End-point assessment plan for Materials Process Engineer Degree apprenticeship standard

Apprenticeship standard number	Level of this end point assessment (EPA)	Integrated
ST0659	7	Non- integrated degree apprenticeship

Contents.

Introduction and overview

This document sets out the requirements for end-point assessment (EPA) for the Materials process engineer (Degree) apprenticeship standard. It is for end-point assessment organisations (EPAOs) who need to know how EPA for this apprenticeship must operate. It will also be of interest to materials process engineer (Degree) apprentices, their employers and training providers.

Full time apprentices will typically spend 24 months on-programme (before the gateway) working towards the occupational standard and complete the required amount of off-the-job training in line with the apprenticeship funding rules. All apprentices will spend a minimum of 12 months on-programme.

The EPA period should only start, and the EPA be arranged, once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, all of the pre-requisite gateway requirements for EPA have been met and that they can be evidenced to an EPAO. All pre-requisites for EPA assessment methods must also be complete and available for the assessor as necessary.

An approved EPAO must conduct the EPA for this apprenticeship. Employers must work with the training provider to select an approved EPAO from the apprenticeship providers and assessment register (APAR).

As a gateway requirement and prior to taking the EPA, apprentices must complete all approved qualifications mandated in the materials process engineer (Degree) standard.

These are:

- Manufacturing Technology and Management MSc
- achieved English and mathematics qualifications in line with the apprenticeship funding rules

The EPA must be completed within an EPA period lasting a maximum of 9 month(s), beginning when the apprentice has passed the EPA gateway.

The EPA consists of 3 discrete assessment methods.

The individual assessment methods will have the following grades:

Assessment method 1: work based project and presentation

· pass
· distinction
· fail

Assessment method 2: professional review

· pass
· distinction
· fail

Assessment method 3: knowledge and skills test

· pass
· fail

Performance in the EPA will determine the overall apprenticeship standard and grade of:

· pass
· fail
· distinction

EPA summary table

On-programme (typically 24 months)	Training to develop the occupation standard's knowledge, skills and behaviours.
End-point Assessment Gateway	Employer is satisfied the apprentice is consistently working at, or above, the level of the occupational standard. Complete training towards English and mathematics qualifications in line with the apprenticeship funding rules Apprentices must complete the following approved qualifications mandated in the standard: • Manufacturing Technology and Management MSc
End Point Assessment (which would typically take 9 months)	Assessment Method 1: work based project and presentation With the following grades: · pass · distinction · fail Assessment Method 2: professional review With the following grades: · pass · distinction · fail Assessment Method 3: knowledge and skills test With the following grades: · pass · fail

Professional recognition	Aligns with recognition by: Institute of Materials, Minerals and Mining Institution of Mechanical Engineers The Welding Institute Chartered Society of Designers Institute of Metal Finishing Institute of Cast Metal Engineers

Length of end-point assessment period:

The EPA must be completed within an EPA period lasting a maximum of 9 month(s), beginning when the apprentice has passed the EPA gateway.

Order of assessment methods

The assessment methods need to be delivered in the following order:

1. AM3 should be completed first. AM1 and AM2 can be administered in any order and are likely to be carried out simultaneously with AM1 commencing as soon as the project outline has been agreed.

The reason for this order is:

AM3 is the most cost effective method to confirm competency of the knowledge and skills assigned to this method of assessment. For this reason, it needs to be passed first as this mitigates the risk of launching a project if the individual does not possess the complementary underpinning knowledge that supports the other assessment methods.

The assessment methods need to be delivered in the order shown in the table below.

The method that needs to be passed first is in ‘A' column and the method(s) that need to be passed subsequently in the ‘B' (and ‘C’) column(s).

A	B	C	Reason for this
AM3			As outlined above.

Gateway

The EPA period should only start once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, that is to say they are deemed to have achieved occupational competence. In making this decision, the employer may take advice from the apprentice’s training provider(s), but the decision must ultimately be made solely by the employer.

In addition to the employer's confirmation that the apprentice is working at or above the level in the occupational standard, the apprentice must have completed the following gateway requirements prior to beginning EPA:

English and mathematics qualifications in line with the apprenticeship funding rules

Apprentices must complete the following approved qualifications as mandated in the standard:

- Manufacturing Technology and Management MSc

Assessment methods

Assessment Method 1: work based project and presentation (This method has 2 components.)

Method 1 Component 1: work based project

Overview

The project is compiled after the apprentice has gone through the gateway process.

