

*The Institution  
of Structural  
Engineers*

Initial Professional Development

# Initial Professional Development: Chartered Membership via Research and Development

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*The* **Institution**  
*of* **Structural**  
**Engineers**

# Becoming a Chartered member

Research and Development

Becoming a Chartered member



# Becoming a Chartered member: Research and Development

## 1.0 Introduction

- 1.1 The Institution of Structural Engineers is the preeminent global professional body for structural engineering and is recognised internationally for the high technical and professional competence of its members. The vision of the Institution is ‘working together to promote world-class standards of safety, efficiency and excellence in structural engineering’.
- 1.2 The Institution sets and maintains standards for professional structural engineers and implements these through a qualifying Professional Review (comprising an interview and Research and Development Review), Code of Conduct and a policy for Continuing Professional Development (CPD).
- 1.3 Members of the Institution have a high degree of professional knowledge and expertise in structural engineering. They display judgement in making the best use of resources in the interests of public health and safety and in the care of the environment. Chartered Members are entitled to use the designatory letters ‘FIStructE’, ‘MIStructE’ or ‘AIStructE’ and use the title ‘Chartered Structural Engineer’. They may also be registered as Chartered Engineers (CEng) with Engineering Council.
- 1.4 Chartered Members of the Institution will be able to demonstrate:
  - a sound understanding of core structural engineering principles;
  - the ability to use relevant existing technology coupled with the ability to locate and use new research and development to benefit their work and structural engineering generally;
  - the ability to solve complex structural engineering problems and produce viable structural design solutions using appropriate methods of analysis;
  - the ability to exercise independent judgement in the application of structural engineering science and knowledge;
  - technical, management and leadership skills to plan, manage and direct human, material and financial resources;
  - commitment to the public interest in all aspects of their work, including health, safety, risk, financial, commercial, legal, environmental, social, energy conservation and sustainability;
  - effective communication and interpersonal skills;
  - knowledge of the statutory and other regulations affecting current practice in structural engineering;

- a significant base of information technology skills;
- commitment to the profession of structural engineering, particularly with regard to the Institution's Code of Conduct and the requirement for Continuing Professional Development.

1.5 There are 3 stages in becoming a Chartered Member of the Institution:

1. Achievement of the required educational base;
2. A period of responsible work experience initially under guidance and supervision, known as Initial Professional Development;
3. Success in the Institution's Professional Review (PR).

Note: Completion of the educational base and IPD can run concurrently but both must be completed before applying.

## 2.0 The educational base

The educational base required of a Chartered Member is one of the following:

- Accredited degree: a degree in civil and/or structural engineering accredited by the Joint Board of Moderators (JBM) on behalf of the Institution of Structural Engineers. For degrees accredited under UK-SPEC (2004) the requirement will be met by a 4 year accredited MEng degree or equivalent eg a 3 year accredited BEng (Hons) degree plus a period of Further Learning (eg MSc or Technical Report Route);
- Recognised degree: a degree in civil and/or structural engineering recognised by an approved body eg Washington Accord Signatories;
- Non-accredited qualification: such other university degree, academic qualification or academic test which, after scrutiny by the Institution's Academic Qualifications Panel is deemed to be of a standard equivalent to an accredited degree.

## 3.0 Initial Professional Development (IPD)

- 3.1 IPD comprises the acquisition and development of the specialist knowledge and skills, and their practical application that are needed to practise as a structural engineer. It bridges the gap between your educational base and attaining professional qualifications. The Institution defines IPD in terms of core objectives, which are defined to minimum standards.
- 3.2 Acquiring competencies and experience at work will develop your ability to carry responsibility and make independent judgement. The first part of your IPD should be managed by you and should provide you with the necessary breadth of experience. The second part will be a gradual progression (dependent upon your personal development and commitment) towards increasing responsibility. These two elements can be viewed as broadening your experience and deepening

your knowledge/ability. The two parts of your IPD should preferably be concurrent rather than consecutive.

- 3.3 All relevant experience may be taken into account, including pre-graduate experience from 'sandwich', part-time or vacation work. However, the amount of pre-graduate experience which may be included will depend on the quality of the experience gained by the individual and its relevance to the core objectives.
- 3.4 A key element of a managed training programme is the production of regular reports which, by recording activities undertaken and the lessons learned in relation to the objectives, not only act as an information source for future reference, but also demonstrate your progress towards and achievement of the core objectives. You will be required to show evidence of your experience by completing the IPD Final Report Forms retrospectively and compiling a portfolio of work.
- 3.5 As an approximate guide, it is unlikely that candidates working in research or development for a period of less than three years since gaining a PhD will have had enough time to produce sufficient research output for consideration. The progress summary record provides a useful means of monitoring achievement of the core objectives and highlighting areas requiring review.

#### **4.0 Core Objectives**

- 4.1 The core objectives are compulsory and outline the basic competence required of candidates pursuing Chartered membership of the Institution. Achievement of the objectives will not in itself create the skills and abilities of a Chartered member but should ensure a sound and broad base upon which you can build further professional and managerial responsibility.
- 4.2 The core objectives relate to all types of structural engineering work and associated disciplines. They permit maximum flexibility and indicate only the minimum standard of required competence. They do not depend on time-served as a measure of achievement but are capable of objective and progressive assessment. Guidance notes are included within the core objectives which include examples of activities which may contribute to the achievement of the core objectives.
- 4.3 The core objectives are set out in three sections:
1. Personal: Effective communication and interpersonal skills, leadership and professional commitment.
  2. Engineering: Identification and solution of engineering problems and the safe, economic and sustainable implementation of these solutions.
  3. Management and commercial: Efficient procurement and management of resources within economic, environmental and regulatory constraints to achieve the engineering objectives.

## 5.0 Research and Development Route Guidance

### 5.1 Introduction

The Research and Development Route is intended for candidates who are seeking membership of the Institution and who have gained their experience of structural engineering mainly through research and development activity.

