

Competence Profiles – Guidance for applicants and assessors

PART 2 – INDUSTRY CLASSIFICATION (Q) – RAILWAY ENGINEERING

1 Summary

The railway industry is complex and diverse, but encompasses many roles that will qualify its personnel for Chartered or Incorporated Engineer Registration. The railway industry is very safety orientated and all new and modified vehicles need to pass stringent checks to ensure that they conform to Railway Group Standards. Rolling Stock Acceptance. Companies have their own railway safety cases, which detail their commitment to safety and safe systems of work. The railway industry may provide many opportunities for mechanical engineers to achieve the competences necessary for corporate membership of the Institution. Across the various types of company within the industry, the following functions are likely to provide opportunities for exercising and demonstrating professional mechanical engineering competence: (1) Operations and depot management; (2) Maintenance and performance monitoring; (3) Design and modification work; (4) Procurement of technical equipment; (5) Safety engineering, and (6) Project engineers. It is perfectly possible for aspiring professional engineers to gain the range of experience necessary to develop the competences needed for registration. It is important to carefully assess applicants' personal responsibilities and competences, together with their direct input to projects in their work area and their degree of supervision.

Senior engineering posts within the railway industry should be considered as generally likely to meet the requirements for the class of Fellow. Examples of these are Engineering Director, Production Director, Department Manager. Applicants need to demonstrate a very high level of competence in each of the categories defined in UK-SPEC.

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3 Introduction

The railway industry is complex and diverse, but encompasses many roles that will qualify its personnel for Chartered or Incorporated Engineer Registration. The railway industry comprises many companies, large and small, as described below, who may contract with each other for support or for the provision of design and/or manufacture of traction and rolling stock. The interdependencies of the various companies need to be understood, and the demarcation between one specialist company and its customer is sometimes small, as companies tend to take on a more independent, business-led attitude to contractors, and to become more self-contained. The railway industry is very safety orientated and all new and modified vehicles need to pass stringent checks to ensure that they conform to Railway Group Standards. Rolling Stock Acceptance. Additionally, Notified Bodies check interaction with the signalling equipment and track clearances and adherence to Railway Group Standards. Companies have their own railway safety cases, which detail their commitment to safety and safe systems of work. The Railway Inspectorate oversees this process.

The following types of company within the rail industry will generally offer professionally qualified mechanical engineers the opportunity to fulfill the requirements for Membership and Professional Registration.

3.1 *Passenger Train Operating Companies*

These companies are train service providers, and are therefore particularly business orientated. They normally lease their traction and rolling stock from the Rolling Stock Companies but are responsible for day-to-day maintenance and performance. They will also be involved in developing new vehicle specifications and modifications. The engineers within these companies would be involved in maintenance at depot level as well as with contracts with other operators for maintenance. They would monitor performance and look at technical solutions to problems with in-house technical support or by contracts with the Train Engineering Service Companies. They would be involved in safety issues as well as the railway safety case and have ultimate safety responsibility for the vehicles that they operate. Direct train service provision contracts with vehicle suppliers have been introduced but this does not change ultimate safety and performance responsibilities for day-to-day services. Passenger Train Operating Companies are all members of the Association of Train Operation Companies (ATOC) who co-ordinate Graduate Engineer training for this group.

3.2 *Rolling Stock Companies*

These companies normally own the trains and lease them to the Train Operating Companies. They are responsible for the purchase of new vehicles, laying down a performance specification for the manufacturers to work to, in conjunction with the Train Operating Company concerned. They are also normally responsible for the heavy maintenance of the stock, although this may be part of the manufacturer's contract.

Engineers in these companies will be very commercially minded and will have a sound engineering background and a good understanding and expertise in the vehicles for which they are responsible. Much of the work will be undertaken by project managers and engineers working with the contractors in improving performance levels and residual values of complex equipment.

3.3 *Freight Train Operating Companies*

The Freight Companies generally own and maintain their own traction and rolling stock. They also own and manage their maintenance depots, for routine and even heavy maintenance. They tend to be more self-contained than the Passenger Train Operating Companies, with in-house technical support. They have technical buyers for new traction

and rolling stock as well as parts for the maintenance of a variety of complex technical equipment. Project managers and engineers will oversee the technical aspects of contracts, both for new build and for maintenance of old stock.

Engineers will be dealing with a variety of complex equipment and will need a good understanding and expertise in the vehicles that they own. They may manage maintenance depots, or give technical support and performance monitoring. They may also have their own engineers passed as a Vehicle Acceptance or Notified Body dealing with new vehicles and modifications to old stock. They will have their own railway safety case and will have ultimate safety responsibility for the vehicles that they operate and maintain.