The work-based project should be designed to ensure that the apprentice's work meets the needs of the business, is relevant to their role and allows the relevant KSBs to be demonstrated for the EPA. Therefore the project's subject, title and scope will be agreed between the employer and the EPAO at the gateway. The employer will ensure it has a real business application and the EPAO will ensure it meets the requirements of the EPA (including suitable coverage of the KSBs assigned to this assessment method). The EPAO and employer should sign-off the project title to confirm its suitability at the gateway and prior to the project commencing. The following should be agreed at the gateway as minimum requirements for the final project report:

1. Background
2. Outline of the issue or opportunity
3. Justification for the project
4. Evidence of effective research
5. Potential benefits (cost saving, improved productivity, quality) and drawbacks including commercial, contractual and organisational etc.
6. Potential risks
7. Consideration of legislation, regulation, industry and organisational policies, procedures and requirements
8. Proposed plan for implementation and work breakdown structure
9. Stakeholder engagement
10. Measures of success

The rationale for this assessment method is:

This assessment method has been selected as it is the most valid. Individuals in this occupation will be deployed on project work, and projects will be lengthy in duration (typically around six months). This

method will enable apprentices to demonstrate a range of KSBs on a real piece of work which will add value to their employer. Employers have stated that any project that delivers real margin benefit to the business will be wholeheartedly supported by businesses. This means it is also cost effective.

Delivery

Apprentices will conduct a project in the form of an employment based assignment.
The project is compiled after the apprentice has gone through the gateway process. The apprentice will conduct their project and submit it to the EPAO after a maximum of 30 week(s) of the EPA start date.

The employer will ensure the apprentice has sufficient time and the necessary resources, within this period, to plan and undertake the project.

Whilst completing the project, the apprentice should be subject to the supervision arrangements outlined below:
Normal line management controls. The apprentice may work as part of a team which could include technical internal or external support however the report will be the apprentices own work and will be reflective of their own role and contribution.

The project should be in the form of electronic paper based report.

The project may be based on any of the following:

- a specific problem
- a recurring issue
- an idea/opportunity
- an improvement opportunity

All projects must include:

Report
Apprentices must produce a report of 8,000 words (+/- 10%), excluding references, appendices and diagrams, based on a work-based project, which relates to their option specialism. The report must include a one-page summary outlining recommendations (included in the word count). The project must provide an opportunity for the apprentice to provide evidence of the core knowledge, skills and behaviours and the optional knowledge and skills depending on the apprentice's job role.
The work-based project must be detailed in a project outline and agreed by the apprentice's employer and EPAO as a gateway requirement and the time period will start once this has been agreed. Ideally, the project should aid the employer's business. All work relating to the project and report write-up, must be completed during the EPA period, excluding preliminary research to inform the project outline.
The aim of the project must be: to provide significant engineering advantage, address an engineering or business issue, provide business benefit(s) or deliver step change(s) in business performance. The scope must include problem definition, team structure and plan, research methodology, data analysis, discussion, stakeholder communications, findings and recommendations.
The project must include the following:

- a summary of the project and the apprentice's role and level of responsibility
- the key issues or challenges on the project
- the practical application of knowledge, skills and behaviours
- the options considered, solutions identified and reasons why some options were not feasible
- what the apprentice achieved and how this was achieved
- verification by the apprentice's employer that the project is a true reflection of the apprentice's involvement and that the report is their own work.

Example project titles include:

Yield improvement and Design for Zero Defects (DZD)
Process Equipment Optimisation for improved efficiency and quality

Process Failure Mode Effect Analysis applied to a manufacturing process
Application of problem solving techniques to manufacturing processes.
Application of New Product and process Introduction in manufacturing engineering
Design of manufacturing methods incorporating the whole supply chain

Apprentices must submit their work-based project report by the end of week 30 of the EPA period, at the latest. It must be reviewed by the independent assessor before the presentation with questioning. The presentation with questioning should be scheduled to take place as soon as possible after the work-based project has been reviewed. When the project is submitted, the employer and the apprentice should verify the submitted work is that of the apprentice, authenticating any contributions made to the project by the apprentice. This is achieved by an employer sign-off.

The following should be included in the report as a minimum:

- an introduction
- the scope of the project (including key performance indicators)
- a project plan
- technical decisions made, including supporting evidence linked to clear requirements
- cost breakdown and consideration of financial options
- research and findings, including details of any innovation
- project outcomes, including operational problems overcome
- recommendations and conclusions

The project must map, in an appendix, how it evidences the relevant KSBs for this assessment method.

The project will be conducted as set out here:

The apprentice will need to consider the availability of company and external resources required to complete the project. They must also ensure they are fully aware of the KSBs the project is intended to assess as that is what the grading of the project will be based on. The project is likely to incorporate a stage review process. This is likely to be a monthly progress review with the employer, at the employer's request, to ensure the project and resources are on track as per the original project brief (as this is based on real work and this it usual business practice to ensure projects are on track).

When the project is submitted, the employer and the apprentice should verify the submitted work is that of the apprentice, authenticating the apprentice's contributions to the project. This is achieved by an employer sign-off.

Marking

The independent assessor will review and mark the project in a timely manner, as determined by the EPAO, and without extending the EPA unnecessarily. Similarly all quality control processes will also be conducted in a timely manner, as determined by the EPAO.

Required supporting material

EPAOs will produce the following material to support this assessment method:

- marking sheet
- feedback template to provide feedback to the apprentice

Method 1 Component 2: Presentation of project

Overview

Apprentices will prepare and deliver a presentation that appropriately covers the KSBs assigned to this method of assessment.