In this context, structural engineering includes but is not limited to improving the understanding of existing structures and the development of new structural materials, software, components and/or design and analysis methods in concrete, glass, masonry, polymers, steel, timber and various other structural composites. It also encompasses any discipline that involves the investigation of the action of internal or external force systems on a variety of structural forms including those found in aeronautical, aerospace, geotechnical, marine and medical engineering.

### 5.2 The conventional route

The principle elements of the conventional route to Chartered membership of the Institution, that is the route followed by the majority of applicants, are:

- a) Completion of the Educational Base
- b) Completion of a Period of Initial Professional Development (IPD)
- c) Passing the Institution's Professional Review (Professional Review Interview (PRI) and Chartered Membership Examination)

The Research and Development Route comprises the same elements as described above except that, instead of being required to sit and pass the Chartered Membership Examination, candidates are required to pass the Research and Development Review.

## 6.0 Guidance on submission of portfolio

- 6.1 Candidates will be required to prepare a portfolio of work in support of their IPD Final Report Forms, which will need to be submitted to your regional group in due course. However, in order to avoid unnecessary delays in the interview process the portfolio must be ready for submission at the time when you make your interview application to headquarters. Submission instructions for the portfolio will then be confirmed by your regional group after receipt and processing of the PRI application. Two copies of the completed portfolio will need to be submitted.
- 6.2 The portfolio must demonstrate that you have attained at least the minimum level of competence and responsibility for Chartered Membership. It is a vital element of the PRI process, and you should devote the necessary time and care to its production. Remember, it is in your interest to submit a comprehensive portfolio as it will make the Interview itself more straightforward.

- 6.3 Core objective 1.2 is ability in communication, and your IPD final report forms and portfolio will contribute to the assessment of this objective. It is therefore important to ensure that your documentation is of a high standard.
- 6.4 The portfolio must be A4 size and not more than 40 mm (single-sided) or 25 mm (double-sided) in thickness, excluding the folder/binding. If you exceed this amount your reviewers will be unable to assess all of the submitted information in detail, and consequently may reject your portfolio and can decline to interview you.
- 6.5 The pages of text within the portfolio must also be A4 size, i.e. you cannot reduce your pages to A5 to fit two pages onto an A4 sheet. Drawings must be no greater than A3 size, and folded to suit. The font size used in your portfolio and IPD final report forms must be no smaller than Arial 9.
- 6.6 The portfolio must contain evidence relating to all of the core objectives on which you are being assessed, and allow easy cross-referencing with the IPD Final Report Forms. We recommend that you are judicious in your assessment of what to include, as it will not benefit you to overwhelm your reviewers with informal information. The overriding principle is to ensure that it relates directly to the core objectives and how you have achieved the standards associated with each objective.
- 6.7 Candidates will be expected to include examples of work from a variety of projects that they have worked on, and its format must comply with one of the following two options:
1. Sub-divided into the core objectives, with the evidence provided in each subsection relating specifically to the associated core objective.
- or
2. Sub-divided chronologically by project, with a coversheet at the beginning of each subsection giving an overview of the candidate's specific involvement and responsibilities on the project, and stating clearly which core objectives are covered (and how).
- 6.8 Where appropriate, candidates should provide hand written comments/annotations on the submitted information to help demonstrate an understanding of the work and its relevance to the core objectives.
- 6.9 All work included within the portfolio must be clearly attributable to the candidate, and relevant to the core objectives.



6.10 Although not intended as an exhaustive list, the following are examples of information that could be expected in a typical portfolio:

- Evidence of attendance at CPD events, eg attendance certificates, personal notes, etc.
- Project correspondence by the candidate, eg letters, faxes, emails, reports, site instruction records, site inspection notes, meeting notes, etc.
- Hand drawn conceptual design sketches and sketch details.
- CAD project drawings either by the candidate, or for which the candidate has had design responsibility. Candidates should provide some evidence on the drawing, by way annotation, of their part played in the drawing production.
- Examples of methods of analysis (both manual and computer aided).
- Examples of design calculations (both manual and computer aided).
- Specification documents or specification notes produced by the candidate.
- Evidence of risk assessment procedures undertaken by the candidate and how assessed risks are dealt with and/or communicated to others, including (if appropriate) details of any personal involvement with particular health and safety issues on site.
- Evidence of an understanding of environmental/sustainability issues, either by personal involvement on a project, background reading, or attendance on relevant courses.
- Evidence of site experience, eg photographs taken during site visits, site inspection notes, site meeting notes, correspondence relating to site issues, etc.
- Evidence of basic management skills and responsibilities, eg programming of design works and staff resources, preparation of information release schedules, correspondence regarding release of information, additional works, fees, etc.
- Evidence of quality assurance systems, eg in-house issuing procedures, in-house checking procedures, checking of subcontract/specialist design information, etc.
- Demonstration of an understanding of basic forms of contract either by personal involvement on a project, background reading, or attendance on relevant courses.
- Candidates should avoid submitting repetitive designs.

6.11 A portfolio checklist has been provided in this file and is also available for download from the Institution's website. All candidates must include a signed version of the checklist as the first page of their portfolio. By completing the checklist you are confirming that you have complied with the Institution's requirements in terms of the layout and variety of evidence provided within the portfolio. Failure to comply with these requirements will reduce the likelihood of success at the Professional Review Interview.

## 7.0 The Professional Review

7.1 When you consider that you have accrued sufficient experience and supporting documentation you may apply to the Institution's Membership Department for the Professional Review in accordance with the relevant deadlines. Full details of the submission requirements are stated on the application form (Form M/R) but you should be aware that you will be required to submit:

- Form M/R;
- A two-page experience report detailing your roles and responsibilities over the course of your career;
- Your IPD Final Report Forms for each of the 13 core objectives;
- 3 copies of a Research Summary Report;
- 3 sets of Research or Development Publications;
- Your Interview fee and application fee;
- Your Research Assessment Fee.

Once your application has been processed, you will be provided with details of where to send your portfolio of work.

