Level 6 Materials Science Technologist (Degree) Apprenticeship (ST0675)

AM1 (Component 1): Work-Based Project Guidance

Version 3

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INTRODUCTION

The work-based project will 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 PIABC Limited. The employer will ensure it has a real business application and PIABC Limited will ensure it meets the requirements of the EPA (including suitable coverage of the KSBs assigned to this assessment method). PIABC Limited will sign-off the project title and scope, as a minimum, to confirm its suitability at the gateway.

The rationale for the work-based project is to allow the apprentice the opportunity to utilise their competences and hard work in a real-world environment, contributing to their employer's operational objectives. Both the preparation of a project plan, project report and presentation reflect typical tasks undertaken in this occupation. It allows a wide range of KSBs to be demonstrated holistically, including technical knowledge, judgement and communication skills.

Apprentices will conduct a project which has two distinct milestones. This includes the submission of a project plan at the beginning of the project and submission of the project report following project implementation. This will then be followed by a presentation with questioning.

KNOWLEDGE, SKILLS AND BEHAVIOURS (KSBs)

The Level 6 Materials Science Technologist (Degree) apprenticeship standard states that all apprentices will need to develop specialist KSBs. These KSBs will provide the foundation for an apprentice development in materials science.

The EPA provides apprentice with a showcase opportunity to provide oral and documentary evidence of their KSBs developed throughout the apprenticeship in a synoptic way. It enables the EPA panel to test the KSBs acquired by the apprentice throughout the apprenticeship.

The KSBs of the of the Level 6 Materials Science Technologist (Degree) apprenticeship standard are set out below:

Knowledge
A Material Science Technologist will require a thorough understanding of the industry in which they are employed. They will be able to understand and apply the following areas:

K3 Systems and processes such as, but not limited to, CRM systems, client handling, profit and loss, and planning, in project management, business improvement, proof of concept, and scale up.
K9 Contemporary research and developments in the materials science community in terms of understanding different perspectives, methodologies, and schools of thought as well as the theoretical stances that underpin them.
K10 Materials applications including theories, techniques and relevant calculations to understand related disciplines and be able to work in a collaborative or cross-functional environment in more than one materials context.
K13 Systematic approaches to cost benefit analysis, including contextual financial understanding using industry standard metrics. Awareness of marketplace dynamics.
K15 Report writing techniques, including how to synthesise information and write concisely using a formal or neutral language register and vocabulary appropriate to the target reader.
K16 Management techniques and theories, including problem solving methodologies, effective decision making, delegation and planning methods, time management, organisational awareness, motivational techniques, and conflict resolution.

Skills
A Material Science Technologist will be asked to demonstrate skills in the following:

S1 Utilise cognitive and practical skills in conjunction with adaptability and versatility in technical support both in-house and to clients to improve manufacturing processes, problem solving, innovation, and scale up formulations.
S2 Determine and use industry standard and emerging digital technologies and data analysis tools to complete work activities and address problems that are ill defined or involve numerous interacting factors.
S3 Critically evaluate actions, methodologies, and results and their implications in analysing materials against parameters in product specifications.
S5 Write clear and succinct technical and analytical reports.
S6 Research, adapt and test new technologies through materials characterisation feedback.
S8 Maintain a working knowledge of a range of project management and financial management techniques to complete projects relevant to their discipline.
S10 Communicate effectively with colleagues and stakeholders using the appropriate language register both verbally and in writing.

Behaviours
A Material Science Technologist will be asked to demonstrate the following behaviours:

B2 Clear and concise communicator – influence with integrity and exercise judgement.
B4 Demonstrate personal and professional commitment to enhance the reputation of employer and the profession through interaction with internal and external customers alike.
B5 Results orientated – thoughtful and methodical planner, delivering successful outcomes utilising results and feedback in future activities.
B7 Collaborative – team player, and leader when appropriate, who works with a range of stakeholders to achieve goals.
B9 Take personal responsibility to initiate and lead tasks, manage time and resources.
B10 Health and safety conscious at all times – strict adherence to regulations, incorporating up-to-date knowledge into planning.

THE WORK-BASED PROJECT

The apprentice will conduct their project typically over a period of 24 weeks. The project may be based on any of the following a specific problem, a recurring issue or an idea/opportunity.

