



### Gap Analysis Exercise – IEng

The criteria against which candidates are assessed are set down by the Engineering Council in Competence and Commitment Statements.

Competence	A	Knowledge and understanding
	B	Design, development and solving engineering problems
	C	Responsibility, management and leadership
	D	Communication and interpersonal skills
Commitment	E	Professional commitment

**Health and safety, risk assessment as well as environment and sustainability are embedded within the headings above.**

To help highways and transportation professionals relate what they do at work to the generic standards in [UK-SPEC \(4<sup>th</sup> edition\)](#), we have produced a gap analysis exercise for eight different specialisms. This exercise should assist your understanding of what is required to succeed at the Professional Review stage.

You will be asked to choose which of the eight specialisms are applicable to you when making your application (*you may choose more than one*). To determine this, you should measure your engineering competence against the specialisms' criteria and see which one(s) are relevant to your career. You should be able to cover all the areas listed for your chosen specialism as these will be the areas assessed at the Professional Review stage.

At least one of your reviewers will be an expert in your declared specialism/s so it is important that you choose carefully.

- 1) Transport planning
- 2) Materials and geotechnics
- 3) Traffic management, safety and systems engineering
- 4) Infrastructure planning, design, construction and/or maintenance
- 5) Transport related structural engineering
- 6) Academic research, teaching, or training
- 7) Research and development in highways and transportation
- 8) Intelligent transport systems

The requirements for Competences A and B are different for each of the eight specialisms, but the requirements for Competences C, D and the one commitment E, are common to all disciplines.

You can use this guidance when completing your UK-SPEC Evidence Forms as part of your Portfolio of Evidence.

**INCORPORATED ENGINEER COMPETENCE STATEMENTS CONTEXTUALISED FOR HIGHWAYS & TRANSPORTATION SPECIALISMS**

**1 TRANSPORT PLANNING**

<b>A: Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.</b>	Sufficient experience (Y/N)
Understand the current position with Government policies for transport; & be able to interpret their significance within a more local application.	
Be familiar with the transport aspects of Regional Planning Guidance, the development planning system and Local Transport Plans.	
Be aware of the sources and trends in national transport statistics and be able to interpret their significance.	
Understand the statutory procedures and practices within which transport planning activities operate, and their significance to local applications.	
Understand the fundamentals of survey techniques and analysis, data synthesis, validation, predictive tools, calibration, appraisal methods, telematics, and audit procedures.	
Understand the basic statistical methods to plan and interpret data collection/analysis.	
Understand the capabilities of techniques to identify and interpret the future operational, economic, and environmental impacts of a range of transport projects.	
Be able to locate and evaluate the relevance of information from a variety of sources.	

<b>B: Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and recycle engineering processes, systems, services and products.</b>	Sufficient experience (Y/N)
Identify and describe, in both quantifiable and qualitative terms, standard problems and opportunities, and the significant factors that have a bearing on them.	
Develop measures that will help to solve problems and take advantage of opportunities.	
Promote measures that are practical, affordable, and deliverable, and identify the constraints that influence the application of such measures using relevant design guidance, advice, and best practice	
Be able to advise on the selection and then apply the appropriate techniques to assess the future operational, economic, environmental, social, and other impacts of suggested measures.	
Contribute to the determination of recommendations about the assessment and selection of measures.	
Have the ability to assess critically and constructively measures suggested by others, through mechanisms such as safety or user audits.	
Demonstrate responsibility for the detailed input used to deliver transport planning projects, from project feasibility studies and outline concepts, through initial design studies, public consultation and inquiry, detailed design and implementation stages.	
Design and execute simple methods to elicit reliable opinions from interested and involved parties.	
Design and implement methods of assessing the performance of measures against objectives and targets.	

