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EngTech, **I**Eng and **C**Eng

UK STANDARD FOR PROFESSIONAL ENGINEERING COMPETENCE

Engineering Technician, Incorporated Engineer and Chartered Engineer Standard

Engineering Council

CONTENTS

FOREWORD

Professional engineering is not just a job – it is a mindset and sometimes a way of life. Engineers use their judgement and experience to solve problems when the limits of scientific knowledge or mathematics are evident. Their constant intent is to limit or eliminate risk. Their most successful creations recognise human fallibility. Complexity is a constant companion.

The engineering profession in the UK is well respected internationally. Individuals aspiring to be recognised as professional engineers and engineering technicians often need independent assessment of their competence. The UK Standard for Professional Engineering Competence (UK-SPEC) provides the means to achieve this. Even for those whose reputation is secure, the process of registration offers a means to demonstrate recognition by one's peers, and an encouragement to others.

THE PURPOSE OF UK-SPEC

This Engineering Council Standard describes the value of becoming registered as an Engineering Technician (EngTech), Incorporated Engineer (IEng) or Chartered Engineer (CEng). It describes the requirements that have to be met for registration, and gives examples of ways of doing this. This standard should enable individuals and employers to find out whether they or their staff can meet the requirements, and explains the steps necessary to achieve national registration. Registrants carry many responsibilities, including the need to observe a professional code of conduct. These are described here, together with advice on how to maintain registration.

This Standard is published by the Engineering Council on behalf of the United Kingdom engineering profession. The Engineering Council is governed by a Board representing the major professional engineering institutions in the UK, together with individuals drawn from industries and sectors with an interest in regulation of the engineering profession. Its primary tasks are to maintain the registers of professional engineers and technicians, originally established in the 1960s and 1970s by the former Council of Engineering Institutions and Engineers Registration Board, and to set the standards required for registration.

Career Development

The Engineering Council's registrants include Engineering Technicians, Incorporated Engineers and Chartered Engineers and the skills of each of them are needed within an engineering team. Achievement of registration in each category is valuable recognition in its own right. Life-long learning and career development may also enable individuals to progress within the registration structure, from Engineering Technician to Incorporated Engineer and from Incorporated Engineer to Chartered Engineer. Evidence of competence is the key requirement for progression, and normally there will be a need for additional education and training to enable progression to be recognised, although this may vary in nature.

Today's engineering professionals demonstrate a personal and professional commitment to society, to their profession, and to the environment. This is reflected in the standard for all three registration categories.

Why Register?

Registration has many benefits for employers and individuals and for the UK economy and society.

Registration sets professionals apart from engineers and technicians who are not registered. It establishes their proven knowledge, understanding and competence. In particular, registration demonstrates a commitment to professional standards, and to developing and enhancing competence. So professional registration gives an edge to candidates applying for engineering positions, whether or not registration is specified in the job advertisement. Registration links engineers and technicians into a professional engineering institution which provides professional development opportunities and guidance. Resources may include regular publications, web based facilities and many other opportunities to network with colleagues with similar professional interests. Registration also keeps registrants abreast of job opportunities and is a regular reminder of their professional standing and their obligations to society.

Employers of registered engineering professionals have the assurance of knowing that their employees have had their competence assessed, their credentials verified, and their commitment to continuing professional development established. They will have gained the recognition of their peers as meeting UK and international standards for knowledge and experience. Maintaining registration ensures that they are exposed to new developments in their profession, and provides numerous opportunities to benefit from these. It also means that they are governed by a professional code of conduct, and receive reminders and assistance in determining their obligations under this code.

In some cases, evidence of employing registered engineering professionals will be necessary for the award of contracts in the UK and internationally.

Some employers use the competence framework offered by registration as a basis for their own organisational needs, and rely on achievement of registration to demonstrate promotion readiness.

International Recognition

The standing of Engineering Technicians and of Incorporated Engineers and Chartered Engineers is increasingly being recognised around the world. In some cases these qualifications are required for particular work. Evidence of registration with the Engineering Council can prove helpful in applying for jobs and tendering for work abroad. The Engineering Council works closely with other countries' national bodies to increase recognition of engineering professionals. Further details are available from the Engineering Council licensed professional engineering institutions and from the Engineering Council's International Department.