The presentation will be based on the work based project and will cover :

- a summary of the project and the apprentice's role and level of responsibility
- the key issues or challenges on the project and how they were met
- the practical application of relevant knowledge, skills and behaviours -
- the options considered, solutions identified and reasons why some options were not feasible
- what the apprentice achieved and how this was achieved

The presentation will be completed and submitted after the gateway and will be presented to an independent assessor, either face-to-face or via online video conferencing.

The apprentice will have 10 days after the report has been submitted to prepare, complete and submit the presentation.

The rationale for this assessment method is:

- the presentation is part of the overall "work-based project and presentation" assessment method.
- the use of the presentation element is that is replicates the sort of work undertaken by competent individuals in this profession.
- apprentices are expected to be able to make presentations to individuals and groups.
- the presentation allows the project to be explored in more depth.

Delivery

The presentation assessment method will last for 60 minutes. The assessor has the discretion to increase the time of the presentation by up to 10% to allow the apprentice to complete their last point.

The independent assessor will ask a minimum of 10 questions at the end of the presentation. Supplementary questions are allowed to seek clarification.

To deliver the presentation, the apprentice will have access to:

- PowerPoint
- flip chart
- computer
- work products
- videos
- interactive demonstrations

- notes

The presentation will be conducted as follows:

The presentation is to be 20 minutes with 40 minutes of questions and answers to be held following the presentation.

The presentation will take place on a one-to-one basis between the assessor and the apprentice.
The way in which the content of the presentation is made is not prescriptive.
A copy of the project report and presentation must be sent to the EPAO at least 10 days in advance and this must outline details of any visual aids to be used and specify any equipment required.
The assessor will review the presentation alongside the project report and prepare questions to be asked at the end of the presentation.
A minimum of 10 questions will be asked at the end of the presentation but follow up questions are allowed and don't form part of this question number count.

The independent assessor will make all grading decisions.

Venue

EPAOs must ensure that the presentation and questioning elements are conducted in a suitable controlled environment in any of the following:

· employer's premises
· other suitable venue selected by the EPAO (e.g. a training provider)

The presentation may be conducted face-to-face or via an electronic platform e.g. video-conferencing. EPAOs must ensure appropriate methods to prevent misrepresentation are in place should an electronic option be used, for example, screen share and 360-degree camera function with an administrator/invigilator present. The test venue shall have access to appropriate resources to conduct the assessment such as appropriately trained invigilation staff (provided by the EPAO, robust IT equipment and infrastructure to enable effective use of any technology used.

Other relevant information

A representative from the employer must also be present to observe the presentation. The employer technical expert's role is to provide technical engineering information, at the independent assessor's request, in relation to the apprentice's workplace and the apprentice's work, such as confirming company policies, procedures, processes, providing context on technical information or on emerging technologies. They may for example be the work-based project sponsor, programme sponsor, the apprentice's line manager, site engineer, head of engineering or operations manager. The technical expert must not have any role in the decision making process. They must not provide information on behalf of the apprentice or influence in the apprentice in any way. Their role is purely to provide information to the independent assessor on request. Independent assessors will solely determine the grade for the work-based project and presentation with questioning.

Support material

EPAOs will produce the following material to support this assessment method:

Documentation to gather evidence and decisions including grades awarded to ensure consistency of feedback to the apprentice.

A question bank of sample questions, although independent end-point assessors will need to tailor questions according to the work based project. The question bank should be of sufficient size to

prevent predictability and be reviewed regularly (at least once a year) to ensure the questions are fit for purpose'.

Assessment Method 2: professional review (This method has 1 component.)

Method 2 Component 1: professional review

Overview

This assessment will take the form of a professional discussion, which must be appropriately structured to draw out the best of the apprentice's competence and excellence and cover the KSBs assigned to this assessment method. It will involve the questions that will focus on coverage of prior learning or activity.

The professional discussion can take place in any of the following:

· employer's premises
· other suitable venue selected by the EPAO (e.g. a training provider)

The rationale for this assessment method is:

This assessment method was selected as a valid way to draw out KSBs, in particular behaviours, which would be less likely to naturally occur in the project and presentation. It is commonplace for people in this occupation to engage in detailed technical discussions, so this assessment method mirrors their day to day work.

Delivery

The independent assessors will conduct and assess the professional discussion.

The professional discussion must last for 60 minutes. The independent assessor has the discretion to increase the time of the professional discussion by up to 10% to allow the apprentice to complete their last answer. Further time may be granted for apprentices with appropriate needs, in-line with the EPAO's Reasonable Adjustments policy.

The professional discussion will be conducted as set out here:

This is a 1:1 conversation in an appropriate environment (a quiet room free from distraction). Evidence must be captured using documentation produced by the EPAO. The assessor will ask a minimum of 10 open questions from the question bank to ensure consistency in approach. Follow up questions will then be used to draw out further evidence.

Video conferencing can be used to conduct the professional discussion, but the EPAO must have processes in place to verify the identity of the apprentice and ensure the apprentice is not being aided in any way e.g. use of a 360 degree camera to allow the assessor to look around the round the room during the interview.

The independent assessor must use the assessment tools and procedures that are set by the EPAO to record the professional discussion.