7.2 The application form must be signed by three Chartered members of the Institution of Structural Engineers, one of whom must be a Fellow member. If you are unable to acquire the requisite supporters we recommend that you:

- Try previous employment or colleagues. If they themselves are not Chartered they may know someone who is.
- Contact the university where you studied to see if any Member/Fellows would be able to assist.
- Contact your local regional group or representatives via the Institution's website.
- Search the online Members' Directory for members in your area.

Contacting regional group members is very much a last resort and we make it clear that group members are under no obligation to sign the forms. It is important to note that in acting as a supporter they are not stating that you are qualified to be a Chartered member but rather that, subject to satisfying the appropriate requirements, i.e. interview and exam, you are a fit and proper person to become a Member of the Institution.

On this basis some members will sign the form, others will only do so after they have met with you and reviewed your work, whilst some refuse to act as supporters. The decision is very much a personal one for each Member/Fellow and we encourage Members/Fellows to take the role of supporter seriously.

- 7.3 The Professional Review Interview will verify that you have achieved the core objectives to the minimum standards.

Interviews are normally arranged through your Regional Group and will be with two trained Reviewers who will normally be experienced members of the Institution.

The Interview will normally be approximately one hour long but this may vary according to the different routes and length of time it takes for the Reviewers to determine whether you have reached the required standard in each Core Objective. It will include an informal presentation of your training records, if applicable, and your portfolio of work without the use of electronic aids, followed by discussion and questions.

Whilst the Reviewers will try to help you by putting you at ease and asking questions about your work and experience, it is important that you realise that the onus is on you to demonstrate that you have achieved the stated attainment levels for all 13 Core Objectives.

- 7.4 After the Professional Review the Reviewers are required to complete a Reviewer's Summary Report Form which indicates whether you have passed all the Core Objectives. This form is returned to the Institution and reviewed by the Applications and Professional Review Panel. If you have passed all the Core Objectives the panel will recommend that you proceed to the Research Review.
- 7.5 If you have failed the Professional Review Interview the Institution secretariat will write to you and advise you of the Core Objectives where you did not sufficiently demonstrate achievement of the required standard. If you fail three or fewer objectives you will only need to be re-interviewed on those objectives. If you fail four or more objectives then you will be required to re-sit the full Interview. In both cases an updated and improved submission will be required.

On request the Institution will provide you with guidance on how you might address deficiencies in meeting the core objectives and you are strongly advised to seek the help of your mentor before re-applying. There is no limit on the number of times you can sit the Professional Review.

However, should a candidate fail up to three core objectives in their first interview, they will have three years to pass the failed core objectives before being required to resubmit IPD Final Report Forms for all 13 core objectives and to be re-interviewed on the full 13 core objectives.

## 8.0 Continuing Professional Development (CPD)

- 8.1 At the Professional Review Interview you will be assessed on your commitment to CPD which is defined by the Institution as: The systematic maintenance, improvement and broadening of knowledge and skill and the development of personal qualities necessary for the execution of professional and technical duties throughout the practitioner's working life.
- 8.2 All members of the Institution have an obligation to keep their skills and knowledge up to date and as a graduate you will be expected to understand this commitment at an early stage in your career. Evidence of your CPD can be demonstrated by regular use of a development action plan, a personal development record in the form of a diary and keeping a portfolio of your work and responsibility during the period of your IPD.
- 8.3 The Institution provides a CPD Activities Record which can be used to record your CPD. There is also a secure online version accessible via My Account on the Institution's website.
- 8.4 Please note that the Institution has introduced mandatory reporting of CPD which applies to all those elected to Fellow, Chartered, Associate, Associate-Member and Technician from January 2011. It is therefore recommended that you develop the habit of recording and submitting your CPD from an early stage in your career.

Please visit the Institution's website for further details.

## 9.0 Appeals Procedure

The Institution has an appeals procedure for candidates who have been unsuccessful in their application. An appeal may be made on the following grounds only:

- Extenuating circumstances occurring immediately before or during the application process, and/or
- Departure from the Institution's application or Interview procedures. Full details of the procedures are published on the Institution website ([www.istructe.org](http://www.istructe.org)).

## 10.0 Registration with Engineering Council

Candidates who are successful in the Chartered Member Professional Review may apply to Engineering Council (EngC) for registration as a Chartered Engineer (CEng). This further demonstrates your proven knowledge and competence. In particular, registration demonstrates a commitment to professional standards and to the development and enhancement of competence.



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# Core Objectives

Core Objectives



# Core Objectives: Chartered membership Research and Development

## INTRODUCTION

The following list of compulsory Core Objectives details the requirements for IPD for candidates intending to qualify as Chartered Members of the Institution of Structural Engineers and thereby as Chartered Structural Engineers. Candidates will be required to demonstrate the minimum level of competence in each of the objectives within their chosen career path. Achievement of the objectives will not in itself create the skills and abilities of a Chartered Member, but should ensure a sound and broad base upon which the candidate can build further professional and managerial responsibility.

The minimum standards required for the Core Objectives are:

- |   |              |   |
|---|--------------|---|
| A | Appreciation | A general appreciation of the subject is required, as well as an understanding of how the subject may affect, or integrate with other subjects. |
| K | Knowledge    | A knowledge and understanding of the subject and its application is required.   |
| E | Experience   | The subject should be performed independently or under supervision.   |
| B | Ability      | Perform the subject without supervision and be competent to advise others.  |

The Core Objectives are highlighted in bold type, whilst the notes after each of the Core Objectives indicate further guidance to candidates and mentors on possible ways in which the Core Objectives may be satisfied. These are given in terms of examples of ways in which candidates may choose to satisfy the core objectives to the level of competence required and should be seen as guidance only and not prescriptive.

## **IPD FINAL REPORT FORMS**

The Institution has produced example IPD final report forms to assist candidates. These are available in section 3 of this document. The Institution is conscious of the fact that the experiences of engineers differ across the world and the IPD forms/portfolio should reflect the individual experiences of these applicants.