How to Register

Registration is open to everyone who can demonstrate competence to perform professional work to the necessary standards, and commitment to:

• Maintain their competence
• Work within professional codes
• Participate actively within the profession.

Anyone wishing to be registered must apply through one of the professional engineering institutions licensed by the Engineering Council (see **www.engc.org.uk** for a current list). Candidates who believe they measure up to this Standard, or who wish to work towards registration, should approach one of the listed engineering institutions to obtain further details of how to apply for recognition and registration. The assessment process – known as a professional review - normally takes from one to six months, depending on the extent to which education and training is found to meet the standard requirements, the size of the chosen professional engineering institution and the availability of experienced assessors familiar with the branch of technology in which the applicant works.

The process of assessment starts with a written application made in accordance with the requirements of the particular institution concerned. A detailed description of the format for this will be provided by the institution, but any claim of qualifications, experience or training will need formal documented evidence. In submitting details, applicants will need to show how this relates to the required competences.

What is Competence?

Professional competence integrates knowledge, understanding, skills and values. It goes beyond the ability to perform specific tasks. The formation process through which engineering professionals become competent generally involves a combination of formal education and further training and experience (generally known as professional development). However these different elements are not necessarily separate or sequential and they may not always be formally structured. They are described in more detail later.

Pages 8 to 27 of this document set out the threshold generic competence standard for registration as an Engineering Technician, Incorporated Engineer or Chartered Engineer, and include some examples of the kind of evidence which would help demonstrate these. The exemplifying educational requirements for each category of registration are also given. The standard has widespread support and is based on occupational standards developed for the main industries and services in which engineers are employed.

Assessment of Competence

To become registered, applicants must have their competence assessed through a process known as professional review. The assessment is by practising engineering professionals, trained in this kind of assessment. Applicants are assessed against the competence standards listed in this document, which may be adapted by the institution to relate specifically to the particular technologies or industries with which it is concerned.

For would-be Incorporated Engineers and Chartered Engineers, a formal interview with the assessors is always a part of the process and, following a review of the documented evidence, the institution will decide whether the applicant is ready for this. For those seeking to become registered Engineering Technicians, the assessment may be on the basis of documentary evidence. For all three categories, the institution will be able to advise how best to present evidence of training and experience. Where deficiencies emerge, institutions will usually be able to suggest ways in which they can be addressed (although this may involve further training or additional experience). On completion of the professional review, a decision will be made by the relevant committee of the institution concerned. A positive decision will result in registration of the candidate as an Engineering Technician, Incorporated Engineer or Chartered Engineer. Retention of the title will require continued membership of the admitting institution or another Engineering Council licensed professional engineering institution and payment of an annual fee.

Applicants may appeal against the decision of the membership committee of the licensed engineering institution to which they have applied. The Engineering Council requires all licensed institutions to have robust and effective systems, including procedures to deal fairly and openly with contested membership and registration decisions. However, the Engineering Council is unable to intervene in the decision of a licensed professional engineering institution.
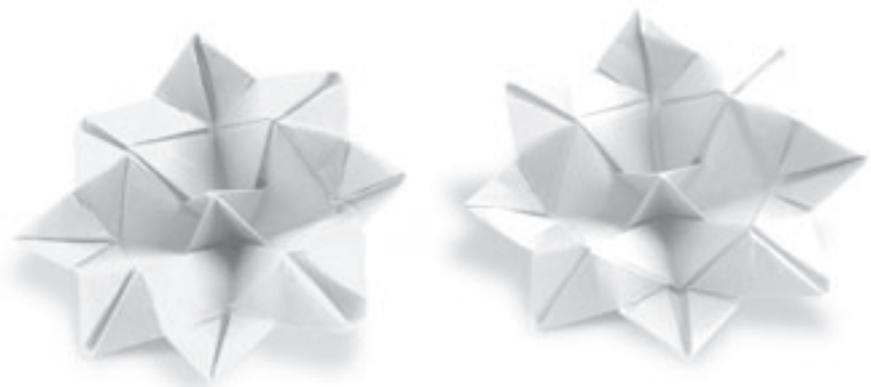
THE ENGINEERING TECHNICIAN STANDARD

Engineering Technicians are concerned with applying proven techniques and procedures to the solution of practical engineering problems. They carry supervisory or technical responsibility, and are competent to exercise creative aptitudes and skills within defined fields of technology. Professional Engineering Technicians contribute to the design, development, manufacture, commissioning, decommissioning, operation or maintenance of products, equipment, processes or services. Professional Engineering Technicians are required to apply safe systems of working.

