

Railway Engineering Design Technician Apprenticeship

Assessment Strategy

Overview

The Railway Engineering Design Technician Apprenticeship is seen as an integrated programme of knowledge and skills acquisition alongside developing confidence and maturity.

The assessment strategy will ensure that candidates can progress towards the achievement of Eng Tech registration with the relevant PEI as the first step in a career as a professional engineer. Engineering Technician is an internationally recognised benchmark of competence with associated postnominal - EngTech.

In pursuing the EngTech benchmark, an apprentice will be assessed against four distinct development goals.

- *Goal 1:* They are fit to work in a safety critical design and engineering environment and understand the safety, rigour and responsibility of so doing.
- *Goal 2:* They have the skills and knowledge to understand the foundations of communication, problem solving, CAD, project administration and the science, maths and engineering that underpins the design of railway systems and components.
- *Goal 3:* They have gained experience in and can apply their knowledge across a range of subjects. As such they are able to support teams in the design of components and sub-assemblies for railway systems. They are sufficiently self-aware to know their limitations and when they need to develop new skills and ask for help.
- *Goal 4:* They can exercise judgment, independence and confidence as a design engineering technician and are a productive member of a team.

The apprentices will demonstrate their progress through a combination of written/on-line examinations, documented development reviews with experienced professionals (appraisals), the completion of work based projects, and the maintenance of a portfolio of evidence. These will be supervised by in-company verifiers and tested by external assessors.

The synoptic end point assessment will be based on the portfolio of evidence and the completion of a series of short structured reports. Before applying for the end point assessment the apprentice will need to demonstrate that they have successfully completed all aspects of their apprenticeship. The assessment will demonstrate that the apprentice can apply their knowledge, skills and behaviours in an integrated way and will satisfy the requirements for registration as an Engineering Technician by the relevant Professional Engineering Institution. The portfolio and reports will be reviewed by at least two engineers nominated by the relevant Professional Engineering Institution. Benchmarking the end point assessment against the Engineering Council UKSPEC requirements for EngTech means that the assessment outcomes will be consistent and reliable, allowing a fair and proper comparison between apprentices employed in different types and sizes of organisations.

What will be assessed

The detailed plan of what will be assessed is set out in a table later in this assessment strategy.

Assessment Methods

The assessment of the apprenticeship will be in two stages

- *Formative* – to monitor progress in the acquisition of both knowledge and competence
- *Summative* – the synoptic end point assessment

Formative Assessment

1 Knowledge

The Employer Trailblazer Group is working with an Awarding Body to develop a new qualification which is, in the main, the bringing together of appropriate units from a range of existing Level 3 qualifications. The qualification will be the recommended means for the delivery of the knowledge elements of the Apprenticeship Standard. The assessment strategy adopted for the qualification will be that already in place for the existing qualifications including a mix of centre marked assignments, online and written tests subject to internal and external verification. The difference is that the employers, working as a group, will where appropriate, be writing the assignments in order that they are properly contextualised and ensure consistency across providers. The assignments will be submitted to the Independent Assessment Authority(ies) for validation against their published standards and quality requirements.

Where the knowledge component is best delivered by the employer in conjunction with the development of skills this will be assessed via the portfolio of evidence and as such subject to the same external validation and quality assurance.

2 Competence

The assessment of competence will be carried out in the workplace and be evidenced via a portfolio of evidence. The evidence will take a number of forms consistent with the skills being assessed. These could include

- Products such as drawings, reports, presentations
- Reflective accounts/personal statements
- Professional discussion
- Expert witness evidence/testimony
- Observation

As the portfolio will be submitted as part of the synoptic end point assessment it is important that it acts as a record of an apprentice's development as set out in the four goals as well as achievement of individual elements of knowledge and skill. To provide evidence for this the apprentice will be expected to complete a series of six monthly short reports demonstrating how they have integrated the knowledge and skills they have acquired to contribute to a workplace project. These reports will be the subject of a professional discussion with the assessor and workplace mentor. The reports are not the same as the structured reports required as part of the end point assessment but will provide valuable experience for the apprentice and a source to draw from when compiling the end point assessment reports.