General advice for completing the IPD Final Report Forms:

**Personal:** the reviewers will not be interested in what your company does, they are only interested in what you have done. Therefore, ensure that you state what you have personally undertaken and try to avoid generic statements about how your company operates.

**Positive:** do not sell yourself short. Try to avoid statements such as 'I have limited/some experience' — you either have experience or not. Try and ensure that the correct words are applied to the relevant core objectives, e.g. if it's an 'ability' core objective, do not use 'experience' or 'knowledge' always use 'ability'.

**Practical:** ensure you state how you have achieved the core objective standards; all too often candidates fall into the trap of simply describing the core objective or stating why it is important. This is not what the reviewers will want to know. There is no benefit in describing the properties of various materials (for core objective 2.3) as the reviewers will already know this; what they need to know is how you have developed your understanding of materials and what practical experience you have.



# Core Objectives for Chartered Membership (Research and Development): Guidance notes

## 1.0 PERSONAL

### 1.1 INSTITUTION (Minimum standard K)

**Objective:** Knowledge of the Institution and involvement in Institution affairs

**Guidance Note:** The candidate should demonstrate a knowledge of the structure and purpose of the Institution of Structural Engineers, together with an awareness of the Institution's Code of Conduct.

Candidates are strongly encouraged to support Institution activities in universities, colleges and schools by giving careers talks, lecturing, providing case studies, assisting in the marking/critiquing of project work, etc.

The candidate will be expected to demonstrate a history of involvement with the Institution and a knowledge of its purpose and operation. Several possibilities exist for achieving this, including:

- Involvement with regional group activities and/or national Institution activities.
- Utilisation of The Structural Engineer, Institution website and Institution publications.
- Contributions to The Structural Engineer, CPD activities, reviewing for the Institution, etc.
- Facilitating contact between the student body and the Institution.
- Regular attendance at regional group meetings/seminars over a prolonged period of time
- Regular contact with members of the regional group committee
- Knowledge of and adherence to the Institution's Code of Conduct
- Knowledge of the Institution's Council and committee structure and the work of those committees
- Regular use of the Institution's website
- Regular review of the Structural Engineer journal
- Knowledge of the Institution services including CPD courses and the library
- Knowledge of the international dimension of the Institution
- Knowledge of other institutions and disciplines

The Candidates should have an appreciation of the Institutions of other disciplines. (E.g. ICE, CIBSE, RICS, RIBA, IEE, IMechE, IEl, HKIE, IEAust, SAICE, etc.).

## 1.2 COMMUNICATION (Minimum standard B)

**Objective:** Ability to demonstrate effective communication and interpersonal skills

**Guidance Note:** The candidates should demonstrate competence in effective communication and interpersonal skills using written, oral and visual media.

Where resources permit the candidate should demonstrate the ability to communicate via IT links, produce spreadsheets and database documents.

The candidate should develop an ability in writing letters, summaries and reports, both factual and interpretative.

Where appropriate the candidate should develop drawing skills to be able to produce drawings to illustrate concept appraisals, feasibility studies and initial design details.

The candidate should have the ability to prepare and deliver presentations, project précis or design concepts etc.

The candidate must have an understanding of the principles of effective communication and can highlight how they have developed the abilities as stated in the core objective guidance note.

Working in an academic environment should naturally enhance communication skills through:

- Preparing and delivering teaching material in lectures, tutorials and project supervision.
- Presentations at conferences, including contribution to the discussion.
- Organisation of student activities.
- Undertaking administrative tasks that require working with others.
- Preparation of grant proposals, commercial reports, references and research project reports.

The Candidate should have an appreciation of the skills of other professionals in the construction, research or development team and demonstrate an ability to work as an effective member of the team.

## 2.0 ENGINEERING

### 2.1 CONCEPTUAL DESIGN (Minimum standard B)

**Objective:** Ability to produce viable structural solutions, within the scope of a design brief, taking account of structural stability, durability, aesthetics, sustainability and cost

**Guidance Note:** The candidate should demonstrate competence in conceiving approximate scheme solutions to assess the viability of alternative materials and forms of construction.

This could be achieved by developing and appraising alternative designs for experimental test apparatus or by consideration of the implication of proposed new design recommendations on the technical and financial viability of alternative structural solutions.

This extends beyond the mastery of techniques and the teaching of analysis and encompasses an understanding of the design process from interpretation of the brief to production and justification of a variable scheme. Teaching or assisting with the supervision and assessment of structural design work should provide most of the necessary background. This should include:

- Assessment of the brief.
- Recognition of constraints and identification of feasible solutions.
- Appraisal of the possible schemes
- Understanding of the importance of overall stability, selection of suitable foundations, sustainability and environmental issues, construction methods and buildability and, where appropriate, resistance to extreme events, demolition and potential recycling.

Experience gained in the design and delivery of laboratory equipment for research or teaching may also provide suitable opportunities.

## 2.2 ANALYSIS AND DESIGN (Minimum standard B)

**Objective:** Ability to carry out analysis and design of structural forms

**Guidance Note:** The candidate should demonstrate an ability to solve structural engineering problems using a variety of suitable methods of analysis and media, including both traditional methods, using hand calculations, and computer analysis using proprietary software. The candidate should also understand the limitations of such techniques.

Traditional methods of analysis should typically include multi-span continuous beams, slabs and plane frames. The candidate should demonstrate the ability to verify analysis by simple approximation and an understanding of the deflected structural forms.

The candidate should demonstrate an ability to appraise the design of structures for overall stability, resistance to progressive collapse, fire and performance of a structure as a whole.

The candidate would typically be able to demonstrate competence in the following aspects of structural design:

- i. The design of the primary structural materials, for example concrete, steel, masonry, timber, etc.
- ii. The ability to carry out the design of individual components.
- iii. The ability to determine and apply appropriate loading criteria and the ability to determine the appropriate load path.
- iv. The ability to assess soil-structure interaction, including alternative sub-structure solutions appropriate to the form of construction and prevailing ground conditions.
- v. The interface between primary materials, e.g. concrete with steelwork.
- vi. The integration of other design disciplines.