The Competence and Commitment Standard for Engineering Technicians.	Guidance – These are examples of activities which could demonstrate that you have achieved the EngTech criteria.
Engineering Technicians must be competent throughout their working life, by virtue of their education, training and experience, to:	Tell us about your career and the education and training you have received. Explain how the experience you have gained has made you more competent.
A Use engineering knowledge and understanding to apply technical and practical skills. This includes the ability to:	The reviewers will be looking for evidence that you have the know-how to do the job, and were able to go beyond the immediate requirements and use your initiative and experience to solve a problem or improve a process.
A1 review and select appropriate techniques, procedures and methods to undertake tasks	Describe something in your work you were involved in which didn't quite work and explain why.
A2 use appropriate scientific, technical or engineering principles.	Drawing from your direct experience, this might be an explanation of how a piece of equipment, system or mechanism works.
B Contribute to the design, development, manufacture, construction, commissioning, operation or maintenance of products, equipment, processes, systems or services. In this context, this includes the ability to:	Explain how you contribute to one or more of these activities.
B1 identify problems and apply diagnostic methods to identify causes and achieve satisfactory solutions	Show an example of how you have used measurement, monitoring and assessment to identify the source of a problem or to identify an opportunity.

B2	identify, organise and use resources effectively to complete tasks, with consideration for cost, quality, safety and environmental impact.	Illustrate how you make decisions about what material, component, people or plant to use or how to introduce a new method of working.

C	**Accept and exercise personal responsibility.** This may include the ability to:	Describe an experience or instance where you have had to accept personal responsibility for seeing a process through to completion within agreed targets.
C1	work reliably and effectively without close supervision, to the appropriate codes of practice	Your evidence should show how you personally identified and agreed with what had to be done and to what standards on a typical project.
C2	accept responsibility for work of self and others	Minutes of meetings; site notes and instructions; Variation Orders; programmes of work; specifications, drawing and reports; appraisals. Activity not associated with your job can contribute evidence.
C3	accept, allocate and supervise technical and other tasks.	

D	**Use effective communication and interpersonal skills.** This includes the ability to:	You will need to show you can: contribute to discussions; make a presentation; read and synthesise information; write different types of documents.
D1	use oral, written and electronic methods for the communication in English[1] of technical and other information	Letters, reports, drawings, advice, minutes, including progress meetings, appraisals, work instructions, and other task planning and organising documents certificated by colleagues, clients, customers or management. Your application itself will be relevant.
D2	work effectively with colleagues, clients, suppliers and the public.	Examples of how this has occurred, and your role at the time.

E	**Make a personal commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment.** In order to satisfy this commitment, they must:	Your commitment will be to become part of the profession and uphold the standards to which all members subscribe. You need to show that you have read and understood your Institution Code of Conduct.
E1	comply with the Code of Conduct of their Licensed Institution or Professional Affiliate	You will need to sign a personal undertaking. The professional review involves demonstration of, or discussion of, your position on typical ethical challenges.

1 Any interviews will be conducted in English, subject only to the provisions of the Welsh Language Act 1993 and any Regulations which may be made in implementation of European Union directives on free movement of labour.

E2	manage and apply safe systems of work	Evidence of applying current safety requirements, such as examples of good practice you adopt in your work. You will need to show that you have received a formal safety instruction relating to your workplace, such as a CSCS safety test, or an update on statutory regulations such as COSHH requirements.
E3	undertake engineering work in a way that contributes to sustainable development	Examples of methodical assessment of risk in specific projects; actions taken to minimise risk to health, safety, society or the environment.
E4	carry out continuing professional development, including opportunities for this offered by their Institution, to ensure competence in areas and at the level of future intended practice.	This means demonstrating that you have actively sought to keep yourself up to date, perhaps by studying new standards or techniques, or made use of magazines, Branch meetings and other opportunities to network in order to keep abreast of change.