The independent assessor will make all grading decisions.

Venue

The professional discussion should take place in a quiet room, free from distractions and influence.

Other relevant information

A structured specification and question bank must be developed by EPAOs. The 'question bank' must be of sufficient size to prevent predictability and the EPAO must review it regularly (and at least once a year) to ensure that it, and its content, are fit for purpose. The specifications, including questions relating to the underpinning knowledge, skills and behaviours, must be varied yet allow assessment of the relevant KSBs.

EPAOs must ensure that apprentices have a different set of questions in the case of re-sits/re-takes.

Independent assessors must be developed and trained by the EPAO in the conduct of professional discussion and reaching consistent judgement.

EPAOs will produce the following material to support this assessment method:

Documentation to gather evidence and decisions including grades awarded.

Assessment Method 3: knowledge and skills test (This method has 1 component.)

Method 3 Component 1: knowledge and skills test

Overview

The rationale for this assessment method is:

This is a cost effective and efficient way for employers to test some of the knowledge and skills in the apprenticeship standard. This is the first assessment method taken after gateway. This is the shortest and most cost effective method for employers because it is not resource intensive for them but can robustly test the knowledge and skills mapped to this assessment method. If this test is not passed candidates do not go forward to the more costly phase of the EPA without further training from their employer and EPAO. It complements the other methods as it tests aspects that can't be tested elsewhere.

Test Format

The test can be:

- computer based
- paper based

It will consist of 25 questions. These

questions will consist of:

· 5 open questions requiring short, structured answers
· 5 scenario / case study questions
· 15 closed response questions (e.g. multiple-choice questions)

The multiple choice questions should have 4 options of which, 1 will be correct. Multiple choice tests should sample across the areas mapped to it to allow the test to determine the strength of the apprentice and avoid becoming too predictable.

Test administration

Apprentices must have a maximum of 60 minutes to complete the test.

The test is closed book which means that the apprentice cannot refer to reference books or materials.

Apprentices must take the test in a suitably controlled environment that is a quiet space, free of distractions and influence, in the presence of an invigilator. The invigilator may be the independent assessor, or another external person employed by the EPAO or specialised (proctor) software, if the test can be taken on-line. The EPAO is required to have an invigilation policy that will set out how the test/examination is to be carried out. This will include specifying the most appropriate ratio of apprentices to invigilators to best take into account the setting and security required in administering the test/examination.

The EPAO is responsible for ensuring the security of test materials and ensuring the test remains valid and reliable (this includes any arrangements made using online tools). The EPAO is responsible for verifying the validity of the identity of the person taking the test.

This assessment method will be carried out as follows:

The test consists of 25 questions in total. There must be 5 open questions requiring short, structured answers. These enable the apprentice to demonstrate knowledge more fully and holistically. There must be 5 questions based on a scenario/case study. These questions ensure the apprentice can demonstrate that they can assess which knowledge or learning is appropriate for the situation. The test must be conducted in a quiet room free from distraction and influence. Steps must be taken to ensure the integrity of the test.

The EPAO must verify the suitability of the venue for taking the test and the identity of the person taking the test.

Marking

Tests must be marked by independent assessors or markers employed by the EPAO following a marking guide produced by the EPAO. Marking of the multiple choice aspects can be automated.

Correct answers in the closed response questions will be awarded 1 mark. The open response and scenario based questions will be worth 5 marks each, partial credit will be awarded for partial responses.

Question and resources development

Questions must be written by EPAOs and must be relevant to the occupation and employer settings. It is recommended that this be done in consultation with employers of this occupation. EPAOs should also maintain the security and confidentiality of their questions when consulting employers. EPAOs must develop ‘question banks’ of sufficient size to prevent predictability and review them regularly (and at least once a year) to ensure they, and the questions they contain, are fit for purpose.

Required supporting material

As a minimum EPAOs will produce the following material to support this method:

- a test specification
- sample tests and mark schemes
- live tests and mark schemes

Weighting of assessment methods

The methods are equally weighted, and the grading table explains the combination of grades required to achieve a fail, pass or distinction.

Grading

Assessment method 1: work based project and presentation

See Appendix A for full grading descriptors

KSBs	Fail	Pass	Distinction
K1 K2 K4 K23 K24 K25 K26 K28 K29 K30 K31 K32 **S1 S2 S3 S5 S7 S8 S11 S12 S13 S15 S16** **B1 B3 B5 B6**	The apprentice will be deemed to have failed the assessment method if they do not meet the criteria outlined in the pass descriptor.	In order to achieve a "pass" all of the pass descriptors mapped to this assessment method must be met.	In order to achieve a "distinction", all of the pass criteria and seven of the distinction criteria mapped against this assessment method must be met.

Assessment method 2: professional discussion

See Appendix B for full grading descriptors.

KSBs	Fail	Pass	Distinction
K3 K5 K6 K17 K18 K19 K20 K21 K22 K27 **S4 S9 S17** **B2 B4**	The apprentice will be deemed to have failed the assessment method if they do not meet the criteria outlined in the pass descriptor.	In order to achieve a "pass" all of the pass descriptors mapped to this assessment method must be met.	In order to achieve a "distinction", all of the pass criteria and four of the distinction criteria mapped against this assessment method must be met.