The candidate's training and experience would typically include a balance of sub-structure, super-structure and infrastructure elements.

The candidate should have the ability to use the appropriate standards/Codes of Practice, specifications, Institution publications, technical agency publications, bulletins, reports, commercial and relevant publications from other professional institutions etc., and apply the requirements or recommendations of these documents within specification or design criteria.

The candidate should have the ability to develop or review specifications, e.g. materials and workmanship specifications, project briefs, method statements.

It is expected that candidates will have taken primary responsibility for developing and delivering several courses in the analysis and design of structures. These should cover a variety of structural forms and a range of structural materials. Some aspects of the candidate's research may also provide additional evidence. As a result they should be able to discuss structural concepts, developing simplified explanations, making comparisons and generally appraising structural matters.

The candidate should be able to evaluate and appraise existing structural engineering research knowledge or design guidance, develop and test research hypotheses, critically evaluate structural test data obtained from experimental and numerical tests and synthesise research findings into the design recommendations. Candidates involved in development work should be able to demonstrate an ability to carry out analysis and design through the production of detailed design guidelines, manuals or codes.

### **2.3 MATERIALS (Minimum standard B)**

**Objective: Ability to specify and co-ordinate the use of materials**

**Guidance Note:** The candidate should develop knowledge of the properties and behaviour of the primary construction materials, their manufacture, availability, sustainability and cost, sufficient to be able to specify and co-ordinate their use in structures.

The candidate should develop an in-depth understanding of the behaviour of the principal structural material or materials used in their research or development activity and be able to apply such knowledge in the development of their research findings or design recommendations.

The candidate should have an understanding of the properties of and thus the advantages and disadvantages in use of the main types of construction materials, i.e. steel, concrete, masonry and timber, and should have some understanding of the principles of material selection. Whilst they may choose to specialise in one material - and thus have developed a detailed knowledge of its behaviour - they should have some appreciation of the availability, principal engineering properties and potential applications of the four main construction materials.

Research into material behaviour could also demonstrate ability in this area.

## 2.4 ENVIRONMENT (Minimum standard K)

**Objective:** Knowledge of relevant environmental, societal and sustainability and economic issues, impacting issues and legislation

**Guidance Note:** The candidate should demonstrate knowledge of the relevant environmental and sustainability objectives issues and legislation in a broad study of the overall context of their research or development activity.

The candidate should have knowledge of:

- the measures required to protect the environment and to achieve more broadly defined sustainability objectives
- the implications of design choices and construction methods on the environment
- the wide range of environmental and sustainability issues raised by the selected design solution, along with the project construction methods and the selection of construction materials.

The candidate should have an understanding of the circumstances and the timing for involvement of specialist environmental and sustainability advisers and the methods of managing information exchange in interfaces with such advisers.

The candidate should have an appreciation of the effects and constraints that planning, sustainability and environmental impact assessments can have on the design.

The candidate should appreciate the different mitigation measures required for the control of contaminants which may be present in the form of solids, liquids or gases; and where appropriate of the implications of relevant legislation and fiscal controls such as Landfill Tax.

The candidate should have an understanding of how the interaction of the structure, usage and services can influence the lifetime impacts associated with the selected design. This should include an appreciation of the magnitude of embodied and energy consumption in construction and emission of greenhouse gases.

The candidate should be able to demonstrate knowledge of the relevant environmental and sustainability issues and legislation in a broad study of the overall context of their research or development activity.

The candidate should embed the principles of sustainability throughout their teaching. This should recognise the holistic nature of the subject and its pervasive influence on the identification of choices and the making of decisions. It should address issues such as embodied carbon, energy efficiency, environmental impact, recycling and decommissioning.

The candidate should understand and demonstrate their contributions to the JBM concept of a sustainability thread running throughout their courses.

## 2.5 CONSTRUCTION (Minimum standard E)

**Objective:** Experience in construction techniques

**Guidance Note:** The candidate should demonstrate experience in construction techniques, construction plant and machinery, temporary support systems, material testing procedures, construction programmes, construction sequencing, etc.

Ideally, the candidate should complete a period of site experience on one or more construction projects, which is relevant to this core objective, i.e. it is mainly related to structural engineering elements.

It is recognised that not all candidates will be able to spend a continuous period on site for any significant length of time and in such cases they will be expected to accumulate experience to an equivalent of three months. A record should be kept by the candidate of all site-related matters, e.g. meetings, visits, inspections, surveys, testing procedures, supervision checking, etc., which will count towards their aggregate period of site experience.

It should be noted that the actual period of site experience is indicative only and the emphasis will be on the quality of experience rather than the quantity.

The candidate should gain suitable experience through the design and construction of experimental test apparatus for research and/or teaching activity, measurement systems and instrumentation in the laboratory and through experience accrued from field testing and site visits.

The candidate should have some knowledge of the main features of construction techniques gained through personal experience, study of construction projects, assisting with student site visits and involvement with advisory and consulting work. They should be able to explain how this knowledge influences their teaching of structural analysis and design.

## 3.0 MANAGEMENT AND COMMERCIAL

### 3.1 MANAGEMENT SKILLS (Minimum standard E)

**Objective:** Experience in management skills for programming and control

**Guidance Note:** The candidate should demonstrate experience in the following aspects of management and leadership:

- i. Project team management and leadership skills.
- ii. Programming and project control.
- iii. Liaison and interface management.

The candidate's skills may typically include the programming and control of manpower, project resources, finances and administrative support.

The candidate should demonstrate experience in managing the interfaces and exchanges of information with other disciplines.

Candidates are required to have some experience of management and have developed leadership skills through the programming of appropriate resources. This can be demonstrated through a combination of supervising research projects, organising teaching or leading student activities. This experience may be gained through:

- Lead investigator to a number of PhD research projects, responsible for the management of budgets, reporting, etc. of such projects.
- Developing new programmes of learning and/or reviewing existing programmes (including preparation for accreditation visits).
- Supervising research students, such as PhD students.
- Taking up management roles, e.g. unit coordinators, course leaders, and/or directors of undergraduate studies.
- Managing research and/or teaching projects.