Education
There are two routes to Engineering Technician registration:

Standard Route
Standard route applicants are individuals who hold a qualification which has been approved by a licensed professional engineering institution as providing evidence of part or all of the required competence. Individuals who have successfully completed an approved engineering-based Advanced/Modern Apprenticeship or equivalent programme provide the most obvious example. They will need to provide evidence that their apprenticeship included training integrated with substantial working experience, and to demonstrate commitment to future development of their competence and to their Institution's code of conduct. This may fulfil all of the EngTech competence requirements and so can lead directly to Engineering Technician registration.

Many other qualifications may also be acceptable as evidence that part of the necessary competence has been acquired. These include an EdExcel level 3 BTEC Certificate or Diploma in Engineering or Construction and the Built Environment, and programmes, employer schemes and qualifications set at or above level 3 in the Qualifications and Credit Framework (or level 6 in the Scottish Credit and Qualifications Framework) which have been approved by a licensed professional engineering institution.

Each professional institution has a list of programmes and qualifications which it has approved. The Engineering Council will be making available a searchable database of all approved qualifications and programmes during 2010. Please check the Engineering Council website: www.engc.org.uk

Individual Route

Many potential professional Engineering Technicians have not had the advantage of formal training, but are able to demonstrate they have acquired the necessary competence through substantial working experience. Thus individuals without the types of qualifications described above may apply for an Individual Route assessment. This process, administered by the applicant's institution, includes assessment of prior learning and of current performance. Evidence of employer recognition of competences and relevant skills may be helpful.

Maintaining Competence

Candidates applying for registration as professional Engineering Technicians will be required to show evidence that they have taken steps to ensure that their competence is maintained, and that they intend to continue to do this. This is an important part of recognition as a professional Engineering Technician. It is for this reason that professional Engineering Technicians may only obtain and retain registration if they are members of one of the Engineering Council licensed professional engineering institutions. It is important that anyone seeking registration recognises that this will entail obligations and an ongoing commitment.

THE INCORPORATED ENGINEER STANDARD

Incorporated Engineers maintain and manage applications of current and developing technology, and may undertake engineering design, development, manufacture, construction and operation. Incorporated Engineers are variously engaged in technical and commercial management and possess effective interpersonal skills.

The Competence and Commitment Standard for Incorporated Engineers.	Guidance – These are examples of activities which could demonstrate that you have achieved the IEng criteria.
Incorporated Engineers must be competent throughout their working life, by virtue of their education, training and experience, to:	
A Use a combination of general and specialist 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.	Engage in formal learning. Learn new engineering theories and techniques in the workplace, at seminars, etc. Broaden your knowledge of engineering codes, standards and specifications.
A2 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 market 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	Manage/contribute to market research, and product and process research and development. Involvement with cross-disciplinary working. Conduct statistically sound appraisal of data. Use evidence from best practice to improve effectiveness. Apply root cause analysis.

	• Apply knowledge and experience to investigate and solve problems arising during engineering tasks and implement corrective action.	
B	**Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and re-cycle engineering processes, systems, services and products.**	
B1	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.	Contribute to the marketing of and tendering for new engineering products, processes and systems. Contribute to the specification and procurement of new engineering products, processes and systems. Develop decommissioning processes. Set targets, and draft programmes and action plans. Schedule activities.
B2	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 potential operational problems and evaluate possible engineering solutions, taking account of cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact • Contribute to the design of engineering solutions.	Contribute to theoretical and applied research. Manage/contribute to value engineering and whole life costing. Work in design teams. Draft specifications. Develop and test options. Identify resources and costs of options. Produce detailed designs.

B3 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 critical constraints
- 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.

Follow the design process through into product manufacture. Operate and maintain processes, systems etc. Contribute to reports on the evaluation of the effectiveness of the designs. Contribute to product improvement. Interpret and analyse performance. Contribute to determining critical success factors.