The internal assessment of the portfolio will be by occupationally competent staff from within the companies. By occupationally competent we mean people with a relevant professional qualification registered as either EngTech, IEng or CEng. The completed and signed off portfolio will form part of the end point assessment.

3 Behaviours

The behaviours will be assessed via the employers' internal mentoring and appraisal systems and be tracked via a 360° appraisal applied at the end of each year. Evidence will also be available via the portfolio of evidence.

Independence and impartiality

Individual employers will appoint their own Independent Assessment Authority to lead on the formative assessment. In the case that employers choose to use different Independent Assessment Authorities such that there is more than one Independent Assessment Authority working in the sector they will be required to demonstrate a consistent approach to the validation and external verification of all aspects of the apprenticeship.

Consistency and reliability of the formative assessment

This will be achieved through

- The appointment, by the employers, of training provider(s) to oversee the delivery of apprenticeship programme as a whole. The performance management of the training provider(s) will be via a Service Level Agreement.
- The employers will, collectively, be writing a number of the assignments to ensure consistency and proper contextualisation of learning. The assignments will be submitted to the Independent Assessment Authority(ies) for validation against their published standards and quality requirements.
- All occupationally competent company mentors will be expected to attend a standardisation workshop run by the Independent Assessment Authority(ies) and the Professional Engineering Institutions.
- The range of assessments which ensures that an apprentice cannot pass this standard without undertaking independent rigorous and un-biased assessment.
- The role of the Independent Assessment Authority(ies) will be to ensure, via external moderation, the consistency and reliability of the evidence of both the knowledge and skill achievement. In the case that employers choose to use different Independent Assessment Authorities such that that there is more than one Independent Assessment Authority working in the sector they will be required to demonstrate a consistent approach to validation and the external verification of all aspects of the apprenticeship.

External Quality Assurance

External quality assurance will be provided by the Engineering Council, working in partnership with the IfA.

Synoptic End Point Assessment

An apprentice will need to demonstrate that they have successfully completed all aspects of their apprenticeship before they are able to apply for the end point assessment. The decision as to when the apprentice is ready to undertake the end point assessment will be made by the employer and the training provider and formalized in a letter signed by the employer, the training provider and the approved assessment Authority(ies). The employer will then submit the letter to the Professional Engineering Institution. Without this letter any submitted end point assessment will be considered to be invalid.

The synoptic end point assessment will be carried out by the relevant Professional Engineering Institution and will be based on two elements

- A **portfolio of evidence** signed off by the Independent Assessment Authority(ies) as meeting the required standard
- The completion of a series of short **structured reports** (separate from the six monthly reports produced as part of the portfolio of evidence) which demonstrate that the apprentice can apply their knowledge, skills and behaviours in an integrated way and satisfy the requirements for registration as an Engineering Technician by the relevant Professional Engineering Institution. The reports are based on those requested in the EngTechNow EngTech Registration Form which has been

developed as part of the EngTechNow initiative supported by ICE, IET and IMechE, the three professional bodies that have approved the Railway Engineering Design Technician Apprenticeship Standard. These are the synoptic assessment questions from the form

- Give an example of a project or task where you solved a technical problem, explaining your role and how you selected the appropriate techniques, procedures and methods used. Tell us about any scientific, technical or engineering principles you used and how you reported or made recommendations on what you did to your employer or other people involved such as clients or suppliers. Include anything you did to prevent harm to people, equipment or data.
- Give an example of how you have identified, planned, and organised the resources needed to effectively complete a project, explaining how you took into consideration cost, quality, safety and any environmental impact. Remember to think about what equipment was used, how data was gathered and analysed and how you initiated the project to produce the desired outcome
- Give an example of how you have complied with the Institution's Code of Conduct, how you keep in touch with developments in your technical area and how you have continued to develop your knowledge and skills?