Assessment method 3: knowledge and skills test

See Appendix C for full grading descriptors

KSBs	Fail	Pass	Distinction
K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 **S6 S10 S14**	The apprentice will be deemed to have failed the assessment method if they do not meet the criteria outlined in the pass descriptor.	In order to achieve a "pass" all of the pass descriptors mapped to this assessment method must be met.	No available

The following grade boundaries apply to the test:

Grade	Minimum score (%)	Maximum score (%)
Pass	70	100
Fail	0	69

Overall EPA grading

All EPA methods must be passed for the EPA to be passed overall.

A distinction must be achieved in AM1 and AM2 of the assessment methods in order to achieve an overall "distinction".

Grades from individual assessment methods should be combined in the following way to determine the grade of the EPA as a whole:

Assessment method 1	Assessment method 2	Assessment method 3	Overall grading
Any	Any	Fail	Fail
Any	Fail	Any	Fail
Fail	Any	Any	Fail
Pass	Pass or Distinction	Pass	Pass
Pass or Distinction	Pass	Pass	Pass
Distinction	Distinction	Pass	Distinction

Roles and responsibilities

Role	Responsibility
Apprentice	• complete the on-programme element of the apprenticeship • prepare for and complete the EPA
Employer	• identify when the apprentice is ready to enter the gateway in order to undertake EPA and notify the EPAO of this
EPAO	As a minimum EPAOs should: • conform to the requirements of the apprenticeship provider and assessment register • appoint administrators/invigilators and markers to administer/invigilate and mark the assessment • provide training and CPD to the assessors they employ • have no direct connection with the apprentice, their employer or training provider i.e. there must be no conflict of interest • have processes in place to conduct internal quality assurance and do this on a regular basis • organise standardisation events and activities in accordance with this plan • organise and conduct moderation of assessors' marking in accordance with this plan
Independent assessor	As a minimum an Independent assessor should: • be independent of the apprentice, their employer and training provider(s) i.e. there must be no conflict of interest • hold or be working towards an assessor qualification e.g. A1 and have had training from their EPAO in terms of good assessment practice, operating the assessment tools and grading • have recent relevant experience of the occupation/sector gained in the last two years or significant experience of the occupation/sector. This should be at least at the same level as the standard. • undertake a minimum of 1-days' EPAO standardisation training per year
Training provider	As a minimum the training provider should: • work with the employer to ensure that the apprentice is given the opportunities to develop the KSBs outlined in the standard and monitor their progress during the on-programme period • advise the employer, upon request, on the apprentice's readiness for EPA prior to the gateway • play no part in the EPA itself

Internal Quality Assurance (IQA)

Internal quality assurance refers to the requirements that EPA organisations must have in place to ensure consistent (reliable) and accurate (valid) assessment decisions. EPA organisations for this EPA must:

- appoint independent assessors who have knowledge of the following occupational areas: Assessors must be competent in both the core and the option discipline.
- appoint independent assessors who are members of relevant professional bodies (as outlined in the apprenticeship standard).
- appoint independent assessors who are competent to deliver the end-point assessment
- provide training for independent assessors in terms of good assessment practice, operating the assessment tools and grading
- have robust quality assurance systems and procedures that support fair, reliable and consistent assessment across the organisation and over time.
- operate induction training and standardisation events for independent assessors when they begin working for the EPAO on this standard and before they deliver an updated assessment method for the first time

Re-sits and re-takes

Apprentices who fail one or more assessment method will be offered the opportunity to take a re-sit or a re-take. A re-sit does not require further learning, whereas a re-take does.

Apprentices should have a supportive action plan to prepare for the re-sit or a re-take. The apprentice's employer will need to agree that either a re-sit or re-take is an appropriate course of action.

An apprentice who fails an assessment method, and therefore the EPA in the first instance, will be required to re-sit any failed assessment methods only.

Re-sits and re-takes are not offered to apprentices wishing to move from pass to distinction.

Where any assessment method has to be re-sat or re-taken, the apprentice will be awarded a maximum EPA grade of pass, unless the EPAO determines there are exceptional circumstances requiring a re-sit or re-take.

Affordability

Affordability of the EPA will be aided by using at least some of the following practice:

· online testing
· using employer's premises
· assessing multiple apprentices simultaneously for the knowledge and skills test

. implementing a project with real business benefits

Professional body recognition

This apprenticeship is designed to prepare successful apprentices to meet the requirements for registration as Chartered Engineer with:

Institute of Materials, Minerals and Mining

Institution of Mechanical Engineers

Or as a Chartered Designer with

Chartered Society of Designers

Reasonable adjustments

The EPAO must have in place clear and fair arrangements for making reasonable adjustments for this apprenticeship standard. This should include how an apprentice qualifies for Reasonable Adjustment and what Reasonable Adjustments will be made. The adjustments must maintain the validity, reliability and integrity of the assessment methods outlined in this assessment plan.