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 and confirm roles in project team
- Apply the necessary contractual arrangements with other stakeholders (client, subcontractors, suppliers, etc.).

Manage/contribute to project planning activities. Produce and implement procurement plans. Contribute to project risk assessments. Collaborate with key stakeholders. Plan programmes and delivery of tasks. Identify resources and costs. Prepare and agree contracts/work orders.

C2 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, within legal and statutory requirements
- Manage work teams, coordinating project activities
- Identify variations from quality standards, programme and budgets, and take corrective action
- Evaluate performance and recommend improvements.

Manage/contribute to project operations. Manage the balance between quality, cost and time. Manage contingency processes. Contribute to the management of project funding, payments and recovery. Satisfy legal and statutory obligations. Manage tasks within identified financial, commercial and regulatory constraints.

C3 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 • Manage and support team and individual development • Assess team and individual performance, and provide feedback.	Carry out/contribute to staff appraisals. Plan/contribute to the training and development of staff. Gather evidence from colleagues of the management, assessment and feedback that you have provided. Carry out/contribute to disciplinary procedures.
C4 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.	Promote quality. Manage/contribute to best practice methods of continuous improvement, e.g. ISO 9000, EFQM, balanced scorecard. Carry out/contribute to quality audits. Monitor, maintain and improve delivery. Identify, implement and evaluate changes to meet quality objectives.
D Demonstrate effective interpersonal skills.	
D1 Communicate in English[2] with others at all levels. This could include an ability to: • Contribute to, chair and record meetings and discussions • Prepare letters, documents and reports on technical matters • Exchange information and provide advice to technical and non-technical colleagues.	Reports, minutes of meetings, letters, programmes, drawings, specifications.
D2 Present and discuss proposals. This could include an ability to: • Prepare and deliver appropriate presentations • Manage debates with audiences • Feed the results back to improve the proposals.	Presentations, records of discussions and their outcomes.

2 Any interviews will be conducted in English, subject only to the provisions of the Welsh Language Act 1993 and any Regulations which may be made in implementation of European Union directives on free movement of labour.

D3 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 • Create, maintain and enhance productive working relationships, and resolve conflicts.	Records of meetings. Evidence from colleagues of your personal and social skills. Contribute to productive working relationships. Apply diversity and anti-discrimination legislation.
E Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.	
E1 Comply with relevant codes of conduct. This could include an ability to: • Comply with the rules of professional conduct of own professional body • Manage work within all relevant legislation and regulatory frameworks, including social and employment legislation.	Contribute to the affairs of your professional body. Work with a variety of conditions of contract.
E2 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 • Manage systems that satisfy health, safety and welfare requirements • Develop and implement appropriate hazard identification and risk management systems • Manage, evaluate and improve these systems.	Undertake formal H&S training. Work with H&S legislation and best practice, e.g. HASAW 1974, CDM regs, OHSAS 18001:2007 and company safety policies. Carry out safety audits. Identify and minimise hazards. Assess and control risks. Deliver H&S briefings & inductions.

E3 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 • Provide products and services which maintain and enhance the quality of the environment and community, and meet financial objectives • Understand and encourage stakeholder involvement in sustainable development.	Carry out/contribute to environmental impact assessments. Carry out/contribute to environmental risk assessments. Manage best practice environmental management systems, e.g. ISO 14000. Work within environmental legislation. Adopt sustainable practices. Contribute to "triple bottom line" (i.e. social, economic and environmental) outcomes.
E4 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.	Keep up to date with national and international engineering issues. Maintain CPD plans and records. Involvement with the affairs of your professional body. Evidence of your development through on-the-job learning, private study, in-house courses, external courses and conferences.

Education

Knowledge and understanding are important components of professional competence. Formal education is the usual, though not the only, way of demonstrating the necessary knowledge and understanding, and the following qualifications exemplify the required knowledge and understanding for Incorporated Engineers:

• An accredited Bachelors or honours degree in engineering or technology

• **or** a Higher National Diploma (HND) or a Foundation Degree in engineering or technology, plus appropriate further learning to degree level

• **or** an NVQ4 or SVQ4 which has been approved for the purpose by a licensed engineering institution

Applicants who do not have exemplifying qualifications may demonstrate the required knowledge and understanding in other ways, but must clearly demonstrate they have achieved the same level of knowledge and understanding as those with exemplifying qualifications.