## 2 MATERIALS AND GEOTECHNICS

<b>A: Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.</b>	Sufficient experience (Y/N)
Be familiar with relevant codes of practice and specifications applicable to the nature of the work and environment in which it is performed.	
Be aware of the sources and trends in local, national, and international utilisation of material resources, their exploitation, and sustainability and be able to interpret the significance of these factors in relation to construction and maintenance of the infrastructure.	
Be aware of the sources and trends in local, national, and international utilisation of material resources, their exploitation, and sustainability. Understand the statutory procedures and practices within which these activities are undertaken.	
Undertake data collection and interpretation; use predictive analyses and prepare guidance for users with clear explanations of critical factors that affect validity and completeness of data.	
Be competent with appropriate statistical methods to plan and interpret data collection/analysis.	
Be able to locate and evaluate the relevance of information from a variety of sources.	
Be familiar with relevant codes of practice and specifications applicable to the nature of the environment in which it is performed.	

<b>B: Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and recycle engineering processes, systems, services and products.</b>	Sufficient experience (Y/N)
Identify and describe, in both quantifiable and qualitative terms, standard problems and opportunities, and the significant factors that have a bearing on them.	
Develop possible measures that will influence problems and opportunities.	
Promote measures that are practical, affordable, and deliverable, and identify the constraints that influence the application of such measures using relevant design guidance, advice, and best practice.	
Advise on the selection and application of appropriate techniques to assess the future operational, economic, environmental, social, and other impacts of suggested measures.	
Contribute to the determination of recommendations about the assessment and selection of measures.	
Assess critically and constructively measures suggested by others, through mechanisms such as safety or user audits.	
Demonstrate some responsibility for detailed assessment of materials and geotechnical feasibility in relation to ground investigation, quality control, and pavement analysis/management.	
Design and implement methods of assessing the performance of control measures against contract procedures and specifications.	

### 3 TRAFFIC MANAGEMENT, SAFETY AND SYSTEMS ENGINEERING

<b>A: Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.</b>	Sufficient experience (Y/N)
Understand the current position with Government policies for transport; and be able to interpret their significance within a more local application.	
Be familiar with the transport aspects of Regional Planning Guidance, the development planning system and Local Transport Plans.	
Be aware of the sources and trends in national transport statistics, and be able to interpret their significance.	
Understand the statutory procedures and practices within which traffic management/system engineering activities operate, and their significance to local applications.	
Understanding the fundamentals of survey techniques and analysis, data synthesis, validation, predictive tools, calibration, traffic engineering appraisal methods, traffic control systems, intelligent transport systems, design tools and techniques, audit procedures, scheme costing and contract documents.	
Understand the basic statistical methods to plan and interpret data collection/analysis.	
Understand the capabilities of appraisal techniques to identify and interpret the future operational, economic, and environmental impacts of a range of transport projects.	
Be able to locate and evaluate the relevance of information from a variety of sources.	
Be knowledgeable about engineering solutions to road or rail transport problems.	

<b>B: Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and recycle engineering processes, systems, services and products.</b>	Sufficient experience (Y/N)
Identify and describe, in both quantifiable and qualitative terms, standard problems and opportunities, and the significant factors that have a bearing on them.	
Develop possible measures that will influence problems and take advantage of opportunities.	
Promote measures that are practical, affordable, and deliverable, and identify the constraints that influence the application of such measures using relevant design guidance, advice, and best practice.	
Advise on the selection and application of the appropriate techniques to assess the future operational, economic, environmental, and social and other impacts of suggested measures and to design appropriate engineering solutions to road or rail transport problems.	
Contribute to the determination of recommendations about the assessment, selection and design of measures.	
Assess critically and constructively measures suggested by others, through mechanisms such as safety or user audits.	
Demonstrate some responsibility for the detailed input used to deliver traffic management/system engineering projects, from project feasibility studies and outline concepts, through initial design studies, public consultation and inquiry, detailed design and implementation stages.	
Design and execute simple methods to elicit reliable opinions from interested and involved parties and to consult with the public on road or rail transport problems and proposed solutions.	
Design and implement methods of assessing the performance of measures against objectives and targets.	

