Food and Drink Engineer
Apprenticeship Standard, Level 5

End-point Assessment Plan

Food and Drink Engineer Apprenticeship

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 apprenticeship 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. In addition, apprentices without English and mathematics at level 2 must achieve this level prior to taking their EPA.[1]

The EPA must be completed within a 6-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 distinct assessment methods:

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[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.

- **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

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 (maximum 6-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)**	English/maths Level 2 Agreement of work-based project title and scope with EPAO Employer satisfied apprentice is consistently working at or above the level of the occupational standard	Three assessment methods: • Work-based project – graded fail, pass, merit or distinction • Test – graded pass or fail • Technical Interview – 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
- agreement of work-based project title and scope with EPAO; the project should have a business benefit
- a portfolio to evidence demonstrating competence against the KSBs assessed by the technical interview.

The portfolio of evidence will be used to underpin the EPA technical interview. 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. Evidence collected as part of the work-based project may be used within this portfolio however, this should not comprise the entirety of the evidence presented; the portfolio of evidence and technical interview it supports are assessing different KSBs. Self-reflective accounts and witness testimonies are not valid evidence sources. 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. Apprentices must bring the portfolio of evidence to the technical interview.

Length of end-point assessment period:

The EPA must be completed within a 6-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 during the maximum EPA period, 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 knowledge, skills and behaviours (KSBs) as shown in annex A. It can focus on an immediate or longer-term issue/opportunity, provided the project can be completed with the EPA period. 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 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 and achievements.

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 requirement is to 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 it 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.

Apprentices must submit their work-based project report by the end of month 5 of the EPA period, at the latest. It must be reviewed by their independent assessor before the presentation and discussion, to inform their questioning.

b) Presentation, with questioning

Apprentices must prepare and deliver a presentation, based on their work-based project. Apprentices must have two-weeks to prepare the presentation post submission of their project. The presentation will be made to an independent assessor and 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. 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. Independent assessors will solely determine the grade for the work-based project and presentation with questioning. The employer technical expert 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, power-point 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 cover: the work-based project scope, outcomes/achievements, any difficulties faced/lessons learnt and recommendations.

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 PowerPoint, 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 PowerPoint 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 annex A) or determine the apprentice's depth of understanding to assess performance against the distinction criteria.

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 annex, 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 criteria in annex B.

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 annex A.

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

20% of the multiple-choice and 40% of the extended answer questions must assess specialist knowledge and skills relating to the apprentice's option.

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 extended answer question will be awarded six marks, partial marks can be awarded. The marking scheme must clearly show how marks are awarded.

Apprentices must have a maximum of 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	0-15	16-30

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 6-month 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 six questions from a bank of set questions covering the 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. 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.

Apprentices must bring their portfolio of evidence – see above, to 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.

Grading

The three assessment methods are equally weighted.

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	**Merit**
Distinction	Pass	Pass	**Merit**
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.

All assessment methods must be successfully passed within the same six-month period. Thus, if an assessment method re-sit/re-take is more than six-months from achievement of another method, that assessment method will also need to be re-sat/re-taken.

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 accounting for the original fail.

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.

Re-sits/re-takes will not be offered to apprentices wishing to move from pass to merit or distinction or merit to distinction.

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
- Hold a Bachelor of Engineering degree as a minimum and have 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 and online 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

External quality assurance

External quality assurance arrangements will ensure that EPAOs delivering EPA for this apprenticeship operate consistently and in line with this plan.

External quality assurance for this apprenticeship standard will be undertaken by Ofqual.