Ways to demonstrate this include:

• Taking further qualifications, in whole or in part, as specified by the institution to which they are applying
• Completing appropriate work-based or experiential learning
• Writing a technical report, based on their experience, and demonstrating their knowledge and understanding of engineering principles
• Until 2011, taking Engineering Council examinations.

Applicants should consult their licensed professional engineering institution for advice on the most appropriate option.

Professional Development

This is the other key part of developing competence. It is how potential Incorporated Engineers learn to apply their knowledge and understanding and begin to apply professional judgement. It can happen at the same time as some of the formal education referred to above, for example through an industrial placement during a higher education course or alongside part-time study. Many larger employers run well-established graduate training and development schemes. While these schemes are of course geared to the specific needs of their organisations, they are frequently designed to help graduates on the way to registration, and may have been accredited by one or more of the professional engineering institutions.

Other employers may not have schemes of this type. Potential Incorporated Engineers in these organisations will need to develop profiles of competence and professional activity to help them prepare for registration. In some cases employers will use occupational standards or competence frameworks in determining job descriptions and staff development, even without a formal scheme, and these may assist in developing a competence profile. Otherwise aspiring registrants should use the competence and commitment statements and seek advice and guidance from the relevant engineering institution, which may be able to put them in touch with a mentor to assist them through the process and help them address any gaps in their development. Sector Skills Councils may be another source of advice.

Those seeking registration as an Incorporated Engineer should maintain a detailed record of their development, responsibilities and experience, verified by superiors or mentors, to provide best evidence for the professional review (see page 7).

Maintaining Competence

Candidates applying for registration as an Incorporated Engineer will be required to show evidence that they have taken steps to ensure that their competence is maintained, and that they intend to continue to do this. This is an important part of recognition as an Incorporated Engineer. It is for this reason that Incorporated Engineers may only obtain and retain registration if they are members of one of the Engineering Council licensed professional engineering institutions. It is important that anyone seeking registration recognises that this will entail obligations and an ongoing commitment.

THE CHARTERED ENGINEER STANDARD

Chartered Engineers are characterised by their ability to develop appropriate solutions to engineering problems, using new or existing technologies, through innovation, creativity and change. They might develop and apply new technologies, promote advanced designs and design methods, introduce new and more efficient production techniques, marketing and construction concepts, or pioneer new engineering services and management methods. Chartered Engineers are variously engaged in technical and commercial leadership and possess effective interpersonal skills.

The Competence and Commitment Standard for Chartered Engineers.	Guidance – These are examples of activities which could demonstrate that you have achieved the CEng criteria.
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 specialist 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.	Engage in formal post-graduate academic study. Learn and develop new engineering theories and techniques in the workplace. Broaden your knowledge of engineering codes, standards and specifications.
A2 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	Lead/manage market research, and product and process research and development. Cross-disciplinary working involving complex projects.

	• 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.	Conduct statistically sound appraisal of data. Use evidence from best practice to improve effectiveness.
B	**Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems.**	
B1	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.	Involvement in the marketing of and tendering for new engineering products, processes and systems. Involvement in the specification and procurement of new engineering products, processes and systems. Set targets, and draft programmes and action plans. Schedule activities.
B2	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, taking account of cost, quality, safety, reliability, appearance, fitness for purpose and environmental impact • Undertake engineering design.	Carry out formal theoretical research. Carry out applied research on the job. Lead/manage value engineering and whole life costing. Lead design teams. Draft specifications. Develop and test options. Identify resources and costs of options. Produce concept designs, and develop these into detailed designs.

B3 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
- Implement design solutions, taking account of critical constraints
- 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.

Follow the design process through into product or service realisation and its evaluation. Prepare and present reports on the evaluation of the effectiveness of the designs. Manage product improvement. Interpret and analyse performance. Determine critical success factors.

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.).

Lead/manage project planning activities. Produce and implement procurement plans. Carry out project risk assessments. Collaborate with key stakeholders, and negotiate agreement to the plans. Plan programmes and delivery of tasks. Identify resources and costs. Negotiate and agree contracts/work orders.