**4 INFRASTRUCTURE PLANNING, DESIGN, CONSTRUCTION AND/OR MAINTENANCE**

<b>A: Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.</b>	Sufficient experience (Y/N)
Be aware of the forward planning process for new transport infrastructure schemes in economic, social, and environmental terms.	
Understand the current design and construction standards for new transport infrastructure schemes and the maintenance of existing transport infrastructure.	
Be aware of the assessment techniques to establish the condition of the existing transport infrastructure.	
Be competent with data collection and interpretation.	
Demonstrate experience of good practice in cyclic, routine, and emergency maintenance.	

<b>B: Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and recycle engineering processes, systems, services and products.</b>	Sufficient experience (Y/N)
Use appropriate processes to progress a new transport infrastructure scheme through the forward planning, legal order, design, contract and construction stages.	
Apply selected appropriate current standards and techniques to the process.	
Suggest innovative approaches to non-standard situations.	
Understand the rationale behind decisions taken.	
Be aware of the risk and health and safety implications of decisions taken.	
Demonstrate responsibility in the delivery of elements of new transport infrastructure projects.	
Demonstrate responsibility for elements of the assessment of the condition of existing transport infrastructure and of the evaluation and commissioning of appropriate maintenance solutions.	
Demonstrate assistance in the management of projects.	

## 5 TRANSPORT RELATED STRUCTURAL ENGINEERING

<b>A: Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.</b>	Sufficient experience (Y/N)
Be familiar with relevant codes of practice and specifications applicable to the nature of the work and environment in which it is performed.	
Be aware of the opportunities and problems associated with the creation and maintenance of sustainable structures.	
Understand the statutory procedures and practices within which the foregoing activities are undertaken. Contribute to the modification of such activities to be consistent with the regulatory and best practice framework.	
Be competent with appropriate statistical methods to plan and interpret data collection/analysis.	
Be able to locate and evaluate the relevance of information from a variety of sources.	

<b>B: Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and recycle engineering processes, systems, services and products.</b>	Sufficient experience (Y/N)
Identify and describe, in both quantifiable and qualitative terms, standard problems and opportunities, and the significant factors that have a bearing on them.	
Develop possible measures that will influence solution to problems and exploit opportunities to prolong structural life.	
Undertake data collection and interpretation, use predictive analyses and prepare guidance for users with clear explanations of critical factors that affect validity and completeness of data.	
Promote measures that are practical, affordable, and deliverable, and identify the constraints that influence the application of such measures using relevant design guidance, advice, and best practice.	
Advise on the selection and then apply the appropriate techniques to assess the future operational, economic, environmental, social, and other impacts of suggested measures.	
Contribute to the determination of recommendations about the assessment and selection of measures.	
Assess critically and constructively measures suggested by others, through mechanisms such as safety or user audits.	

## 6 ACADEMIC RESEARCH, TEACHING OR TRAINING

<b>A: Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.</b>	Sufficient experience (Y/N)
Be aware of current developments in policy and practice in relation to the fundamental principles of transport and related theory	
Be able to assemble and deliver elements of programmes of study to meet specified teaching and learning objectives, having regard to the health and safety of students and teachers	
Underpin such elements, whether in engineering or multidisciplinary programmes, with engineering principles and mathematical and statistical competence	
Take part in applying appropriate academic standards and principles of equity and justice in the selection, tutoring, assessment and qualification of students and trainees	
Contribute to systematic investigation at the frontiers of knowledge and to communicating the resulting findings effectively	
Be aware of sources of funding for teaching and training initiatives, for student support and for research	
Supervise project work giving students and trainees the experience of original investigation	
Understand the importance of moving towards sustainability and be able to take account of its implications for the application of technology	
Understand the basic statistical methods to plan data collection and interpret analysis of data	
Be able to locate and evaluate the relevance of information from a variety of sources	