3.4 Train Engineering Service Companies – Consultants

These companies provide detailed design and technical support by contract to all parts of the rail industry including financial institutions. Their engineers will have specialised knowledge of various aspects of traction and rolling stock design operation and maintenance. This will be for both new train design and modification work. This could be power equipment, braking equipment, structures, vehicle dynamics and mechanical or electrical equipment, etc. They may be a Vehicle Acceptance or Notified Body and give engineering support on this and also the technical work for the Rolling Stock Acceptance Bodies. The engineers will be qualified in their various specialist subjects and will cover all aspects of engineering. Independent audits and strategic feasibility studies are undertaken.

3.5 Infrastructure Companies

Network Rail is by far the largest of these in the railway industry and as well as owning the infrastructure (track, structure, stations, depots, electrification systems, signalling and control) is responsible for the maintenance of these assets and design and installation of new equipment.

Engineers deal with every aspect of the complex matrix of facilities and services and this includes design work, modification, project engineering and management, maintenance scheduling and train operation. Network Rail also own and operate an extensive fleet of infrastructure maintenance equipment, specialist machines, test trains, locomotives and wagons. All of these present many engineering challenges.

3.6 Traction & Rolling Stock Manufacturers and Suppliers

These companies were basically designers and manufacturers of new railway equipment. The new vehicles may be designed in-house, to a performance specification, and may be supplied with a maintenance contract as part of a train service provision contract.

Engineers in such companies may well have wide engineering experience in either manufacturing processes or design and maintenance, including project management of multi-discipline teams and component supply chains. Management of train maintenance is now common with recent new vehicle fleets.

3.7 On-Track Plant & Equipment Manufacturers

These companies are similar to traction & rolling stock manufacturers but design and build equipment to maintain the railway track and infrastructure. This includes tracklayers, ballast cleaners, track maintenance and aligning or other specialised equipment. Engineers in such companies may well have wide engineering experience in either manufacturing processes or design and maintenance, including project management.

4 Requirements for Membership and Professional Registration

It can be seen the railway industry may provide many opportunities for mechanical engineers to achieve the competences necessary for corporate membership of the Institution. Engineers may start their careers in technician roles or as graduates training on one of the many formal engineering development schemes.

Structured training of engineers can be difficult in some of the smaller companies, as they are unable to provide a broad enough training programme, although training partnerships are often formed between companies that allow new trainees to reach technician, Incorporated or Chartered registration by acquiring a foundation in the necessary skills. To assist this, the IMechE Engineering Passport Scheme has been adopted by the rail industry to encourage experience development. The alternative for many aspiring graduate engineers is to seek promotion in another company to provide the necessary breadth of experience.

5 Assessment of Competence

Across the various types of company within the industry, the following functions are likely to provide opportunities for exercising and demonstrating professional mechanical engineering competence:

- Operations and depot management
- Maintenance and performance monitoring
- Design and modification work
- Procurement of technical equipment
- Safety engineering
- Project engineers

It is perfectly possible for aspiring professional engineers to gain the range of experience necessary to develop the competences needed for registration. It is important to carefully assess applicants' personal responsibilities and competences, together with their direct input to projects in their work area and their degree of supervision. In addition, clear and comprehensive organisation charts should be interpreted in relation to the company.

5.1 Competence statements A and B

Successful applicants will be able to demonstrate their use of a combination of general and specialist engineering knowledge and understanding within the railway industry, be it in operations, maintenance, design or other areas outlined above.

Applicants engaged primarily in project engineering or management should provide, and assessors should seek, evidence of responsibility for technical specifications, technical risk management, or personal involvement in technical solutions and design standards.

Examples of situations or activities that may give mechanical engineers the opportunity to achieve and demonstrate professional competence in these areas include: -

- Theoretical studies in design or operational problems in traction and rolling stock, either in a design and/or manufacturing environment or in a support role for an operating company.
- Participation in evolution, development, manufacture, testing and commissioning of new designs of traction and rolling stock, including

performance evaluation and the investigation of operational failures. Examples include novel solutions to ride performance, engine or braking problems and modifications to existing equipment, as well as the development of heavy overhaul or modification packages.

- Problem solving at depot level with production of solutions to operational failures and more cost-effective maintenance.

