Institute for Apprenticeships & Technical Education

End-point assessment plan for food and drink engineer apprenticeship standard

Apprenticeship standard reference number	Apprenticeship standard level	Integrated end-point assessment
ST0624	5	No

Contents

Introduction and overview

This document sets out the requirements for end-point assessment (EPA) for the food and drink engineer apprenticeship standard, level 5. 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 food and drink engineer apprentices, their employers and training providers.

The food and drink engineer is a core and option apprenticeship standard. The end-point assessment will assess apprentices against the occupational standard's core knowledge, skills and behaviours (KSBs) and knowledge and skills relating to their occupational option: mechanical or electrical.

Full time apprentices will typically spend 30 months on-programme working towards the occupational standard, with a minimum of 20% off-the-job training.

The EPA 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, the pre-requisite gateway requirements for EPA have been met and that they can be evidenced to an EPAO.

As a gateway requirement, apprentices must have a work-based project title and scope agreed by their EPAO prior to taking their EPA; the project should have a business benefit. They must have compiled and submitted a portfolio of evidence. In addition, apprentices without English and mathematics at level 2 must achieve this level prior to taking their EPA.[1]

The EPA will typically be completed within a six-month period, after the apprentice has met the EPA gateway requirements.

EPA must be conducted by an organisation approved to offer services against this apprenticeship standard, as selected by the employer, from the Education & Skills Funding Agency's (ESFA) Register of End-Point Assessment Organisations (RoEPAO).

The EPA consists of three discrete assessment methods:

- **work-based project**, consisting of a report and presentation with questioning
- **test**, multiple-choice and extended answer
- **technical Interview,** underpinned by a portfolio of evidence

[1] For those with an education, health and care plan or a legacy statement the apprenticeships English and maths minimum requirement is Entry Level 3. British Sign Language qualification is an alternative to English qualifications for those whom this is their primary language.

Performance in the EPA will determine the apprenticeship grade of pass, merit, distinction or fail.

On-programme (typically 30-months)	End-point assessment gateway	End-point assessment (typically six-months)	Professional recognition (optional)
Training to develop the food and drink engineer occupational standard's knowledge, skills and behaviours Working towards English/maths Level 2 (if required) Compilation of portfolio of evidence	Employer satisfied apprentice is consistently working at or above the level of the occupational standard English/maths Level 2 Agreement of work-based project title and scope with EPAO Compiled and submitted portfolio of evidence	Three assessment methods: • Work-based project – graded fail, pass, merit or distinction • Test – graded pass or fail • Technical interview, underpinned by portfolio of evidence – graded fail, pass, merit or distinction EPA - graded fail, pass, merit or distinction	Incorporated Engineer
Food and drink engineer occupational standard			

Diagram 1. Typical food and drink engineer apprenticeship summary

End-point assessment gateway

The EPA should only start once the pre-requisite gateway requirements for EPA have been met and that they can be evidenced to an EPAO. Employers may wish to take advice from their apprentice's training provider(s).

Gateway requirements:

- employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard
- English and mathematics at level 2, as a minimum. For those with an education, health and care plan or a legacy statement the apprenticeships English and maths minimum requirement is Entry Level 3. British Sign Language qualification is an alternative to English qualifications for those whom this is their primary language.
- agreement of work-based project title and scope with EPAO; the project should have a business benefit
- compiled and submitted a portfolio to evidence to their EPAO demonstrating competence against the KSBs assessed by the technical interview

Portfolio of evidence

The portfolio of evidence will be used to underpin the EPA technical interview. The apprentice should draw on its contents when answering questions. It will typically contain 10-12 pieces of evidence. It will typically contain evidence such as performance review documentation, training records/certificates and work products such as risk assessments, reports, meeting records, plans and costings. Any employer contributions should focus on direct observation of evidence (for example witness statements) of competence rather than opinions. Records of learning activities targeting their own performance, to support demonstration of Behaviour B4 is acceptable. Evidence relating to the work-based project cannot be included in the portfolio of evidence. The portfolio of evidence must include a mapping of the evidence to the relevant KSBs for this assessment method. It is expected that each piece of evidence will cover multiple KSBs. The annex must also include a statement from the employer authenticating the apprentice's evidence. The portfolio of evidence must be available at the technical interview.

Length of end-point assessment period

The EPA will typically be completed within a six-month period, after the apprentice has met the EPA gateway requirements. The EPA period will start once the apprentice's work-based project outline has been agreed with their EPAO, in addition to the other gateway requirements.