In the reports the apprentice will demonstrate that they can work in an integrated way bringing together knowledge, skills and behaviours from across the Apprenticeship Standard.

The reports will be counter signed by a registered member of a Professional Engineering Institution (EngTech, IEng or CEng) who will verify that the work described has been carried out by the apprentice.

Carrying out the synoptic end point assessment

The portfolio and the reports will be reviewed by at least two engineers nominated by the Professional Engineering Institution (PEI). The nominated reviewers will not be connected to either the employer or the apprentice. The reviewers will have undertaken the relevant training as required by their PEI and subject to the PEI's quality assurance process. This is a tried and tested process within the PEIs which are licensed by the Engineering Council, the UK regulatory body for the engineering profession. Licensed institutions are deemed to have sufficient experience, procedures and resources to undertake and quality assure the assessment of the competence and commitment necessary to satisfy the requirements for registration as an Engineering Technician. The quality assurance of the end point assessment will be carried out by the Professional Engineering Institutions in their role as licensees of the Engineering Council.

Benchmarking the end point assessment against the Engineering Council UKSPEC requirements for EngTech means that the assessment outcomes will be consistent and reliable, allowing a fair and proper comparison between apprentices employed in different types and sizes of organisations.

Professional Registration

On successful completion of the apprenticeship the apprentice will have satisfied the requirements for registration as an Engineering Technician such that they can, if they so wish, apply for membership of the relevant PEI.

Weighting and Grading

The employers are of the view that all the knowledge and skills set out in the standard are of equal importance and therefore should be equally weighted.

The knowledge based assessments should be graded, with outcomes on a scale that includes Pass, Merit and Distinction. These will appear on the Apprenticeship Certificate. The signed off and externally verified portfolio of evidence will show that the apprentice has been comprehensively and fairly assessed at the requisite level against all of the skill statements in the delivery plan. All elements will be recorded on the

final Apprenticeship Certificate, clearly showing the grades for knowledge and also the outcome of the skills assessment. There will no overall grade assigned to the apprenticeship in line with the Apprenticeship Standard which states that achievement of the apprenticeship will satisfy the requirements for Engineering Technician registration which is a binary pass/fail benchmark.

Plans for delivery

At the outset of the apprenticeship it is important that the apprentices gain an awareness and a 'hands-on' practical understanding of the fundamental principles in track, civil engineering, structures, traction, signalling mechanical and electrical equipment and plant and how each of these interface with the others. The recommendation is that this is achieved through the apprentices attending a week long residential course.

As it currently stands the knowledge delivery will consist of

- A recommended level 3 qualification which brings together appropriate engineering units many of which can be delivered using existing local modes of delivery for the knowledge elements set out in the Apprenticeship Standard.
- Specialist technical units which will probably need to be delivered on a block release basis using specialist staff.
- Elements that are best delivered by the employer in conjunction with the development of associated skills.
- Specialist webinars delivered by employers

The portfolio will provide evidence that the apprentice has

- acquired all the skills as set out in the standard
- demonstrated that they meet the four development goals through a series of reflective reports and professional discussion

The nature of competency assessment means that the assessment must be over a period of time matching the 4 development goals detailed in this assessment strategy. It is recognised that the learners will need to demonstrate a varying level and increasing depth of competence as the programme progresses. Some of the standards will require specialist assessor competence to ensure that evidence provided is valid.

To ensure that the learner's progress through the standard is captured effectively and required evidence is collected not only to achieve the standard but also to put the learner in the best place to gain professional recognition by the professional bodies will require a mentoring approach. The assessment visits are likely to include all that is normally expected by assessment and review visits but in addition the assessor will work directly with the apprentices mentor to identify any knowledge or competency development issues. This again will require an assessor who has both the assessment and technical skills to ensure the best support for the apprentice and the employer

Whilst recognising the importance of the role of the mentor/assessor, the delivery plan will also seek to maximise the use of technology to support a dispersed learner population such as an e-portfolio, use of a virtual learning environment for learning materials, assignments and webinars. Given the importance of ensuring consistency and reliability of delivery and assessment of what is a fairly complex programme the employers are seeking to work with training providers to run the programme, sub-contracting elements as appropriate.