The apprentice must complete a project plan and submit this to PIABC Limited by week 4 (after agreeing the project title and scope with the employer and PIABC Limited). This is because planning is a vital part of this occupation. The project plan itself is not assessed but needs to be submitted to confirm that this planning activity has taken place and the deadline has been met. This work feeds into the presentation where the apprentice can reflect on how the project developed from the planning stage and explore/explain any variation and developments from the original plan. A project report about the project must be produced and submitted by week 24. This must make reference to the project plan and how this was delivered in order to demonstrate the KSBs assigned to AM1.

The project report will summarise the project and be 2,500 words +/- 10% (excluding any Annexes and Appendices).

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

The project summary should be in the form of an electronic report.

Once commenced, the apprentice must plan their delivery of the project and carry out initial research. They must prepare a project plan and submit this to PIABC Limited in week 4 of the EPA period to confirm completion of this milestone in the assessment method.

The project plan must include as a minimum the purpose of this project (what problem is it going to solve?), methodology, the planned main deliverables and anticipated risks and issues. It must not exceed 1,000 words (+/-10%) or two sides of A4 paper using font 12. The timeline, including deadlines, resources that are required to complete this project, cost benefits and stakeholder information may be included in an annex to add clarity to the list above and will not be included in the word count.

The project report must be completed and submitted to PIABC Limited by week 24. The report should comprise of 2,500 words (+/-10%) and must refer to the project plan and

whether the plan was achieved, although actual delivery of the project is not a determining factor when grading AM1.

The project summary report and project plan will be reviewed by PIABC Limited prior to the presentation taking place. PIABC Limited may use the project plan and project report alongside the electronic copy of the presentation as the basis for questions asked during the questioning of AM1. The KSBs can be assessed from project report, presentation and questions as AM1 is a holistic assessment method.

The evidence presented by the apprentice in the work-based project must be valid, current, authentic, sufficient, and relevant to the standard. By this PIABC Limited mean:

- **Valid:** Relevant and appropriate to meet the KSBs criteria.
- **Current:** The evidence has been produced during the time the apprentice has been on the apprenticeship.
- **Authentic:** The evidence can be identified as the individual apprentice's own work and not that of someone else or a group of people. If produced by the apprentice, if evidence is team-based it must be able to clearly identify the apprentice's contribution
- **Sufficient:** There is enough evidence to be certain that performance to the required standard is consistent and could be achieved on more than one occasion.
- **Relevant:** There is a clear match between the item of evidence and the required KSBs criteria.

It is important to note that the work-based project is NOT:

- A report that a consultant would produce
- A description of the latest developments in an organisation
- A textbook or manual
- A narrative history of a company's successes or failures

CHOOSING A WORK-BASED PROJECT TOPIC

The biggest hurdle lies not in technique of researching or carrying out the research or writing up the research, but in deciding a relevant work-related project that provides the opportunity for the apprentice to provide evidence of the core knowledge, skills and behaviours and the optional knowledge and skills dependent on the apprentice's job role.

The aim of the work-based project is to provide significant engineering advantage, address an engineering or business issue, provide business benefit(s) or deliver step change(s) in business performance.

The project may be based upon any of the following:

- A specific problem
- A recurring issue
- An idea/opportunity
- An improvement opportunity

Ideally, the work-based project should aid the employer's business, and it has a real business application.

PROJECT PLAN

At gateway the project outline and scope has been agreed with the employer and PIABC Limited. The project is undertaken after the apprentice has gone through the gateway process.

Apprentices will conduct a project which has two distinct milestones. The first milestone is the submission to PIABC Limited by week 4 of a project plan and the second milestone is the submission of the project report following project implementation by week 24.

The project plan itself is not assessed but needs to be submitted to confirm that this planning activity has taken place, and the deadline has been met. This work feeds into the presentation element of this assessment method where the apprentice can reflect on how the project developed from the planning stage and explore/explain any variation and developments from the original plan.

The employer will ensure it has a real business application and PIABC Limited will ensure it meets the requirements of the EPA (including suitable coverage of the KSBs assigned). PIABC Limited and the employer will then sign off the project title and scope to confirm its suitability at gateway and prior to the project commencing.