Mapping of knowledge, skills and behaviours (KSBs)

Apprentices will only be assessed on the core KSB and the ones mapped to their specialist option – see apprenticeship occupational standard for details

Assessment method 1: work based project and presentation

Knowledge
K1 Theories of team working
K2 Principles of programme management
K4 Risk management theories and practice
K23 The principles of effective presentations (including planning, structuring, how and when to engage with the audience, using visual aids, presenting data)
K24 Art of technical report writing
K25 Principles of mentoring people
K26 Fundamentals of casting process and technology
K28 Fundamentals of coating processes and technology
K29 Fundamentals of welding processes and technology
K30 Fundamentals of brazing processes and technology
K31 Fundamentals of heat treatment processes and technology
K32 Fundamentals of surface treatment processes and technology

Skills
S1 Work within a team environment. This may include acting as a team leader with people management skills. They undertake risk analysis and problem solving on behalf of the team.
S2 Communicate and present information appropriately and effectively taking account of target audience
S3 Apply appropriate programme management tools. Typically this would include a RACI chart, Project Plans, Load and Capacity analysis and cost analysis.
S5 Mentor and support others using coaching skills and actively support continuous professional development.
S7 Operate and control process equipment using continuous improvement methodologies
S8 Apply process control procedures correctly and effectively
S11 Make appropriate use of problem solving tools for example 8D, 5 whys
S12 Apply change control tools and practices
S13 Apply risk management tools and techniques

S15 Apply production control methods for example planning and project management
S16 Correct use of specialist equipment and process knowledge

Behaviours
B1 Working collaboratively - is comfortable in working in teams and being a team leader to agreed goals
B3 Commitment to leadership. Taking personal responsibility for their actions, managing projects including resource management within their remit and able to mentor and instruct others in associated standards and best practice
B5 Curiosity and innovation. Utilising own and others creativity to Improve the industry through embracing new technology and the digital world
B6 System thinking. Seeing whole systems and parts and how they connect recognising interdependencies and integration

Assessment method 2: professional discussion

Knowledge
K3 Understanding the importance of conflict management
K5 Principles of Quality Management Systems and implementation in factory environments
K6 New product introduction and technology management - theory
K17 Principles of Lean manufacturing
K18 Cost based engineering (including estimating, cost control, cost forecasting, investment appraisal and risk analysis.)
K19 Principles of operations management
K20 Principles of Leadership in Operations Management
K21 Principles of Supply Chain Management
K22 Principles of Asset Management
K27 Fundamentals of the product life cycle

Skills
S4 Actively listen and explain clearly and appropriately to target audience
S9 Apply appropriate negotiation techniques effectively
S17 Correct use of product life cycle concepts

Behaviours
B2 Professional commitment. Commitment to corporate values and behaviours through the demonstrating a personal , ethical and professional commitment to society, their profession and the environment, adopting a set of values and behaviours that will maintain and enhance the reputation of the profession as well as their organisation
B4 Commitment to the profession. Contributing proactively to the continuing development of engineering within their domain

Assessment method 3: knowledge and skills test

Knowledge
K7 Importance of design for manufacture and assembly
K8 Principles and practices of engineering standards
K9 Principles of process risk management including Process Failure Modes and Effects Analysis (PFMEA)
K10 Principles of Stakeholder management
K11 Importance of working within a regulatory framework
K12 Importance of Intellectual Property, Patents and Export Control
K13 The function of Quality Techniques Systems and Standards
K14 The principles of statistical process control and application techniques (for example PFMEA)
K15 Change management principles
K16 Principles and practices of knowledge based systems

Skills
S6 Use Process Failure Mode Effect Analysis tool kit appropriately
S10 Make appropriate use of statistical tools for example Minitab, excel, DMAIC
S14 Demonstrate correct application of Value Stream Mapping tools

Appendix A – Grading criteria for the work-based project

Apprentices will only be assessed on KSBs mapped to the core and the ones mapped to their specialist option – see apprenticeship occupational standard for details.

EPAOs should focus on assessing the apprentice against the higher order descriptors outlined in the pass and distinction columns rather than the lower order knowledge, skills and behaviours references in the second column. By showing competence against the higher order descriptors, it can be assumed that the apprentice is working at or above the level outlined in the standard.

Fail- The apprentice will be deemed to have failed if they do not meet the criteria outlined in the pass descriptor.

Area of Assessment	Method	Pass Criteria – The apprentice's project must demonstrate that they:	A successful contribution at distinction will meet the pass criteria in all areas and meet seven of the individual distinction descriptors from the criteria below:
Application of technical knowledge	K26. Fundamentals of casting process and technology K28. Fundamentals of coating processes and technology K29. Fundamentals of welding processes and technology K30. Fundamentals of brazing processes and technology K31. Fundamentals of heat treatment processes and technology	Applies appropriate theoretical and technological methods to design, develop and commission engineering solutions, with reference to the appropriate process relating to their specialism.	Appraises solution and explains the risks and implications of the process, alternative approaches and ways to address them.