Assessment methods

The assessment methods can be completed in any order, allowing EPAOs flexibility in scheduling and cost-effective allocation of resources. The result from one method does not need to be known before taking the next.

Requirements for each assessment method are detailed below.

Assessment method 1: Work-based project (WP)

The work-based project consists of a report, a presentation on the work completed and questioning.

The work-based project must assess apprentices against the occupational standard's core and option knowledge, skills and behaviours (KSBs) as shown in KSB mapping. It can focus on an immediate or longer-term issue/opportunity. The project should be of sufficient challenge and scope to typically take five months to complete and write the report.

The following should be discussed and agreed at the gateway as a minimum:

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 preliminary plan for implementation
9. Stakeholder engagement
10. Measures of success

a) Report

Apprentices must produce a report of 5,000 words (+/- 10%), excluding references, appendices and diagrams, based on a work-based project.

All work relating to the work-based project and report write-up, must be completed during the EPA period; excluding preliminary research to inform the work-based project outline.

The work-based project must be based on introducing an engineering change or new engineering to the production process considering efficiency (including cost), planning and co-ordination.

The work-based project report must include as a minimum:

- Background
- Project brief detailing targets
- Project research
- Project plan
- Implementation – how targets were achieved
- Risk analysis
- Challenges faced
- Project outcomes

The apprentice must provide supporting evidence relating to the project in an appendix. Evidence could include job cards, test scripts, data reports, build specifications, quality/compliance records or fault reports, pictures or links to video clips. This list is not definitive and other relevant sources are permissible. The appendix must include a mapping of the evidence to the relevant core and option KSBs for this assessment method. It is expected that each piece of evidence will cover multiple KSBs. The appendix must also include a statement from the employer authenticating the apprentice's evidence and achievements.

Apprentices should submit their work-based project report by the end of month five of the EPA period. It must be reviewed by their independent assessor before the presentation and discussion, to inform their questioning.

Work-based project example:

Project title: Improve maintenance and overall equipment effectiveness of packing line

Line 2B in West Leven produces biscuits at 800kg/hr, with 15% wastage as measured January-March this year. In 2015 this line was recorded at producing at a rate of 950kg/hr with 5% wastage. Fundamentally the equipment has not changed, but 4 new products have been introduced requiring additional changeovers and set up. Also the hygiene is now being completed by a 3rd party contractor.

Project will investigate the Engineering performance on the line and identify opportunities to recover the line to its former performance (or identify reasons for decrease with proposed cost benefit if investment is required to improve); consider Engineering operator and Hygiene team and their approach to asset care.

The robotic case packer appears to be the key issue on the line, which is operated with new staff and cleaned by the new Hygiene crew. The machine is also believed to be running slow either through software or mechanical capability.

Focus should be on this machine, but capability of the wrappers feeding should be understood.

Budget for basic work is available at £7k, this spend should be prioritised on return, and more funding could be found if justified.

Core contacts are: projects department, Manufacturing Manager, finance manager

Target completion is: given level of new stock keeping units on line success would be achieving 900kg/hr 5% waste with recommendations on how further 50kg/hr could be achieved.

b) Presentation, with questioning

Apprentices must prepare and deliver a presentation, based on their work-based project. The purpose of the presentation is to allow the apprentice further demonstrate the KSBs assessed by this assessment method.

The presentation should cover the project scope, outcomes/achievements, any difficulties faced/lessons learnt and recommendations. Apprentices must have two-weeks to prepare the presentation post submission of their report. The presentation will be made to an independent assessor and technical expert from the apprentice's employer. The independent assessor and technical expert must be present in person.

The 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 is provide information to the independent assessor on request; they have no input on the assessment decision. The assessment decision for the work-based project (report, presentation and questioning) must be determined solely by the independent assessor. The employer technical expert is expected to provide their services free of charge.

The presentation with questioning must take place in a controlled environment; a room free from distractions and influence, with sufficient space for all present and the necessary equipment, for example computer, presentation facilities (if required by the apprentice). It is anticipated that EPAOs will use the apprentice's employer's premises wherever possible to minimise costs.

The presentation must last 15 minutes, plus 10% at the independent assessor's discretion to allow the apprentices to complete the presentation.

There are no restrictions on how apprentices deliver the presentation or support resources/materials used. However, any equipment requirements for example computer, whiteboard, flip chart facilities must be agreed with the EPAO, at least two weeks in advance of the date of the presentation and questioning. It is anticipated that the presentation will typically consist of 5-6 slides, supported by a handout or A1 poster.