Once commenced, the apprentice must plan their delivery of the project and carry out initial research. They must prepare a project plan and submit this to the EPAO in week 4 of the EPA period to confirm completion of this milestone in the assessment method.
A suggested layout for the project plan is:

- The Purpose (what problem is it going to solve?)
- Methodology
- Key Deliverables
- Anticipated Risks
- Annex (including Gantt chart a timeline of planned activities)

It must not exceed 1,000 words (+/-10%) (or two sides of A4 paper using font 12).

The timeline (including deadlines), resources that are required to complete this project, cost benefits and stakeholders may be included in an annex to add clarity and will not be included in the word count.

WORK-BASED PROJECT CONTENT

As a minimum the project summary report must include:

- Introduction
- Scope of the project (including key performance indicators)
- Methods (How the outcomes were achieved)
- Reference to the project plan and any deviations from the original timelines and planned methods
- How anticipated risks and issues developed and were mitigated
- Research
- Outcomes and Results
- Recommendations and conclusions

- Annex providing evidence relating to the technical project activity, which must be referenced in the report. Evidence[1] could include:

    - the final project plan
    - work records
    - video clips (maximum 15 minutes in total)
    - annotated photographs of completed work or work in progress
    - diagrams
    - job write up
    - calculations
    - data reports
    - quality/compliance records

It must also include an appendix containing:

- Mapping of the report and supporting evidence against the KSBs being assessed by this assessment method.
- A statement from the employer confirming that the report and evidence is the apprentice's own work and authenticating the project outcomes.

The annex and appendix do not form part of the overall word count.

[1] Self-reflective accounts and witness testimonies are not valid evidence sources except in relation to S3 and B5. This is because for these areas only the apprentice must reflect and evaluate the actions they have taken to act on results and feedback with regards to the project plan.

SUBMISSION GUIDELINES

The summary project report should comprise of 2,500 words (+/-10%) excluding references, appendices and diagrams and must refer to the project plan and whether the plan was achieved, although actual delivery of the project is not a determining factor when grading the assessment method.

The project report should be A4 and be in Arial font size 12 with double line spacing.

The footer should include the apprentice's full name/Unique Learner Number (ULN)/submission date.

It should be submitted in PDF format.

PLAGISARISM

PIABC regards plagiarism as a very serious issue. Plagiarism is taking or using another person's thoughts, writings or inventions and presenting them as one's own. Apprentices needed to ensure that all work submitted to be assessed within their work-based project is their own work.

If an apprentice uses other people's work then it must been properly cited or referenced. If an apprentice does not cite or reference someone else's work, then this is called plagiarism. Dependent upon the amount of work which has been plagiarised an apprentice risk having their work-based project failed by the panel of assessors.

The following are examples of plagiarism:

- Downloading text from the web, without reference to the original source or using quotation marks and without using the material to answer the question or to support an argument.
- Quoting, re-writing, or scanning information from books without adequate reference.
- Copying information from colleagues and including this as if it were own work (whether modified or not).

The apprentice may work as part of a team which could include technical internal or external support however the work-based project report will be the apprentice's own work and will be reflective of their own role and contribution.

While discussing others work is an important part of an apprentice's research but the information must be referenced properly and written in an apprentice's own words or put into quotation marks. It is difficult to produce definitive guidelines for exactly what is or is not acceptable. To avoid any misunderstanding, always put quotations from other authors within quotation marks and give full references to every source used, even if not quoting directly from it.

The apprentice may work as part of a team which could include technical, internal, or external support. However, the report will be the apprentice's own work and will be reflective of their own role and contribution. Therefore, all work, statements, images, charts, or ideas that are presented as an apprentice's own (i.e. not referenced) must be an apprentice's own work.

PIABC regards this as cheating and it can have serious consequences, even if it is unintentional.

The Citing and referencing section above gives guidance for apprentices when using someone else's work.

When the work-based project report 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 and the apprentice submitting with the work-based project a covering sheet, which an apprentice confirms compliance with the following statement:

"I declare that this work-based project is my own work. Where sources such as the internet, books and the work of others has been used; these sources have been fully acknowledged within the text and included in the references and bibliography on the last page. Any assistance given by others has been included in the acknowledgements."

ASSESSMENT CRITERIA

Apprentices will only be assessed on KSBs mapped to this assessment method.