The candidate should gain experience of project and resource management in the programming and control of a small research or development team to achieve proposed research outcomes. Experience of working with other disciplines can be gained by working within multi-disciplinary research or development teams or by working with instrumentation specialists and mechanical engineering technicians in the laboratory.

### **3.2            LAW (Minimum standard A)**

#### **Objective:      Appreciation of the law and statutory legislation**

**Guidance Note:** The candidate should demonstrate an appreciation of the law of the construction industry with respect to statutory legislation, health and safety legislation, insurance, contract law, and the contractual obligations effective within the construction industry, relevant to the candidate's location.

The candidate can gain an awareness of the law and statutory legislation relating to the activities undertaken within a University (including teaching and research), a laboratory, commercial research centre or in field-based research activity. In particular, opportunities should exist to gain an awareness of Health and Safety and the law relating to the procurement and purchase of specialist items of equipment or services.

The candidate should demonstrate an awareness of the legal climate within which construction is practised. They should also have an understanding of the legal requirements surrounding the working with students, especially those relating to laboratory and off campus activities and be able to demonstrate how they utilise this when planning and conducting such activities.

### 3.3 HEALTH AND SAFETY (Minimum standard E)

**Objective:** Experience in Health and Safety requirements and legislation

**Guidance Note:** The candidate should demonstrate experience of using health and safety standards and reports on structural and construction safety, publications produced by public authorities, relevant trade bodies and professional institutions.

The candidate should develop experience of the role of hazard and risk assessments in avoiding or mitigating the potential risks posed by both construction materials and construction activities to site personnel, building users and the general public.

The candidate must understand the concept of health and safety at work as it influences both the operation of both the construction industry (e.g. the identification and management of risk) and their responsibilities for students (e.g. the importance of introductory briefing for students visiting construction sites and the need to observe health and safety requirements when working in laboratories.). They should be able to demonstrate personal responsibility for managing some health and safety issues associated with their normal range of activities.

The candidate should develop knowledge of the above in context of their research and/or teaching environment, i.e. laboratory-based activity, site visits, field trials or in the development of new materials or structural systems.

### 3.4 COMMERCIAL AWARENESS (Minimum standard A)

**Objective:** Appreciation of commercial and financial constraints

**Guidance Note:** The candidate should be aware of commercial pressures within the construction industry and develop an appreciation of the effects of national and international current affairs on the cost of raw materials, labour and manufacturing processes, market forces, the effects of taxation, etc.

The candidate should develop an appreciation of the methods of calculating construction costs, including documents used for estimating and measuring quantities and determining unit rates.

The candidate should appreciate the sensitivity of cost variations in construction techniques and appreciate the role of techniques such as value engineering and whole life project costing.

Candidates are required to have an appreciation of commercial issues. Although this would, for those working in industry, be expected to relate to the financing and commercial organisation of construction projects, it is recognised that working in an academic or research environment provides different opportunities to become familiar with the financial dimensions of the work and the organisation. Thus experience of:

- costing and running externally funded research projects,
- operating teaching grants,
- the student fee and resources aspects of contributing to a new teaching programme,
- running a laboratory should all provide opportunities to develop an appreciation of financial matters.



The candidate should gain an appreciation of the commercial and financial constraints when designing and constructing experimental test apparatus and when negotiating research contracts with research agencies and industrial collaborators or sponsors.

### **3.5 CONTRACT DOCUMENTATION (Minimum standard K)**

**Objectives: Knowledge of procurement routes and forms of contract**

**Guidance Note:** The candidate should develop knowledge of the various standard forms of contract for the procurement of both construction and design services and a knowledge of appropriate procurement issues, e.g. partnering, dispute resolution, etc.

The candidate should develop knowledge of procurement procedures and law associated with the purchase of items of experimental test apparatus and equipment used in field trials and when establishing contractual agreements with research agencies, industrial collaborators or sponsors including Knowledge Transfer Partnerships and partnerships with local and overseas colleges, universities and other academic institutions.

The candidate should have some appreciation of the different ways of procuring construction projects and the likely effects this will have on the responsibilities of the various parties. They should understand how a contract assigns roles, determines responsibilities and influences relationships.

### **3.6 QUALITY SYSTEMS (Minimum standard K) Objective: Knowledge of quality systems**

**Guidance Note:** The candidate should develop an understanding of the requirements for quality systems and a knowledge of the specific procedures required to achieve quality in design and construction.

The candidate should develop knowledge of quality systems applied to the management and operation of academic or commercial laboratory facilities; in the development activity or in the compilation and checking of design guidelines, manuals or codes.

Candidates should understand the concept of a quality system, its main components and how it should be operated. Within the educational environment this is likely to be encountered in the context of examining, coursework, external and peer-review, supervision of research and student feedback. The candidate should appreciate that parallel systems operate within construction and should recognise the common features of any effective system. The candidate should be able to discuss how they utilise such principles within their own work.

*The* **Institution**  
*of* **Structural**  
**Engineers**

# Report Forms

Report Forms



# IPD Final Report Form

Candidate name:				
Membership number:		Date of report:		
Core objective:				
Standard achieved (Candidate MUST indicate standard)	A	K	E	B
Please indicate below how you have achieved at least the minimum standard citing specific examples from projects you have worked on				
Mentor's comments (if applicable):				
Mentor's signature:		Mentor's name (print):		

Continue on separate sheet if necessary. Photocopying of form is permitted.