The questioning must seek to confirm that the apprentice has the knowledge, skills and behaviours assigned to this method of assessment (see KSB mapping) or determine the apprentice's depth of understanding to assess performance against the grading descriptors.

EPAOs must provide sample questions however, independent assessors can adapt and devise questions pertinent to the project.

The duration of the questioning must be 30-minutes, plus 10% at the independent assessor's discretion to allow the apprentices to complete an answer.

Apprentices may refer to their project report, evidence contained with the project report appendices, presentation or presentation aides when answering the questions.

The presentation and questioning should be recorded electronically, subject to the apprentice's agreement; where permission is not given, it is permissible for another independent assessor to be present to document evidence presented.

Independent assessors must assess the evidence from the report, presentation and questioning holistically to determine the work-based project grade - pass, merit, distinction or fail using the grading descriptors for this assessment method.

EPAOs must produce the following material to support this method:

- sample questions as a guide for independent assessors; they must produce and maintain a sample question bank of sufficient size to prevent predictability and review the questions regularly (and at least once a year) to ensure they are fit for purpose.

Assessment method 2: Test

Apprentices must complete a knowledge test during the EPA period.

The knowledge test must assess apprentices against the occupational standard's knowledge as shown in mapping of KSBs.

The knowledge test must consist of 20 multiple-choice and five extended answer questions.

The multiple-choice must assess the core knowledge and the extended answer questions must assess the knowledge relating to the apprentice's option: mechanical or electrical.

Each multiple-choice question must present the apprentice with four options, from which the apprentice must select the correct option. Each question answered correctly must be assigned one mark; any incorrect or missing answers must be assigned zero marks.

Extended answer questions will require the apprentice to provide answers of approximately 200 words per answer. Each question answered correctly will be awarded one mark; any incorrect or missing answers must be assigned zero marks. EPAOs must produce a marking scheme in line with the extended answer grading descriptors.

Apprentices must have three-hours to complete the knowledge test.

The knowledge test must be closed book i.e. the apprentice cannot refer to reference books or materials.

Knowledge tests can be either electronic or paper-based; and may be taken on-line.

Apprentices must take the knowledge test in the presence of an EPAO administrator/invigilator. The maximum administrator/invigilator to apprentice ratio must be 1 to 10 if face-to-face; or 1 to 5 if remote.

EPAOs must ensure that the test is conducted in a suitable controlled environment i.e. quiet room free from distraction and influence, with the necessary equipment, for example a computer for an on-line test. It is anticipated that EPAOs will use the employer's premises wherever possible to minimise costs. Where the test is administered remotely, EPAOs must ensure appropriate measures are in place to prevent misrepresentation, for example, screen share and 360-degree camera function of the test venue.

Knowledge tests must be marked by EPAO independent assessors or markers following a marking guide produced by the EPAO; electronic marking is permissible for the multiple-choice questions.

Independent assessors must award a grade using the following grading boundaries.

Grading boundaries	**Fail**	**Pass**
Multiple-choice marks	0-14	15-20
Extended answer marks	0-3	4-5

A pass mark is required in both elements of the test for an overall award of pass in the test component of the EPA.

It is recommended that EPAOs develop questions, in consultation with representative employers; where they do so they must ensure measures are in place to maintain question security and confidentiality.

EPAOs must ensure the knowledge test is available for apprentices within their EPA time period.

EPAOs must develop and maintain a knowledge test question bank of sufficient size to prevent predictability and review the questions regularly (and at least once a year) to ensure they are fit for purpose.

Knowledge test questions must be set so that a pass will represent competence in the apprentice's knowledge.

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

Assessment method 3: Technical Interview

Apprentices must complete a technical interview with their independent assessor. The technical interview will be conducted in the presence of a technical expert from the apprentice's employer. The independent assessor has the sole responsibility for making the assessment decision. The independent assessor and technical expert must be present in person.

The 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.

The independent assessor must ask a minimum of six questions from a bank of set questions covering the core and option KSBs identified in Annex A. Questions must be open, holistic and competency based in design. The independent assessor may ask follow up questions to probe further or seek clarification, within the time allowed. The technical interview should be recorded electronically, subject to the apprentice's agreement; where permission is not given, it is permissible for another independent assessor to be present to document evidence presented.