The major costs for delivering the programme are

- the initial fundamental principles residential course
- the delivery of the knowledge component
- the ongoing support and progress monitoring of the individual apprentices
- the quality assurance of all the processes involved in the delivery.

The cost of the apprenticeship is currently estimated to be of the order of £20,000.

The cost of the end point assessment is currently estimated to be of the order of £80.00. The cost takes into account that the end point assessment is using a tried and tested process within the PEIs. As such they already have sufficient experience, procedures and resources to undertake the assessment of the competence and commitment necessary to satisfy the requirements for registration as an Engineering Technician.

Supporting Information

Letters of support have been received from ICE, IET and IMechE

Detailed Delivery Plan

	Assessment Methods
K1. The different techniques and methods used to design infrastructure, systems and equipment for use by rail transport systems.	
K1.1 How ideas and requirements are converted into engineering specifications and designs. This is likely to include knowledge of BIM and CAD and the limitations and advantages of such tools.	Centre marked assignments/tests
K1.2 Discipline specific methods for surveying, constructing, installing, testing and inspecting.	Centre marked assignments/tests
K1.3 Industry codes, company standards/procedures, contracts and specifications (for example BS, NWR, GRIP, RIA and LU standards) and when each applies.	Portfolio of evidence
K1.4 Approaches to technical assurance which will include checking and approval processes.	Portfolio of evidence
K2. The appropriate scientific, technical and engineering principles relating to rail transport systems,	
K2.1 The fundamental principles in track, civil engineering, structures, traction, signaling mechanical and electrical equipment and plant and how each of these interface with the others	Centre marked assignments/tests
K2.2 Basic electrical and mechanical engineering theory.	Centre marked assignments/tests
K2.3 Basic materials science.	Centre marked assignments/tests
K2.4 Mathematical and scientific knowledge and techniques used to support the design process.	Centre marked assignments/tests
K2.5 The principles, theories and parameters of design including risk and failure modes and how these can be mitigated.	Centre marked assignments/tests
K3. How to work effectively and contribute to engineering solutions by the correct use of resources and time.	
K3.1 Quality management and assurance systems as applied to the design process	Portfolio of evidence
K3.2 Project management systems, tools and techniques as applied or appropriate	Centre marked assignments/tests
K3.3 Change and document control procedures including EDMS	Portfolio of evidence
K3.4 Time management within overall programme of work	Portfolio of evidence
K3.5 The commercial, construction and technical constraints on a design	Portfolio of evidence

	Assessment Methods
K4. How to communicate effectively using a range of techniques,	
K4.1 Different communication methods (drawings, reports, presentations etc) and when to use each one.	Centre marked assignments/tests
K4.2 Structure of technical reports and how to write them.	Portfolio of evidence
K4.3 Technical drawing conventions and engineering terminology.	Centre marked assignments/tests
K4.4 Collaboration platforms and effective team working	Portfolio of evidence
K5. The code of conduct of relevant professional bodies and institutions.	
K 5 Knowledge of the Code of Conduct and the responsibilities it imposes on the individual	Portfolio of evidence
K6. Safe working practices and how to comply with them,	
K6.1 Relevant health and safety legislation including CDM The range of procedures (HSE, client, company) that apply and how they interact	Centre marked assignments/tests
K6.2 Assessment and mitigation of risks to health and safety	Centre marked assignments/tests
K6.3 Typical hazards associated with designing for and working on the rail system (e.g. personal track safety, safe lifting and manual handling and electrical safety and possession management)	Personal Track Safety Certificate
K7. Sustainable development and their own contribution to economic, environmental and social wellbeing	
K7.1 The contribution of rail transport to a country's sustainability.	Centre marked assignments/tests
K7.2 Awareness of company and client sustainability and environmental policies and their impact on design	Portfolio of evidence
K7.3 Awareness of Environmental Impact Assessment.	Portfolio of evidence
K8. Sources of and approaches to CPD	
K8.1 Appraisal schemes including appropriate training and development plans	Portfolio of evidence
K8.2 CPD obligations and competency requirements	Portfolio of evidence
K9. Ethics and their application in design by which we mean understanding	
K9.1 Protection of client confidentiality	Portfolio of evidence