C2 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 within legal and statutory requirements
- 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.

Take responsibility for and control project operations. Manage the balance between quality, cost and time. Manage contingency systems. Manage project funding, payments and recovery. Satisfy legal and statutory obligations. Lead/manage tasks within identified financial, commercial and regulatory constraints.

C3	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.	Carry out/contribute to staff appraisals. Plan/contribute to the training and development of staff. Gather evidence from colleagues of the management, assessment and feedback that you have provided. Carry out/contribute to disciplinary procedures.
C4	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.	Plan and implement best practice methods of continuous improvement, e.g. ISO 9000, EFQM, balanced scorecard. Carry out quality audits. Monitor, maintain and improve delivery. Identify, implement and evaluate changes to meet quality objectives.
D	**Demonstrate effective interpersonal skills.**	
D1	Communicate in English[3] with others at all levels. This could include an ability to: • Contribute to, chair and record meetings and discussions • Prepare letters, documents and reports on complex matters • Exchange information and provide advice to technical and non-technical colleagues.	Reports, minutes of meetings, letters, programmes, drawings, specifications.
D2	Present and discuss proposals. This could include an ability to: • Prepare and deliver presentations on strategic matters • Lead and sustain debates with audiences • Feed the results back to improve the proposals.	Presentations, records of discussions and their outcomes.

3 Any interviews will be conducted in English, subject only to the provisions of the Welsh Language Act 1993 and any Regulations which may be made in implementation of European Union directives on free movement of labour.

D3 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 lead work towards collective goals • Create, maintain and enhance productive working relationships, and resolve conflicts.	Records of meetings. Evidence from colleagues of your personal and social skills. Take responsibility for productive working relationships. Apply diversity and anti-discrimination legislation.
E Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession and the environment.	
E1 Comply with relevant codes of conduct. This could include an ability to: • Comply with the rules of professional conduct of own professional body • Lead work within all relevant legislation and regulatory frameworks, including social and employment legislation.	Work with a variety of conditions of contract. Demonstrate initiative in and commitment to the affairs of your professional body.
E2 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.	Undertake formal H&S training. Work with H&S legislation and best practice, e.g. HASAW 1974, CDM regs, OHSAS 18001:2007 and company safety policies. Carry out safety audits. Identify and minimise hazards. Assess and control risks. Evaluate the costs and benefits of safe working. Deliver strategic H&S briefings and inductions.

E3 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 secure stakeholder involvement in sustainable development.	Carry out environmental impact assessments. Carry out environmental risk assessments. Plan and implement best practice environmental management systems, e.g. ISO 14000. Work within environmental legislation. Adopt sustainable practices. Achieve "triple bottom line" (i.e. social, economic and environmental) outcomes.
E4 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.	Keep up to date with national and international engineering issues. Maintain CPD plans and records. Involvement with the affairs of your professional body. Evidence of your development through on-the-job learning, private study, in-house courses, external courses and conferences.

Education

Knowledge and understanding are important components of professional competence. Formal education is the usual, though not the only, way of demonstrating the necessary knowledge and understanding, and the following qualifications exemplify the required knowledge and understanding for Chartered Engineers:

• An accredited Bachelors degree with honours in engineering or technology, plus either an appropriate Masters degree or Engineering Doctorate (EngD) accredited by a professional engineering institution, or appropriate further learning to Masters level

• **or** an accredited integrated MEng degree.

Applicants who do not have exemplifying qualifications may demonstrate the required knowledge and understanding in other ways, but must clearly demonstrate they have achieved the same level of knowledge and understanding as those with exemplifying qualifications.

Ways to demonstrate this include:

• Taking further qualifications, in whole or in part, as specified by the institution to which they are applying
• Completing appropriate work-based or experiential learning
• Writing a technical report, based on their experience, and demonstrating their knowledge and understanding of engineering principles
• Until 2011, taking Engineering Council examinations.

Applicants should consult their licensed professional engineering institution for advice on the most appropriate option.