The portfolio of evidence must be available at the technical interview. The apprentice should draw on its contents when answering questions.

The technical interview must last 40-minutes, plus 10% at the independent assessor's discretion to allow the apprentices to complete an answer.

Reasonable adjustments

The EPAO must have in place clear and fair arrangements for making reasonable adjustments for this 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 EPA plan.

Grading

The three assessment methods are equally weighted in terms of determining the pass grade. The work-based project and technical interview underpinned by portfolio have a greater impact in terms of determining merit and distinction grades.

Independent assessors must individually grade each assessment method, according to the requirements set out in this plan. Restrictions on grading apply where apprentices re-sit/re-take an assessment method – see re-sit/re-take section below.

EPAOs must combine the grades of the three assessment methods to determine the EPA grade. To achieve an EPA pass, apprentices must achieve a pass in all three assessment methods. To achieve a merit apprentices must gain a merit or distinction in the work-based project and technical interview. The achieve a distinction, apprentices must achieve a distinction in the work-based project and technical interview. See grading combinations table below.

Independent assessors' decisions must be subject to moderation by the EPAO – see internal quality assurance section below. Decisions must not be confirmed until after moderation.

Work-based project	**Test**	**Technical interview**	**EPA grade**
Fail	Any grade	Any grade	**Fail**
Any grade	Fail	Any grade	**Fail**
Any grade	Any grade	Fail	**Fail**
Pass	Pass	Pass	**Pass**
Pass	Pass	Merit	**Pass**
Merit	Pass	Pass	**Pass**
Merit	Pass	Merit	**Merit**
Distinction	Pass	Merit	**Merit**
Merit	Pass	Distinction	**Merit**
Pass	Pass	Distinction	**Pass**
Distinction	Pass	Pass	**Pass**
Distinction	Pass	Distinction	**Distinction**

Table 1. Grading combinations

Re-sits and re-takes

Apprentices who fail one or more EPA method will be offered the opportunity to take a re-sit/re-take. Re-sits/re-takes must not be offered to apprentices wishing to move to a higher grade. A re-sit does not require further learning, whereas a re-take does.

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

The maximum grade awarded to a work-based project or technical interview re-sit/re-take will be pass, unless the EPAO identifies exceptional circumstances, which affected the original assessment.

In the case of a work-based project re-sit/re-take, the EPAO must advise whether the apprentice must complete a new project or whether a re-submission based on the original project is allowed. A new project will be required where the apprentice's workplace has proven to provide limited opportunity for application of the original project. Alternatively, apprentices can voluntarily choose to re-submit based on a new project, with agreement of their employer and the EPAO, who must agree the title and the scope of the new project.

If the work-based project re-sit/re-take is based on the same project, the project report will typically be submitted within six weeks of notification of the fail or after further learning has been completed and the presentation and questioning components typically completed within two months of notification of the fail or after further learning has been completed.

If the work-based project re-sit/re-take is based on a new project, it must be completed within six months of agreement of the project title/scope by the EPAO. The report will typically be submitted by month five and the presentation and questioning completed within the six-month period.

In the case of a test re-sit/re-take of the test, a different test paper must be sat.

Professional body recognition

Completion of the apprenticeship is designed to be recognised by the relevant professional institutions as contributing towards the appropriate level of professional registration (Incorporated Engineer). However, it is recognised that additional experiential evidence may be required. For more details on the requirements and application process go to the Engineering Council website at www.engc.org.uk

Roles and responsibilities, ensuring independence

Independent assessors must meet the following requirements:

- Be independent of the on-programme delivery, the apprentice and their employer i.e. there must be no conflict of interest
- Either hold at least a Bachelor of Engineering degree with engineering experience in the food & drink industry, or operated as a food & drink engineer at or above the level of the apprenticeship standard.
- Experience should be recent i.e. in the last three years or the independent assessor must be able to demonstrate current knowledge and skills.

- Have completed an induction covering the requirements of the apprenticeship standard and assessment practice (a formal qualification in this is not required) and attend at least two-days standardisation meetings per year.

It is anticipated that the same independent assessor will mark an apprentice's work-based project, technical interview and test to aide efficiency, however this is not a requirement.