	K32. Fundamentals of surface treatment processes and technology		
Manage the delivery of innovative, stable and robust solutions with full integration into the Manufacturing ecosystem	S12. Apply change control procedures S15. Apply production control methods S16. Use of specialist equipment and process knowledge B3. Commitment to leadership -Taking personal responsibility for their actions, managing projects including resource management within their remit and able to mentor and instruct others in associated standards and best practice B5. Curiosity and Innovation - Utilising own and others creativity to Improve the industry through embracing new technology and the digital world B6. System Thinking - Seeing whole systems and parts and how they connect recognising interdependencies and integration	Demonstrates resilience and determination in achieving project outcomes and that they are able to interact with team members and stakeholders to achieve successful outcomes. Proposes solutions based on in-house knowledge and expertise relating to specialist equipment and processes used in the company. Takes a broad view into account, looking at the whole system, not just component parts when making key decisions, embracing specialist equipment and new technology and communicating with stakeholders. Selects and interprets change control procedures and production methods, as appropriate, and applies the requirements leading to the successful delivery of the project.	Challenges the norm and investigates, proposes and articulates solutions outside the immediate business and industry sector, including researching new methods and technologies which could be applied to problems encountered in the material process engineer environment, demonstrated by supporting evidence. Demonstrates an understanding of the risks and implications to the business of the application of new technologies and in the way procedures and methods are selected, and unintended consequences to the business when they are applied (i.e they understand that solving problem A, can cause problem B and can weigh up the benefits).

		Evidence of consistent professional working practices, taking responsibility for their own actions with clear examples of leadership and followership. Approach demonstrates curiosity and innovation.	
Deliver Materials Process systems engineering/ operational solutions effectively	K4. Risk management theories and practice S13. Use of risk management tools	Leads the application of risk management tools and techniques meaning the engineering/operational solution is well managed and successfully implemented.	Interprets, critically evaluates and recommends actions to mitigate problems which have the potential to impact business performance for example, impact on product quality, cost and delivery.
Lead/manage multi-disciplinary teams	K25. Principles of mentoring people S5. Mentoring	Leads their team with appropriate mentoring/coaching for individuals within the team, understanding the importance of team values to support a high performance work culture.	Demonstrate the ability to lead beyond the immediate team at organisational level and above to motivate and mentor people beyond those they directly line-manage to produce a high performance work culture, showing insight into the needs and motivations of others.
Use of team and role play theory to develop high performance teams and individuals	K1. Theories of team working S1. Working within a team environment B1. Working collaboratively - is comfortable in working in teams and being a team leader to agreed goals	Demonstrates understanding of team and role theory and evidence of application of theory to produce intended outcomes.	Applies theory with insight and awareness of risks and rewards, describing how theory was applied with clear analysis of the impact and risks.

Manage the delivery of engineering solutions within a regulated sector	K2. Principles of programme management S3. Use of programme management tools	Manages delivery with appropriate levels of planning, governance, implementation and relevant risk management procedures pertaining to the discipline, and use of appropriate programme management tools.	Investigates innovative improvement methods and techniques and evaluates their suitability for use within the context of their discipline. Takes a leadership role in justifying the use of such tools and techniques and supporting the organisation in achieving benefits from using them.
Use of communication and influencing skills	K23. Presentation Skills K24. Art of technical report writing S2. Communicate and present information appropriately and effectively taking account of target audience	Presents and communicates the key content and messages bounded by quality information pertaining to the discipline. Written report includes introduction, methodology, results and conclusion and defends choice of methods selected. Report takes account of the target audience, is grammatically correct and cohesive. Motivates and mentors team members in both their technical and professional development.	Drafts report in a way that ensures arguments flow from each other to a logical conclusion, which are outlined in a non confrontational way, encouraging discussion. Responds to technical questioning during presentation with ability to argue and defend their view while showing respect for the opinions of others. Applies best practices with a disciplined and responsible approach to avoid risk through application of technical skills and mitigation strategies.
Use six-sigma methodologies, problem solving and continuous improvement	S11. Make appropriate use of problem solving tools	Applies improvement management tools and techniques meaning that the project is well managed and successfully implemented.	Demonstrates an understanding of problem solving tools and the application of them and how they might enhance the business, selecting the most appropriate but discussing merits of alternatives.

			Understands the risks and benefits of each when making the selection.
Use data analytics, process control methodologies and design principles	S7. Operate and control process equipment S8. Apply process control procedures correctly and effectively	Demonstrates evidence that the correct selection of the approach is aligned with the problem being addressed within the work based project. Well-structured approach to data analysis and how this is integrated into the process standards/controls pertaining to the discipline.	Compares a range of principles and techniques to enhance the robustness of decisions, is able to critique the various options and provide supporting evidence for justifying and defending preferred option.

Appendix B – Grading criteria for the professional review

Apprentices will only be assessed on KSBs mapped to the core and the ones mapped to their specialist option – see apprenticeship occupational standard for details

EPAOs should focus on assessing the apprentice against the higher order descriptors outlined in the pass and distinction columns rather than the lower order knowledge, skills and behaviours references in the second column. By showing competence against the higher order descriptors, it can be assumed that the apprentice is working at or above the level outlined in the standard.