## IPD Final Report Form: poor example

Candidate name:	M S Engineer			
Membership number:		Date of report:		
Core objective:	2.1 - Conceptual Design			
Standard achieved (Candidate MUST indicate standard)	A	K	E	B ✓
Please indicate below how you have achieved at least the minimum standard citing specific examples from projects you have worked on				
<p>I have gained the ability through experience of conceptual design on various projects, not only to appraise the best solution in terms of structure but to work with the design team to find the best integrated solution to meet the needs of the particular project.</p> <p>This has been done through conceptual design discussions with the design team on subjects such as visual appearance, thermal mass, acoustics, buildability, air tightness, cost and the possibilities of integration of structure and service schemes to provide both energy and/or cost savings.</p> <p>The conceptual design is a key element of every tender when the best value for the project is sought from designers and contractors. An inappropriate design may lead to concerns regarding its viability as a structure or other health and safety issues.</p> <p>Any design should respond to the client's requirements in terms of cost, aesthetics and use.</p>				
Mentor's comments (if applicable): Agreed				
Mentor's signature:			Mentor's name (print): M Entor	

Continue on separate sheet if necessary. Photocopying of form is permitted.

The information provided within this IPD final report form is neither specific enough nor personal to the candidate. It is very general in nature as it does not refer to any specific projects the candidate has worked on.

Although the candidate attempts to state how they have achieved the necessary standard of the objective, there is insufficient specific information provided for a proper judgement to be made. The lack of detail provided is likely to make the Interview somewhat tougher as the reviewers probe the candidate for the information they require.

Although the candidate's mentor has taken the time to read and sign-off the IPD final report form, the comment provided does not benefit the candidate. The reviewer's would prefer to see positive, informative statements being made by mentors.

\*Please note that mentor's comments/signatures are only compulsory for candidates following the individually managed route. However, mentor's comments are also welcomed from those candidates who have been mentored whilst following the retrospectively or accredited training scheme routes.

## IPD Final Report Form: average example

Candidate name:	M S Engineer			
Membership number:		Date of report:		
Core objective:	2.1 - Conceptual Design			
Standard achieved (Candidate MUST indicate standard)	A	K	E	B ✓
Please indicate below how you have achieved at least the minimum standard citing specific examples from projects you have worked on				
<p>I have been responsible for the production of conceptual schemes for numerous projects – new builds as well as refurbishments/extensions – in particular structural steel against reinforced concrete and masonry against timber framed structures.</p> <p>I have also prepared options for safely constructing retaining walls by either a bored piled retaining wall or a sequenced traditional reinforced concrete retaining wall. These projects involved both the superstructure and foundation options for tenders/contractor pricing.</p> <p>Refer to the following within my portfolio of work:</p> <ul style="list-style-type: none"> <li>• Hancock Bridge strengthening</li> <li>• Burj Al Qatan</li> <li>• Cable-stayed bridge over Dnepr river</li> <li>• Arch dam</li> </ul>				
Mentor's comments (if applicable):				
I confirm that M S Engineer has undertaken the tasks detailed above to a standard of Ability. This can be confirmed within the portfolio of work.				
Mentor's signature:			Mentor's name (print):	
			M Entor	

Continue on separate sheet if necessary. Photocopying of form is permitted.

Although the candidate has provided some specific information about the activities they have been involved in which contribute to this objective, the level of detail is insufficient.

The candidate should have provided specific information under the projects mentioned as well as providing references to where these projects are located in the supporting documentation that has been submitted.

The comments provided by the mentor are at least positive but they lack specific detail and could be made more personal which would help the reviewers in assessing the candidate's ability.

\*Please note that mentor's comments/signatures are only compulsory for candidates following the individually managed route. However, mentor's comments are also welcomed from those candidates who have been mentored whilst following the retrospectively or accredited training scheme routes.

## IPD Final Report Form: good example

Candidate name:	M S Engineer			
Membership number:		Date of report:		
Core objective:	2.1 - Conceptual Design			
Standard achieved (Candidate MUST indicate standard)	A	K	E	B ✓
Please indicate below how you have achieved at least the minimum standard citing specific examples from projects you have worked on				
<p>During my career I have displayed a strong ability to conceive viable alternate structures as per the client's brief. In so doing I take into account the costs, aesthetics, materials, durability and construction methods of the project. An ability in Conceptual Design has been demonstrated in the following projects; references refer to the portfolio of work where more detailed information can be found including comparisons of different materials, designs etc:</p> <ul style="list-style-type: none"> <li>• Ultrasonicated honey processing plant, Devon <ul style="list-style-type: none"> <li>o Ref: Section 2.1.1</li> <li>o £2.2 m, 2 storey, masonry/fabricated steel structure</li> <li>o Complications included: <ul style="list-style-type: none"> <li>– the site being on a significant gradient</li> <li>– close proximity of river – required construction of retaining walls</li> <li>– ground investigation showed that ground bearing pressure was not sufficient to use traditional foundations</li> <li>– ground improvement required through use of piled foundations</li> <li>– close proximity of major road – required construction of retaining walls and removal of existing derby retaining wall as client wished the plant to be built 2 m below the road level. Options for removing derby wall were presented to the client and a contiguous retaining wall constructed to support both</li> </ul> </li> </ul> </li> <li>• (Replacement) Arch Bridge, River Isar, Munich <ul style="list-style-type: none"> <li>o Ref: Section 2.1.2</li> <li>o £1.5 m, 2 storey (railway and two-lane roadway), steel bridge, three arch 250 m span</li> <li>o Replacing a historic bridge which had been rendered unsafe due to an impact by a ferry</li> <li>o Improvements to the original design were possible: <ul style="list-style-type: none"> <li>– steel replaced concrete due to quicker construction and lower weight demands</li> </ul> </li> </ul> </li> </ul>				



- structural system improved by making all arches externally statically determinate. This was achieved by tying the arches throughout the bridge deck
- Exhibition centre, Liverpool
  - o Ref: Section 2.1.3
  - o £125 m, 4 storey (with mezzanine), precast concrete/fabricated steel structure
  - o Complications included:
    - client requested no columns within the main 36 m<sup>2</sup> exhibition hall
    - structural steel truss used as economically viable and met the height requirements
    - numerous staircases and ramps, which were all treated as individual structures within the overall design
    - a combination of support systems (bearing walls, beams, hanging walls, etc) were used
    - flexibility of ground floor (main) exhibition hall – utilised a braced steel transfer frame with the floor beams using UC sections; beam deflection analysis was essential to assess the deflection from the dead load of the precast structure of the floors above

**Mentor's comments (if applicable):**

Whilst acting as M S Engineer's mentor for the last four years, a significant improvement in conceptual design ability has been apparent. Initially M S Engineer gained significant ability in designing 'traditional' structures but after only a short period of time was encouraged to undertake the design of more complex and challenging structures. M S Engineer clearly relishes the challenges posed in designing more complicated structures or where there are underlying problems which must be surmounted for the project to succeed. An innovative approach can be seen in the foundation design (in which they have become something of an office expert) for the honey processing plant and the flexible use ground floor of the exhibition centre.