Professional Development

This is the other key part of developing competence. It is how potential Chartered Engineers learn to apply their knowledge and understanding and begin to apply professional judgement. It can happen at the same time as some of the formal education referred to above, for example through an industrial placement during a higher education course, or alongside part-time study. Many larger employers run well-established graduate training and development schemes. While these schemes are of course geared to the specific needs of their organisations, they are frequently designed to help graduates on the way to registration and may have been accredited by one or more of the engineering institutions.

Other employers may not have schemes of this type. Potential Chartered Engineers in these organisations will need to develop profiles of competence and professional activity to help them prepare for registration. In some cases employers will use occupational standards or competence frameworks in determining job descriptions and staff development, even without a formal scheme, and these may assist in developing a competence profile. Otherwise aspiring registrants should use the competence and commitment statements and seek advice and guidance from the relevant engineering institution, which may be able to put them in touch with a mentor to assist them through the process and help them address any gaps in their development. Sector Skills Councils may be another source of advice.

Those seeking registration as a Chartered Engineer should maintain a detailed record of their development, responsibilities and experience, verified by superiors or mentors, to provide best evidence for the professional review (see page 7).

Maintaining Competence

Candidates applying for registration as a Chartered Engineer will be required to show evidence that they have taken steps to ensure that their competence is maintained, and that they intend to continue to do this. This is an important part of recognition as a Chartered Engineer. It is for this reason that Chartered Engineers may only obtain and retain registration if they are members of one of the Engineering Council licensed professional engineering institutions. It is important that anyone seeking registration recognises that this will entail obligations and an ongoing commitment.

PROFESSIONAL BEHAVIOUR

The Engineering Council and the Royal Academy of Engineering, working with a number of the professional engineering institutions, published in 2007 a Statement of Ethical Principles. The Statement sets a standard to which members of the engineering profession should aspire in their working habits and relationships. The values on which it is based should apply in every situation in which professional engineers exercise their judgement. See: www.engc.org.uk/EthicalPrinciples

As a minimum, Engineering Technicians, Incorporated Engineers and Chartered Engineers are expected to observe the requirements of the Code of Conduct of the professional engineering institution they have joined. Institutions are obliged to respond to allegations of infringement of the code and may suspend or remove membership and registration if proven. Institution Codes of Conduct follow the generic framework detailed here:

Guidelines for Institution Codes of Conduct

The Code of Professional Conduct of each licensed professional engineering institution should place a personal obligation on its members to act with integrity and in the public interest. It should be worded in such a way as to encourage members to act in accordance with the Statement of Ethical Principles published by the Royal Academy of Engineering and the Engineering Council.

Institutions shall ensure that they have appropriate disciplinary processes in place to deal with breaches of their Codes of Conduct.

Specifically, Codes of Conduct should oblige members to:

1. Act with due skill, care and diligence and with proper regard for professional standards.
2. Prevent avoidable danger to health or safety.
3. Act in accordance with the principles of sustainability, and prevent avoidable adverse impact on the environment and society.
4. Maintain their competence, undertake only professional tasks for which they are competent, and disclose relevant limitations of competence.
5. Accept appropriate responsibility for work carried out under their supervision.
6. Treat all persons fairly and with respect.
7. Encourage others to advance their learning and competence.
8. Avoid where possible real or perceived conflict of interest, and advise affected parties when such conflicts arise.
9. Observe the proper duties of confidentiality owed to appropriate parties.
10. Reject bribery and all forms of corrupt behaviour, and make positive efforts to ensure others do likewise.
11. Assess and manage relevant risks and communicate these appropriately.
12. Assess relevant liability, and if appropriate hold professional indemnity insurance.
13. Notify the Institution if convicted of a criminal offence or upon becoming bankrupt or disqualified as a Company Director.
14. Notify the Institution of any significant violation of the Institution's Code of Conduct by another member.

HELP AND ADVICE

A list of professional engineering institutions licensed to assess candidates for registration as Engineering Technicians, Incorporated Engineers and Chartered Engineers is on the Engineering Council website at **www.engc.org.uk**

Further help and advice on education and training issues may be obtained from Sector Skills Councils. A list of these may be obtained from **www.ukces.org.uk**

If additional advice is required please contact the Engineering Council Registration Department at the address given on the back of this document.

NOTES

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