	Assessment Methods
K9.2 Adherence to corporate policies on ethics and diversity	Portfolio of evidence
S1. Use appropriate scientific, technical and engineering principles, techniques and methods to contribute to the design of infrastructure, systems and equipment for the rail transport system.	
S1.1 Locate and apply technical information and standards	Portfolio of evidence
S1.2 Draft produce and check calculations, drawings, plans, schedules, specifications and reports to the required format and necessary standard.	Portfolio of evidence
S1.3 Operate and use appropriate software systems for CAD, BIM and Project Management	Portfolio of evidence
S1.4 Assist with site survey and inspections	Portfolio of evidence
S2. Work effectively and contribute to produce engineering solutions by the correct use of resources and time.	
S2.1 Contribute to identifying, analysing, developing, optimising and finalising solutions to engineering problems	Portfolio of evidence
S2.2 Read and interpret design documents, check requirements and ensure standards are met	Portfolio of evidence
S2.3 Follow technical procedures	Portfolio of evidence
S2.4 Work within programme and to budget,	Portfolio of evidence
S3. Manage work and maintain the quality of their own work and that of others. By which we mean, they can:	
S3.1 Assess the task to be done, plan/schedule work and manage time	Portfolio of evidence
S3.2 Maintain the flow of information so the work can be completed on time	Portfolio of evidence
S3.3 Prioritise and decide when to allocate work to other people	Portfolio of evidence
S3.4 Check work at an appropriate level and against appropriate standards and specifications	Portfolio of evidence
S3.5 Organise, participate in and record meetings	Portfolio of evidence
S3.6 Protect client confidentiality	Portfolio of evidence
S3.7 Adhere to corporate policies on ethics and diversity	Portfolio of evidence

S4. Communicate effectively within a team using a range of techniques, and the correct terms.	
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	Assessment Methods
S4.1 Use "Office" type applications such as spreadsheets, word processors and presentation packages.	Portfolio of evidence
S4.2 Present information to technical and non-technical audiences	Portfolio of evidence
S4.3 Write technical reports to agreed standards and formats	Portfolio of evidence
S4.4 Produce drawings and technical specifications to agreed standards and formats	Portfolio of evidence
S4.5 Clearly communicate their ideas and questions verbally using the correct terms	Portfolio of evidence
S4.6 Use appropriate systems to communicate with colleagues and clients.	Portfolio of evidence
S4.7 Can record and communicate messages with correct level of urgency	Portfolio of evidence
S5. Keep themselves and others safe by adhering to safe practices.	
S5.1 Identify hazards and assess risks	Portfolio of evidence
S5.2 Follow safe systems of work	Portfolio of evidence
S5.3 Hold appropriate competency certifications	Portfolio of evidence
S5.4 Adhere to all company safety policies	Portfolio of evidence
S6. Undertake engineering design work in a way that contributes to sustainable development.	
S6.1 Contribute to the sustainable elements of the design process	Portfolio of evidence
S6.2 Contribute to Environmental Impact Assessment	Portfolio of evidence
S7. Maintain their own skills base and learning.	
S7.1 Identify training needs and set out training action plans	Portfolio of evidence
S7.2 Maintain evidence of competence achievement	Portfolio of evidence
S7.3 Evaluate achievements and review against development needs	Portfolio of evidence
S7.4 Comply with the code of conduct set out by their institution	Portfolio of evidence