I would not hesitate to assign major and challenging projects to M S Engineer as I have every confidence that sufficient ability in conceptual design will be demonstrated to ensure that the project is a success.

<b>Mentor's signature:</b>	<b>Mentor's name (print):</b> M Entor
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This is a strong IPD final report form as it provides a general introductory paragraph detailing how the candidate approaches conceptual design. It then gives detailed information, related to specific projects, justifying the candidate's belief that they have met the standard expected of the core objective. This candidate has also provided references to the portfolio of work so that the reviewers can quickly and easily find the information they are looking for.

The candidate's mentor has given positive and specific comments and clearly takes the role of mentor seriously. By describing the candidate's development and skills, albeit briefly, the mentor has provided the reviewer's with an insight which may otherwise be unavailable to them; this will assist them as they begin the process of assessing the candidate's standard in this core objective.

\*Please note that mentor's comments/signatures are only compulsory for candidates following the individually managed route. However, mentor's comments are also welcomed from those candidates who have been mentored whilst following the retrospectively or accredited training scheme routes.

## Continuing Professional Development: Activity Record

Name: S T Engineer

Membership No: 02222222

Year: 2013

(January to December)

Job description/Role: Designer in partnership covering varied structures

(Please include organisation type, e.g. sole practitioner, partner, etc)

Regional Group: Lancs and Cheshire

I am a member of an organisation whose CPD system is recognised by the Institution (please provide details below)

Name of organisation:
Please ensure you sign the declaration at the end of this Activity Record

Note: You must gain at least 90 hours CPD over three years. If you have been unable to attain the required number of CPD hours please detail the reasons why below:

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### YOU MUST INCLUDE THE NUMBER OF HOURS SPENT ON EACH ACTIVITY

Please retain a copy for your own records.

CPD Categories	Description of Activities <small>(please describe your DEVELOPMENT, not just your job)</small>	Benefits Gained	Hours
<b>1. Work-based learning</b> <i>e.g. mentoring, project related research, development of organisational skills/IT, etc</i>	Training Officer for East Lancs office – ongoing	Keeps me abreast of new developments in industry, especially related to bridge construction	
	Discussions with colleagues/literature investigations regarding: – bridge and culvert inspection	Ensuring H&S of inspection staff and ensuring risk assessments are completed correctly	
	– fire engineering	Produced economical design of composite floor	
	– resin injection techniques to deal with subsidence	Developed resin injection knowledge and competence	
	Mentoring two graduates aiming for Chartered status	Developed knowledge of IPD system and helped keep up to date with new technical processes	
Sub-total for Work-based learning			

<b>2. Self-directed study</b> <i>e.g. journals/technical publications, distance-learning, post-grad study, etc</i>	<i>Suitability testing of materials to absorb lateral stresses behind integral bridge abutments. CARDER, D. R. and others, 2002</i>	Developed knowledge of materials in relation to lateral stress	
	Professionally qualified CSCS card	Better appreciation of site safety and risks	
	<i>Structural Engineer, 19<sup>th</sup> May 2013: Effectiveness of punching shear reinforcement to EN 1992-1-1:2004</i>	Increased understanding of contribution of upper bound section shear resistance	
	<i>Structural Engineer, 16<sup>th</sup> June 2013: Challenges of post-tensioning in Dubai – a designer's perspective</i>	Raised awareness of construction situation in Dubai generally and post-tensioning specifically	

	Sub-total for Self-directed study		
<b>3. Course/ events/ seminars</b> <i>including institution, internal, external, etc</i>	Seminar on displacement piles and precast foundation schemes (local Regional Group – 04/02/13)	Improved understanding of available techniques and outline costs. Also health and safety aspects of each	
	ICE/IStructE/SCOSS meeting 'The unexamined role of the manager in failure' by Richard Williams (held at ICE – 25/06/09)	Enlightening talk on the potential culpability of the project manager	
	The robustness of multi-storey buildings in fire (local Regional Group – 17/07/13)	Interesting and surprising presentation on robustness/fire issues	
	HILTI seminar - the use of small embedment fixings into cracked concrete (supplier-led, at workplace – 10/10/13)	Increased knowledge of use of embedment fixings	
	Latest Developments in Post-tensioned Flat Slab Design and Construction (Concrete Centre – 29/09/13)	Updated knowledge on post-tensioning	
		Sub-total for Courses/events/seminars	

<b>4. Horizon - broadening activities</b> <i>appropriate TV programmes, institution work, community/ public service involvement, etc</i>	Watched selected episodes of 'Mega Structures'	Broadened awareness of significant structural engineering projects	
	Documentary on Leading Engineers of 20 <sup>th</sup> Century	Broadening knowledge of significant engineers and their work and contribution to the art and science of structural engineering	
	School Governor	Developed knowledge in relation to Finance Committee	
		Sub-total for Horizon-broadening activities	
		<b>Total CPD hours for all categories for the year</b>	

Please ensure that you retain any evidence of CPD activities (where possible) as these may be requested during audit.

<b>I declare that I will undertake appropriate CPD over the coming 12 months. Potential CPD activities may include:</b> Similar in nature to the activities listed above. Specific activities will of course be dictated by projects, but I do aim to attend more Institution events and meetings during 2014.	
<b>Signature:</b>	<b>Date:</b>