EPAO internal quality assurance

Internal quality assurance refers to the requirements that EPAOs must have in place to ensure consistent, reliable, accurate and valid assessment decisions. EPAOs for this EPA must undertake the following:

- appoint independent assessors that meet the requirements as detailed in this plan – see above
- provide training for independent assessors in terms of good assessment practice, operating the assessment tools and grading
- have quality assurance systems and procedures that support fair, reliable and consistent assessment across organisation and over time
- operate regular standardisation events that enable assessors to attend a minimum of two-days per year
- operate moderation of assessment activity and decisions, through examination of documentation and observation of activity, with a minimum of 15-percent of each independent assessors' assessments moderated

Affordability
The following factors should ensure the EPA is affordable:

- the work-based project will have business benefits
- the EPAO can use employers' premises to conduct the test, presentation and questioning and technical interview
- the knowledge test can be administered/invigilated remotely

Volumes
It is anticipated that there will be 100 starts per year on this apprenticeship standard.

Mapping of knowledge, skills and behaviours by each assessment method

Key	
Work-based Project	**WP**
Test	**T**
Technical Interview	**I**

Knowledge

		WP	T	I
K1	Legislative, regulatory and ethical requirements, such as Dangerous Substances and Explosive Atmospheres (DSEAR) and Atmospheres and Explosives (ATEX) regulations, and their application to food engineering processes; food safety, hazard analysis and critical control points (HACCP), health & safety and environmental considerations	X		
K2	Food science and technology; how engineering is used in food and drink production: heating processing, packaging, modified atmosphere packaging (MAP), preservation, chilling, freezing, sterilisation		X	
K3	Engineering processes and equipment including automation and controls to make and deliver products to market: shaping forming equipment, ovens, chillers, freezers, sterilisers, MAP packing machines, check weighers, temperers, washing/cleaning, fillers, extruders, bulk solid handling & distribution and liquid systems process validation, sieving, filtration, metal detection, bar code verification metal detection wrapping and palletising		X	
K4	Engineering theory and techniques to develop processes i.e. thermodynamic and thermo-fluid analysis heat transfer can be applied to design of baking, cooling, preserving, freezing, chilling systems		X	
K5	Hygienic engineering principles relating to type of material, machine assembly, design and practice; and their importance to delivering food hygiene and safety and employee health and safety requirements in a food and drink process			X
K6	Packing materials in food; inter-relationships with food ingredients, final product and their effects on safety, quality and performance through the supply chain i.e. how to engineer correct seals on film, cardboard, tins, stable transportation, moisture barriers		X	
K7	Problem solving tools to analyse e.g. Define, Measure, Analyse, Improve Control (DMAIC) principles		X	
K8	Interpretation and evaluation techniques	X		
K9	Overall Equipment Efficiencies (OEE), for example Smart Reliability Driven Maintenance approaches including Reliability Centred Maintenance (RCM)/ Failure mode, effects, and critical analysis (FMECA),			X

	Condition Monitoring Techniques and applications, Single minute change of Die (SMED), Line balance			
K10	Risk management techniques, reliability/criticality tools and how they are used to reduce operational losses/wastage operations			X
K11	Life Cycle Asset Management (LCAM), Criticality Analysis & Technology Selection (CATS), Intelligent Maintenance, Repair and Operations (inventory) (MRO) Optimisation			X
K12	Product, machinery specifications: how they are used to set capability measurement, performance testing and maintenance requirements to deliver a standard set of operating conditions for consistent product delivery	X		
K13	Effective planning and scheduling, including effective communication, team working and project management techniques	X		
K14	Customer/food trade association standards, such as British Retail Consortium, Retailer and Engineering standards		X	
K15	General manufacturing services: steam, pneumatics and hydraulics, electrical supply, refrigeration, water supply and effluent		X	
K16	Manufacturing services specific to food: air filtration, oil free compressors, cleanliness of steam for food, sieving of materials, use of food grade lubricant, primary secondary cooling chemicals for food, MAP gases and generation i.e. Nitrogen		X	
K17	Factory digitisation/optimisation (Iot, Factory 2020 principles), for example principles of control engineering, logic controllers and data communication systems, sensors and devices, drives and transmissions, pumps and distribution systems, safety circuit systems, computer aided design, shop floor data gathering, PC use and computerised maintenance	X		
K18	Digitisation: 4.0, modelling of lines/process, 3d modelling scanning and printing, product dimensional measurement, rheology measurement		X	

Skills:

