mathematical and computer-based models for solving problems in engineering, and the ability to assess the limitations of particular cases;
- Ability to extract data pertinent to an unfamiliar problem, and apply in its solution using computer based engineering tools when appropriate.

Design

- Wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations;
- Ability to generate an innovative design for products, systems, components or processes to fulfil new needs.

Economic, social and environmental context

- Extensive knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately;
- The ability to make general evaluations of commercial risks through some understanding of the basis of such risks.
Engineering Practice

• A thorough understanding of current practice and its limitations, and some appreciation of likely new developments;
• Extensive knowledge and understanding of a wide range of engineering materials and components;
• Ability to apply engineering techniques taking account of a range of commercial and industrial constraints.
APPENDIX 8

General Learning Outcomes Bachelors Level (IEng)

Specific Learning Outcomes in Engineering

In respect of the specific learning outcomes, BEng graduates will also be characterised by some or all of the following (the balance will vary according to the nature and aims of each programme):

Underpinning science and mathematics etc;

- Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies;
- Knowledge and understanding of mathematical principles necessary to underpin their education in their engineering discipline and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems;
- Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline.

Engineering Analysis

- Understanding of engineering principles and the ability to apply them to analyse key engineering processes;
- Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques;
- Ability to apply quantitative methods and computer software relevant to their engineering discipline, in order to solve engineering problems;
- Understanding of and ability to apply a systems approach to engineering problems

Design

Candidates will therefore need the knowledge, understanding and skills to:

- Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;
- Understand customer and user needs and the importance of considerations such as aesthetics;
- Identify and manage cost drivers;
- Use creativity to establish innovative solutions;
- Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;
- Manage the design process and evaluate outcomes.

Economic, social and environmental context

- Knowledge and understanding of commercial and economic context of engineering processes;
- Knowledge of management techniques which may be used to achieve engineering objectives within that context;
- Understanding of the requirement for engineering activities to promote sustainable development;
• Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
• Understanding of the need for a high level of professional and ethical conduct in engineering.

Engineering Practice

Practical application of engineering skills, combining theory and experience, and use of other relevant knowledge and skills. This can include:

• Knowledge of characteristics of particular materials, equipment, processes, or products;
• Workshop and laboratory skills;
• Understanding of contexts in which engineering knowledge can be applied (eg: operations and management, technology development, etc);
• Understanding use of technical literature and other information sources;
• Awareness of nature of intellectual property and contractual issues;
• Understanding of appropriate codes of practice and industry standards;
• Awareness of quality issues;
• Ability to work with technical uncertainty.