Fail- The apprentice will be deemed to have failed if they do not meet the criteria outlined in the pass descriptor.

Area of Assessment	Method	Pass Criteria – The apprentice must demonstrate that they:	A successful contribution at distinction will meet the pass criteria in all areas and meet four of the individual distinction descriptors from the criteria below:
Manage the delivery of cost optimised innovative, stable and robust solutions with integration into the product life cycle	K6. New product introduction and technology management – theory K18. Cost based engineering K27. Fundamentals of the product life cycle S4. Actively listen and explain clearly and appropriately to target audience S17. Correct use of product life cycle concepts	Demonstrates an understanding of the product life cycle concepts in a materials process environment, with reference to new products, and the business and cost benefits which result from adoption of such an approach. Listens carefully to questions and communicates clearly, using appropriate language for target audience. Overall approach demonstrates consideration of how best to present and communicate the key content and messages.	Demonstration of a leadership role in justifying the use of product life cycle concepts and clear evidence that the organisation in achieving business benefits from implementation.

Demonstrate the use of lean manufacturing and operational techniques for continuous improvement	K17. Principles of Lean Manufacturing K19. Principles of Operations management K21. Principles of Supply Chain Management K22. Principles of Asset Management	Discusses manufacturing operations techniques their understanding of these and how they are able to be selected, applied and critiqued.	Manufacturing operation techniques are compared, contrasted and illustrated with examples given of applying to their discipline, whilst demonstrating critical appraisal, insight and reflection.
Demonstrate CPD	B2. Professional Commitment -Commitment to corporate values and behaviours through the demonstrating a personal , ethical and professional commitment to society, their profession and the environment, adopting a set of values and behaviours that will maintain and enhance the reputation of the profession as well as their organisation B4. Commitment to the profession- Contributing proactively to the continuing development of engineering within their domain	Describes the importance of professionalism to the organisation, with examples of demonstrating an ethical approach and a commitment to the environment.	Demonstrates a positive mind-set and willingness to learn, displaying proactive approach to enhancing the profession with examples of the development of engineering beyond their immediate domain.
Demonstrate collaborative working techniques	K3. Understanding the importance of conflict management	Demonstrates an understanding of the importance of collaborative working techniques, and how they	Justifies their choice of techniques, explaining the risks and benefits and offers an alternative.

	S9. Apply appropriate negotiation techniques effectively	can be applied to manage conflict. Gives an example of this.	
Manage the delivery of engineering/operational improvements in a regulated sector	K5. Principles of quality management systems and implementation in factory environments K20. Principles of leadership in operations management	Demonstrates leadership and insight in the way projects are selected and implemented with compliance to the appropriate quality management systems to enhance business performance in terms of cost, quality and delivery.	Explains why quality management is important within the discipline and demonstrates leadership theory and practice to deliver improvement solutions to the required standard, making informed critical judgements and defending their decision(s) to improve the business.

Appendix C – Grading criteria for knowledge and skills test

Apprentices will only be assessed on KSBs mapped to the core and the ones mapped to their specialist option – see apprenticeship occupational standard for details

EPAOs should focus on assessing the apprentice against the higher order descriptors outlined in the pass column rather than the lower order knowledge, skills and behaviours references in the second column. By showing competence against the higher order descriptors, it can be assumed that the apprentice is working at or above the level outlined in the standard.

Fail- The apprentice will be deemed to have failed if they do not meet the criteria outlined in the pass descriptor.

Area of Assessment	Method	Pass Criteria – The apprentice must demonstrate that they:
Deliver material process engineering/operational solutions effectively	K7. Importance of design for manufacture and assembly K10. Principles of stakeholder management K11.Importance of working within a regulatory framework	Describes the key design processes which underpin engineering/operational performance ensuring effective identification, delivery, implementation and management of all stakeholders and adherence to regulation.
Use of six-sigma methodologies, data analysis, problem solving and continuous improvement	K9. Principles of process risk management including Process Failure Modes and Effects Analysis (PFMEA) K14. The principles of statistical process control and application techniques (e.g PFMEA) K15. Change management principles S6. Use of process failure mode effect analysis tool kit S10. Use of statistical tools	Selects and applies appropriate PFMEA, statistical tools and techniques to make recommendations suitable for identification of operational improvements in a materials process engineer environment.

Management of Intellectual Property	K12. Importance of Intellectual Property, Patents and Export Control	Demonstrates an understanding of the major ideas related to the control of intellectual property and the importance of compliance.
Safe and professional working practices	K8. Principles and practices of engineering standards K13. The function of Quality techniques systems and standards	Demonstrate the key processes which underpin safe and professional working practices and describes the function of Quality Techniques Systems and Standards.
Manage the delivery of a stable manufacturing/ operational solutions optimised for whole life costing	K16. Principles and practices of knowledge based systems S14. Demonstrate correct application of Value Stream Mapping tools	Able to demonstrate how to manage and evaluate value engineering, whole life costing as applying to their discipline.