		WP	T	I
S1	Use engineering principles to deliver products/packaged food	X		
S2	Comply with standard operating procedures, company, legal and regulatory requirements and customer/consumer and engineering standards	X		
S3	Plan, for example labour and engineering materials	X		
S4	Influence and communicate with colleagues and others, such as engineers, other functions and teams	X		
S5	Assess team and individual performance, provide feedback to improve; coach and mentor			X
S6	Use continuous improvement techniques, for example apply quality management principles, participate in failure investigations and contribute to and implement practical engineering solutions for efficiency and/or profitability	X		
S7	Use IT, digitisation and manual methods to collect data from systems to support engineering activity within the business	X		
S8	Use and develop planned preventative maintenance (PPM) strategies, incorporate appropriate proactive maintenance routines, such as vibration analysis, thermography, simple visual/part measurement			X
S9	Analyse operational performance, specification and data	X		
S10	Evaluate possible failure modes and identify the strategy, for example technical risk assessment methods, PPM to RCM techniques			X
S11	Contribute to the construction and commissioning of equipment and machinery used for producing preserved/fresh and safe food and drink products			X

Behaviours:

		WP	T	I
B1	Safe working, for example promotes a culture of food safety and safe working practices			X
B2	Takes ownership of work, for example takes responsibility and ownership of decision making for good food practice; is proactive, and demonstrates initiative; plans work: dependable; works autonomously within own sphere of responsibility	X		
B3	Shows pride in work, for example strong work ethic; displays a positive mind set; pays attention to detail; looks for new ways of working that improve outcomes and results			X
B4	Committed to self-development, for example seeks learning, drives the development of self and others; maintains and enhances own practice through continuing professional development activity			X
B5	Shows integrity and respect, for example promotes integrity in process and site standards, respects others, promotes good communication at all levels, adapts personal style to meet work needs			X
B6	Team player, for example drives good relationships with others, works collaboratively, contributes ideas and challenges appropriately	X		
B7	Responsive to change, for example flexible to changing working environment and demands; resilient under pressure			X
B8	Shows company/industry perspective, for example promotes the position of the business in relation to market and competition, keeps up to date with industry and market advancement, commercially aware			X

Mechanical Option Knowledge:

		WP	T	I
MK1	Mechanical design, mechanical analysis (static) performance of components, mechanisms and systems; study of friction wear; the science of interacting surfaces in relative motion (tribology)		X	
MK2	Laws of thermodynamics and its applications within a hygienic food and drink environment: the fundamentals of heat transfer, thermo-fluid analysis, entropy, energy efficiency; conservation and sustainability		X	
MK3	Steam fundamentals such as fuel types, combustion, feedwater, boiler controls and instrumentation, operation of boilers, safety and legal requirements and boiler efficiency		X	
MK4	Heat recovery systems and energy management including the requirements of efficient best practice		X	

Mechanical Option Skills:

		WP	T	I
MS1	Design, produce, and operate mechanical machinery			X
MS2	Design power circuits, utilising software and calculation			X
MS3	Apply specialist reliability engineering techniques to prevent or reduce the likelihood or frequency of failures i.e. vibration analysis, oil sampling, heat mapping, non-destructive testing			X
MS4	Apply thermodynamic theory to more complex engineering systems, for example tempering chocolate, cleaning systems, sterilisation, vacuum cooling		X	
MS5	Design and improve systems, for example steam, water or air	X		

Electrical Option Knowledge:

		WP	T	I
EK1	Electrical and electronic systems, design techniques and their applications to British Standards			X
EK2	Installation of systems and supply systems following food safety standards e.g. tray work			X
EK3	Advanced electrical principles (low voltage (LV) to high voltage (HV))		X	

EK4	Instrumentation and calibration techniques for systems, for example thermo, weights and flow		X	
EK5	Automation and control systems primarily with the following low voltage systems, i.e. building automation systems, heating, ventilation and air conditioning (HVAC) controls, access control systems, data cabling and fiber optic cable installation and termination		X	
EK6	Supervisory control and data acquisition (SCADA) and network systems		X	
EK7	Electrical safety systems and smart solutions		X	

Electrical Option Skills:

		WP	T	I
ES1	Design and configure electrical systems i.e. add distribution boards to circuits	X		
ES2	Model dynamic systems utilising software tools	X		
ES3	Design and modify electrical control engineering systems i.e.: Engineering LAN/network			X
ES4	Diagnose faults on complex control systems			X
ES5	Decipher complex programme sequences in higher and lower level languages			X

Grading descriptors

Work-based project		
KSB	**Pass – apprentices must demonstrate all of the following descriptors.**	**Merit – apprentices must demonstrate all of the pass descriptors plus the descriptors in at least four of the following boxes (core and chosen option).** **Distinction – apprentices must demonstrate all of the pass descriptors plus all of the descriptors in the following boxes (core and chosen option).**
K1, S2	Legislation, regulatory and ethical requirements and company standards that would impact on the project are correctly identified and project compliance with them demonstrated	
K8, S6, S7, S9	Collects data that can support the project outcomes. Evidences using IT, digitisation and manual data collection methods. Information is accurately interpreted/evaluated, comparing collected data against specification or other available sources. Evidence of correct application of at least one continuous improvement and problem solving technique within project.	Justifies choice of continuous improvement/problem solving technique against others.