5.2 Competence statement C

Many roles in the railway industry give the opportunity to develop competences in this area. Applicants need to demonstrate their particular engineering skills and personal responsibilities at the level that they have reached, and their relationship with their colleagues and superiors.

Examples of situations or activities that may give mechanical engineers the opportunity to achieve and demonstrate professional competence in these areas include: -

- The planning and personal supervision of new builds and or major modifications to existing traction and rolling stock.
- Active participation in design review and performance reviews which establish improvement action plans.
- The periodic review of maintenance schedules for traction or rolling stock and responsibility for changes to schedules.
- The supervision of technical staff involved in problem solving.
- The management of maintenance depot activities, with added responsibility for performance of traction or rolling stock.

5.3 Competence statement D

Communication and interpersonal skills should be assessed by consideration of both the Professional Review Report and interview performance. Assessors should look out for a report which has a logical structure, clearly aimed at presenting a portfolio of evidence against each of the five competence statements, while providing a qualitative description of activities and achievements with clear personal influence factors.

With MPDS applicants, reports submitted should clearly include the evidence required relating to communication skills. Assessment of verbal communication skills should analyse the ability to give clear, concise and relevant answers which address the question without undue digression and provide sufficient, but not superfluous detail.

Additional evidence of competence in this area may be sought by investigating: -

- Whether the applicant routinely makes presentations to in-house management at various levels, outside clients and contractors; subjects could include project plans, resolution of problems etc.

- Whether the applicant is involved in contract liaison and negotiations, systems, procedures, method statements, safety cases, etc.

5.4 Competence statement E

The observance of safe working procedures, including compliance with Railway Group Standards, and Safety directives is inherent in virtually all engineering activities within the railway industry. Similarly, there are codes which cover the design and manufacture of all major plant components. Applicants should be able to demonstrate their knowledge and commitment to the use of any such codes that are relevant.

Evidence of professional integrity and commitment should include a Self-Development Action Plan, in any convenient format, outlining how the applicant intends to maintain and enhance competence through personal development. The Plan should include short, medium and long term goals and explain how these are likely to be achieved. Assessors should be aware that UKPSEC interprets Continuing Professional Development (CPD) as commencing at the point where Chartered status is attained; therefore applicants are not required to provide a record of courses attended, etc., when applying for corporate membership and professional registration.

Examples or CPD activities recognised by the Institution as acceptable include:

- Extra qualifications such as an MBA, Diploma in Engineering Management
- Any relevant technical or business courses
- Conducting or attending workshops
- Attending, presenting or participating in seminars and conferences
- Presenting or attending lectures
- Writing technical papers
- Reading technical articles and journals
- Secondments and job rotation
- Updating in own and other fields of work
- Institution meetings or events
- Active IMechE committee work
- Learning a foreign language
- Involvement in government activities
- Community and charity work
- Activities indicating actions to keep abreast of current and emerging technologies.

6 Requirements for Fellowship

Senior engineering posts within the railway industry should be considered as generally likely to meet the requirements for the class of Fellow. Examples of these are Engineering Director, Production Director, Department Manager. Applicants need to demonstrate a very high level of competence in each of the categories defined in UK-SPEC.

Applicants will generally have significant responsibilities for resources (both financial and manpower) and also have wide understanding of strategic, commercial and financial issues. They may well be experts in their particular fields, e.g. the traction and rolling stock that their company owns, operates or manufactures, and "champions" for their directorate, company or industry sector.

Valid applications for election or transfer to Fellow may be received from other engineers with established reputations in important positions of responsibility in engineering science or practice. This applies to engineers both in operating companies and in companies which design and/or manufacture equipment. In addition to demonstration of achievements and standing in their field of engineering science or practice, applicants would be expected to participate in external forums, for example by promoting the importance of engineering issues in debate with Government and other bodies, via the Institution. In any case, an involvement in the professional development of young engineers would be expected, as would documentary evidence of Continuing Professional Development.

Further examples of suitable CPD activities not covered under the requirement for Competence Statement E above include:

- MPDS mentoring
- Acting as an IMechE Membership Panel interviewer
- Active participation in Institution committees

For candidates applying directly for the class of Fellow, a Professional Review Report similar to that required for the class of Member would be required in addition to an interview. In particular, this report must contain additional supporting evidence detailing:

- The position of senior engineering responsibility held by the applicant
- The applicant's contribution to the professional development of young engineers
- How the applicant intends to keep up to date regarding developing technologies, from both a technical and a commercial standpoint.

Finally, a Development Action Plan detailing a future programme of CPD would be required from all applicants.