<b>B: Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and recycle engineering processes, systems, services and products.</b>	Sufficient experience (Y/N)
Identify and describe, in both quantifiable and qualitative terms, standard problems and opportunities, and the significant factors that have a bearing on them	
Develop possible measures that will influence problems and take advantage of opportunities	
Promote measures that are practical, affordable and deliverable, and identify the constraints that influence the application of such measures using relevant design guidance, advice and best practice	
Advise on the selection and application of the appropriate techniques to assess the future operational, economic, environmental, social and other impacts of suggested measures and to design appropriate engineering implementations	
Assess measures suggested by others critically and constructively in terms of effectiveness, safety and contribution towards sustainability	
Design and implement methods of assessing the performance of measures against specifications, objectives or targets	
Use media of oral, audio and visual presentation, print and guided activity to provide students and trainees with effective learning experience	
Take part in implementing procedures of assessment through coursework, project work and written and oral examination	
Help to develop contacts with employers of students and trainees and to understand their requirements	
Contribute to original investigations leading to achievement of stated objectives and reporting of findings to sponsors and clients and by publication	
Use up to date research to update content of teaching and training	

## 7 RESEARCH AND DEVELOPMENT IN HIGHWAYS AND TRANSPORTATION

<b>A: Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.</b>	Sufficient experience (Y/N)
Be able to ascertain and summarise the current state of knowledge on any relevant topic	
Implement proposed innovative ways of addressing questions that have been identified for investigation	
Contribute to systematic investigation at the frontiers of knowledge	
Contribute to communicating the resulting findings effectively to employer, client or sponsor and by publication	
Recognise limitations in one's own skills and knowledge, and when effective investigation depends on additional skill or knowledge either acquire this or seek help from those who possess it	
Understand the importance of moving towards sustainability and be able to take account of its implications for the application of technology	
Be able to extend and develop the application of established methods of investigation	
Understand the basic statistical methods to plan data collection and interpret analysis of data	
Be able to locate and evaluate the relevance of information from a variety of sources	

<b>B: Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and recycle engineering processes, systems, services and products.</b>	Sufficient experience (Y/N)
Document reviews of existing knowledge clearly and completely with full bibliographic references	
Identify and describe, in quantifiable and qualitative terms, standard problems and opportunities, and significant factors that have a bearing on them	
Develop possible measures that will influence problems and take advantage of opportunities	
Be familiar with relevant design guidance, advice and best practice to promote measures that are practical, affordable and deliverable, and identify the constraints that influence the application of such measures	
Advise on the selection and application of appropriate techniques to assess the future operational, economic, environmental, social and other impacts of suggested measures and to design appropriate engineering implementations	
Assess measures suggested by others critically and constructively in terms of effectiveness, safety and contribution towards sustainability	
Design and implement methods of assessing the performance of measures against specifications, objectives or targets	
Execute lines of investigation that will confirm or refute stated hypotheses and/or measure or estimate unknown quantities to a required accuracy	
Carry out programmes of measurement or other data collection and the appropriate mathematical and statistical analysis of the resulting data	
Document investigations, measurements and other data and their analysis comprehensively and lucidly	

## 8 INTELLIGENT TRANSPORT SYSTEMS

<b>A: Use a combination of general and specialist engineering knowledge and understanding to apply existing and emerging technology.</b>	Sufficient experience (Y/N)
Understand the current position with Government policies for transport and be able to interpret their significance within a more local application	
Be familiar with the transport aspects of Regional Planning Guidance, the development planning system and Local Transport Plans	
Be aware of the key UK ITS organisations and the relationships between them	
Be aware of the need for system architectures and able to assist in their development	
Understand 'User Needs' and able to contribute to their interpretation as system requirements	
Understand the communications options available, support the development of an appropriate architecture and resolve or manage identified issues	
Understand the capabilities of the available systems, sub-systems, methods or techniques and technology for all relevant modes of transport	
Be aware of the limitations of the ITS systems and services and support measures to maintain benefit under abnormal conditions	
Be aware of emerging techniques and technologies	
Be able to prepare a cost-benefit assessment and be able to support the preparation of a business case and evaluation of an installed ITS system	