K12	Accurately identifies at least one product and one machinery specification feature (for example measurement of capability; performance test; maintenance requirement) and explains how they have been taken into account for project benefit such as a standard operating condition or consistent product delivery.	Identifies alternative approaches and justifies chosen approach in relation to the project.
K13, S3, S4, B6	Planning and scheduling ensures resources required are available to meet project plans, for example labour, engineering materials. Project communication is technically correct and suitable to the audience, for example technical language used appropriately, sharing ideas and questioning/challenging appropriately. Evidence of influencing stakeholders to achieve project outcomes, for example other engineers, functions and teams.	Justifies how planning and scheduling optimised resources. Demonstrates differentiation in communication or influencing style for different audiences.
K17	Demonstrates an example of applying at least one method of factory digitisation/optimisation within the project and identifies benefits to the project.	Identifies an alternative factory digitisation/optimisation method and justifies chosen approach in relation to the project.
S1	Demonstrates use of discrete engineering principles and explains how they been applied to deliver products/packaged food consistently to specification that meets business, customer, sector and legislative requirements.	Demonstrates integration of multiple engineering principles into one process to deliver products/packaged food consistently to specification that meets business, customer, sector and legislative requirements.
B2	Demonstrates ownership of work within project, for example: providing evidence of when they took responsibility and ownership of decision making; demonstrated proactive working; and used	

	their initiative; working autonomously within own sphere of responsibility to effectively deliver the project.	
MS5	Demonstrates within the project design of a system or system improvement (steam, water or air) that has had a positive impact.	Identifies alternative designs and justifies chosen approach in relation to the project.
ES1, ES2	Demonstrates within the project the design and configuration and modelling of an electrical system i.e. addition of distribution boards to circuits, with working results; using of software tools correctly.	Identifies alternative designs or configurations and justifies chosen approach in relation to the project.
Fail: Apprentices will fail this assessment method if they do not demonstrate all of the core pass descriptors and pass descriptors relating to their chosen option: electrical or mechanical		

Technical interview		
KSB	**Pass – apprentices must demonstrate all of the following descriptors.**	**Merit – apprentices must demonstrate all of the pass descriptors plus the descriptors in at least four of the following boxes (core and chosen option).** **Distinction – apprentices must demonstrate all of the pass descriptors plus all of the descriptors in the following boxes (core and chosen option).**
K5	Demonstrates analysis of a production process and identifies within it the engineering principles relating to hygiene, safety and employee health and safety and explains their importance, including type of material, machine assembly, design and practice.	Justifies the use of chosen engineering principles within a production process over others, considering hygiene, safety and employee health and safety factors relating to these principles.
K9	Evidences the use of an Overall Equipment Efficiencies (OEE) method, within a process/line for food and drink production and justifies the method used, considering more than one factor, for example cost, savings, time etc.	Critically reflect on the effectiveness of a method of OEE used within a process/line for food and drink production and explain its choice over alternatives.
K10, K11, S8, S10, MS3	Gives an example of development and usage of a planned proactive preventative maintenance strategy developed, based on the use of risk management techniques and reliability/criticality tools and, with maintenance routines. This will include how the techniques and	Reflects on the effectiveness of a developed PPM strategy, considering the risk management techniques, reliability/criticality. tools, possible failure modes considered and preventative measures proposed/used.

	tools influenced the strategy's development and its impact on operational losses. Evidence of Life Cycle Asset Management (LCAM), Criticality Analysis & Technology Selection (CATS), Intelligent Maintenance, Repair and Operations (inventory) (MRO) Optimisation should be displayed within this strategy development. Identifies possible failure modes and frequencies and specialist preventative techniques/strategies. Where the student is a mechanical specialist, this should include specific mechanical examples; i.e. vibration analysis, oil sampling, heat mapping, non-destructive testing. Demonstrates within this activity attention to detail when looking for new ways of working that improve outcomes/results.	Suggest improvements to the PPM strategy based on this reflection.
S5, B4	Demonstrates individual development through cycle of reflection and improvement such as CPD and support and encouragement of other individuals and teams in similar practices, for example, through feedback, coaching, and mentoring.	
S11, MS1, EK1, EK2	Evidences their contribution in the design, production/construction and commissioning of equipment for producing preserved/fresh and safe food and drink products.	Evaluates the equipment designed and commissioned for producing preserved/fresh and safe food and drink products, justifying design choices and proposing future developments to improve the equipment.