PIABC Limited will assess 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, then it will be assumed that the apprentice is working at or above the level outlined in the standard. The apprentice will be considered to have failed if they do not meet the criteria outlined in the pass descriptor. Fail - The apprentices will be deemed to have failed if they do not meet the criteria outlined in the pass descriptor.

The full grading descriptors for AM1 is on the following pages:

GROUPING	PASS CRITERIA To achieve a pass all of the pass criteria must be met:	DISTINCTION CRITERIA To achieve a distinction, all of the pass criteria must be met, plus at least 6 of the 8 distinction boxes must be fully achieved:
Systems and processes K3, S1, B5	Manages planning and delivery with regard to systems and processes in place, taking account of governance, implementation and relevant risk management procedures. Makes use of appropriate project management tools. Analyses and explains what they have learned during the project with specific reference to the project plan and whether this was implemented and how this learning can be applied in future projects.	Investigates innovative systems and processes and evaluates their suitability for use within the context of the project. Justifies the use of the tools and techniques, explaining how they support the organisation's aims.
Research K9, S6	Demonstrates evidence that the correct selection of the available research is aligned with the problem being addressed within the work-based project, with reference to the initial project plan. Well-structured approach to carrying out research and how this is integrated into the project, including evidence of adapting and testing new technologies.	Critiques the various research options as well as consider and justify their preferred selection.
Application of materials science K0, S3	Applies appropriate theories, techniques and calculations to materials problems and solutions in more than one materials context.	Appraises solutions and explains the risks and implications of the process, alternative approaches and ways to address them
Cost benefits K13	Demonstrates a systematic approach to planning, analysing and achieving cost benefits for the business.	Justifies their analysis of the projects cost benefits for the business by comparing the costs benefits of their choice with alternative solutions that they considered but disregarded.

GROUPING	PASS CRITERIA To achieve a pass all of the pass criteria must be met:	DISTINCTION CRITERIA To achieve a distinction, all of the pass criteria must be met, plus at least 6 of the 8 distinction boxes must be fully achieved:
Communication K15, S5, S10, B2	Presents and communicates the key content and messages clearly. Defends plan and methods selected. Report and verbal communication takes account of the target audience, is grammatically correct and cohesive.	
Management and leadership B4, B7, B9	Demonstrates understanding of management techniques and theories and describes how they have applied this theory to interact with and lead individuals, stakeholders and teams to help them achieve their goals, treating them with respect and valuing their views.	Applies theory with insight and awareness of risks and rewards, describing how theory/technique was applied with clear analysis of the impact and risks.
Digital and data S2	Demonstrates evidence that the correct selection of industry standard and emerging digital technologies and data analysis tools have been applied to address ill-defined problems.	Justifies their choice of technology and tools, explaining the benefits and risks associated with them in comparison to at least one alternative approach.
Health and safety B10	Clearly articulates the importance of safe working practices, with reference to appropriate regulation. Project outputs and initial planning make clear reference to health and safety factors.	Extends answers to include in-depth examples of applications of legislation in real-world situations and implications of implementation.

GROUPING	PASS CRITERIA To achieve a pass all of the pass criteria must be met:	DISTINCTION CRITERIA To achieve a distinction, all of the pass criteria must be met, plus at least 6 of the 8 distinction boxes must be fully achieved:
Project and financial management S8	Articulates a clear understanding of the financial methodological implications of their work and can show examples of how this can affect project completion.	Fluently describes the use of a comprehensive suite of methods and can assess the relative benefits of same.

GRADING

The following grading are for Assessment Method 1 (AM1) covering both the work-based project and presentation:

KSBs	Fail	Pass	Distinction
K3 K9 K10 K13 K15 K16 **S1 S2 S3 S5 S6 S8 S10** **B2 B4 B5 B7 B9 B10**	Does not meet the pass criteria	The candidate must meet all of the pass grading criteria mapped to this assessment method	The candidate must meet at least 7 of the distinction criteria mapped to this assessment method

SUCCESSFUL COMPLETION OF THE END POINT ASSESSMENT

For an apprentice to pass the EPA as a whole and be deemed to be competent, the apprentice must pass all assessment methods (AM1, AM2 and AM3).

Should the apprentice fail either AM1, AM2 or AM3 they are required to re-sit/re-take that component. The number of times an apprentice is permitted to re-sit/re-take the end point assessment and the date at which they do so is determined by the employer.