<b>B: Apply appropriate theoretical and practical methods to design, develop, manufacture, construct, commission, operate, maintain, decommission and recycle engineering processes, systems, services and products.</b>	Sufficient experience (Y/N)
Identify and describe, in both quantitative and qualitative terms, standard problems and opportunities and the significant factors that have a bearing on them	
Be familiar with the main building blocks of ITS including sensors and actuators, computing and memory, positioning technology, communications technology and human interfaces	
Develop methods and measures that will influence problems and make use of opportunities, with particular reference to the human element	
Be able to advise on the selection of the appropriate systems and functions to deliver the required services	
Contribute to the determining of recommendations for ITS functions	
Have the ability to assess critically and constructively the proposals of others by reference to ITS standards	
Demonstrate some responsibility for delivery or management of ITS systems at feasibility study, outline design, system requirements, system testing and commissioning, system operation	
Demonstrate some responsibility in developing stakeholders and other network managers co-operation to enable the creation of operational procedures	
Demonstrate responsibility for the capture and interpretation of performance measures	
Be able to support the evaluation of an installed ITS system	

**INCORPORATED ENGINEER MANAGEMENT COMPETENCIES  
(APPLICABLE TO ALL SPECIALISMS)**

<b>C PROVIDE TECHNICAL AND COMMERCIAL MANAGEMENT</b>	Sufficient experience (Y/N)
<b>C1 Plan the work and resources needed to enable effective implementation of engineering tasks and projects</b>	
Identify factors affecting the project implementation including safety and sustainability considerations	
Carry out holistic and systematic risk identification, assessment and management	
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, subcontractor, suppliers etc)	
<b>C2 Manage (organise, direct and control), programme or schedule, budget and resource elements of engineering tasks or projects</b>	
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 budget and take corrective action	
Evaluate performance and recommend improvement	
<b>C3 Manage teams, or the input of others, into own work and assist others to meet changing technical and management needs</b>	
Agree objectives and work plans with individuals	
Identify team and individual needs, and plan for their development	
Reinforce team commitment to professional standards	
Manage and support team and individual development	
Assess team and individual performance and provide feedback	
<b>C4 Take an active role in continuous quality improvement.</b>	
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	

<b>D DEMONSTRATE EFFECTIVE COMMUNICATION AND INTERPERSONAL SKILLS</b>	Sufficient experience (Y/N)
<b>D1 Communicate effectively with others, at all levels, in English</b>	
Contribute to, chair and record meetings and discussions	
Prepare communications, documents and reports on complex matters	
Exchange information and provide advice to technical and non-technical colleagues	
<b>D2 Clearly present and discuss proposals, justifications and conclusions</b>	
Prepare and deliver appropriate presentations	
Manage debates with audiences	
Feed the results back to improve the proposals	
Contribute to the awareness of risk	
<b>D3 Demonstrate personal and social skills and awareness of diversity and inclusion issues.</b>	
Know and manage own emotions, strengths and weaknesses	
Be aware of the needs and concerns of others, especially where related to diversity and inclusion	
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	

<b>E DEMONSTRATE A PERSONAL COMMITMENT TO PROFESSIONAL STANDARDS, RECOGNISING OBLIGATIONS TO SOCIETY, THE PROFESSION AND THE ENVIRONMENT</b>	Sufficient experience (Y/N)
<b>E1 Understand and comply with relevant codes of conduct</b>	
Understand and comply with CIHT's Code of Conduct.	
Manage work within all relevant legislation and regulatory frameworks, including social and employment legislation	
<b>E2 Understand the safety implications of their role and manage, apply and improve safe systems of work</b>	
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 and culture	
Manage, evaluate and improve these systems	
Apply a sound knowledge of health and safety regulations	
<b>E3 Understand the principles of sustainable development and apply them in their work</b>	
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	
Use resources efficiently and effectively	
<b>E4 Carry out and record the Continuing Professional Development (CPD) necessary to maintain and enhance competence in their own area of practice</b>	
Undertake reviews of own development needs	
Plan how to meet personal and organizational objectives	
Carry out planned (and unplanned) CPD activities	
Maintain evidence of competence development	
Evaluate CPD outcomes against any plans made	
Assist others with their own CPD	
<b>E5 Understand the ethical issues that may arise in their role and carry out their responsibilities in an ethical manner.</b>	