	Where a mechanical apprentice, this must relate at least in part to mechanical systems. Where an electrical apprentice, evidence installation of design compliance with British food safety standards must be demonstrated.	
B1, B5	Evidences integrity in adherence to site and process standards for safe working. For example, having promoted a culture of food safety and safe working, by having communicated these standards to others (i.e. during an induction activity). Evidences showing respect to others, for example promoting good communication at all levels, adapting personal style to meet work needs.	
B3	Evidences pride in work, for example: by displaying a strong work ethic, explaining how this has led to positive outcomes; by displaying a positive mind set, explaining how this has helped when dealing with challenges within their work; by paying attention to detail, explaining the positive role this has on their work; by looking for new ways of working explaining how this has improved outcomes and results in the workplace.	
B7	Demonstrates with evidence an instance of flexibility to change in their work environment when under pressure.	

B8	Describes the nature of their company and identifies market competition and recent industry/market advances.	Provides qualitative analysis of their company and potential future developments that may be required to maintain market competitiveness.
MS2, ES3	Demonstrates application of specialist knowledge through the design power circuits (mechanical) or design and modification of electrical control engineering systems (electrical) in relation to their food and drink production environment.	Presents multiple design solutions for a project within their food and drink production environment, considering the advantages and disadvantages of each.
ES4	Evidences the diagnosis of faults in a complex control system within the food and drink production environment.	Describe the process undertaken in discounting other potential faults before identifying the actual fault(s) on a complex control system within the food and drink production environment.
ES5	Demonstrates through evidence understanding of the functions controlled by complex programme sequences written, giving examples using higher and lower level programming languages for applications within their food and drink production environment.	Justifies the methodology employed when editing a programme sequence, demonstrating consideration of alternative methods of working.
Fail: Apprentices will fail this assessment method if they do not demonstrate all of the core pass descriptors and pass descriptors relating to their chosen option: electrical or mechanical		

Test – extended answers		
KSB	**Questions should be on:**	**The following elements are required for a pass to be achieved:**
MK1	Mechanical design of a food and drink manufacturing system	Consideration of static forces, friction and its reduction (i.e. tribology).
MK2, MS4	Thermodynamic principles related to food and drink production	Able to analyse or calculate heat transfer, entropy, energy efficiency, conservation and sustainability. Relates these calculations/analyses to the design or operation of food engineering systems.
MK3	Boiler operation, control and instrumentation	Safety requirements and legal requirements for steam generation.
MK4	Efficient use of heat recovery and energy management systems in the food and drink environment.	Identifies the benefits of practices which result in the efficient use of heat recovery and energy management.
EK3	High voltage and low voltage circuits for food and drink manufacture applications.	Able to describe applications for high voltage circuits and the benefits of these circuits in the applications considered. Similarly, able to describe applications for low voltage circuits and the benefits of these circuits in the applications considered.
EK4	A range calibration techniques for different systems relating to the food and drink production environment	Able to describe more than one instrumentation calibration techniques, their application and benefits to the system being considered. May include thermo, weights and flow.
EK5	Low voltage automation and control systems within food and drink production	Able to describe the operation of a system and its application within the food and drink production environment. Systems considered may include building automation systems, heating, ventilation and air conditioning (HVAC) controls, access control systems, data cabling and fibre optic cable installation and termination.

EK6	Supervisory control and data acquisition (SCADA) and network systems to a production line within the food and drink production environment.	Describes the implementation and benefits of SCADA to a production line within the food and drink production environment.
EK7	Electrical safety systems and smart solutions applicable to systems within the food and drink production environment.	Able to describe the operation and benefits of electrical safety systems and smart solutions within the food and drink environment.
Fail: Apprentices will fail this assessment method if they do not demonstrate all of the core pass descriptors and pass descriptors relating to their chosen option: electrical or mechanical		