Annex A – Knowledge, Skills and Behaviours to be assessed by 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	How to interpret and evaluate information, concepts and ideas from existing systems to maintain and continually improve the food manufacturing process, for example designing out repeated failure and delivering higher output with the same quality and consistency of product	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), Condition Monitoring Techniques and applications, Single minute change of Die (SMED), Line balance			X
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) e.g. 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 consistently to specification that meets business, customer, sector and legislative requirements	X		
S2	Comply with standard operating procedures, company, legal and regulatory requirements and customer/consumer and engineering standards	X		

S3	Planning: coordinate labour and engineering materials with operational plans to optimise availability of plant and equipment	X		
S4	Influence and communicate with colleagues and others, including engineers, other functions and teams	X		
S5	Assess team and individual performance, providing feedback to improve; coach and mentor to grow skills and support the development of professional standards	X		
S6	Use continuous improvement techniques to drive continual quality improvement, including ensuring the application of quality management principles, to participate in failure investigations to ensure process effectiveness and to contribute to and implement practical engineering solutions for efficiency and/or profitability			X
S7	Use IT, digitisation and manual methods to collect and analyse data from systems to support engineering activity within the business	X		
S8	Use and develop planned preventative maintenance (PPM) strategies incorporating appropriate proactive maintenance routines i.e. vibration analysis, thermography, to simple visual/part measurement			X
S9	Analyse operational performance, specification and data to minimise system failures to increase equipment reliability and availability			X
S10	Evaluate possible failure modes and identify the most cost-effective strategy for your business e.g. 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
S12	Apply engineering knowledge and specialist techniques e.g. reliability, to prevent or reduce the likelihood or frequency of failures	X		

Behaviours:

		WP	T	I
B1	Safe working: promotes a culture of food safety and safe working practices			X
B2	Ownership of work: 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	Pride in work: 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	Self-development: seeks learning, drives the development of self and others; maintains and enhances own practice through continuing professional development activity	X		
B5	Integrity and respect: promotes integrity in process and site standards, respects others, promotes good communication at all levels, adapts personal style to meet work needs	X		
B6	Working in a team: drives good relationships with others, works collaboratively, contributes ideas and challenges appropriately	X		
B7	Problem solving: applies appropriate solutions; works to identify and ensure root causes of problems are eliminated, demonstrating a tenacious approach	X		
B8	Responsiveness to change: flexible to changing working environment and demands; resilient under pressure			X
B9	Company/industry perspective: 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 steam, water and air systems	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 all systems e.g. 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 (PILZ)		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	Logically decipher complex programme sequences in higher and lower level languages			X

Annex B – Grading criteria

The table below details the grading criteria for the work-based project and technical interview. The work-based project and technical Interview will be graded separately. Grading of each is is based on the following principles:

- pass criteria shows the apprentice is demonstrating competence against the KSB statements; merit and distinction criteria build on the pass criteria. Pass, merit or distinction criteria must be demonstrated against the KSBs for an apprentice to receive a pass grade
- to receive a merit – merit or distinction criteria must be demonstrated against all KSB statements
- to receive a distinction - 75% or more of the KSBs must be demonstrated at distinction, with all other KSBs demonstrated at merit

Standard Statement	**Distinction criteria:**	**Merit criteria:**	**Pass criteria:**	**Fail criteria:**
Work-based project				
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),	An understanding of food legislation and regulation with no errors, demonstrating knowledge of the systems that seek to ensure regulatory compliance and the implications of noncompliance.	Understanding of food legislation and regulation across a range of processes or sectors in the food industry. Demonstrates knowledge of the systems that seek to ensure regulatory compliance.	Understanding of food legislation and regulations within own organisation and processes in the food and drink industry.	Fails to demonstrate any evidence of considering legislative, regulatory or ethical requirements.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
health & safety and environmental considerations				
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	Demonstrates through an example an understanding of packing materials and how they inter-relate with food within a production line of the apprentice's own organisation and possible wider alternatives. Is able to explain reasoning for chosen packaging methodology, including underlying scientific principles.	Demonstrates through an example an understanding of packing materials and how they inter-relate with food within a production line of the apprentice's own organisation and possible wider alternatives.	Demonstrates through an example an understanding of packing materials and how they inter-relate with food within a production line of the apprentice's own organisation.	Fails to demonstrate any understanding of packing materials or their inter-relationship with food in any way.
K7: Problem solving tools to analyse e.g. Define, Measure, Analyse, Improve Control (DMAIC) principles	Gives more than one examples of problem solving techniques used for analysis and can	Gives more than one example of problem solving techniques used for analysis.	Gives an example of a problem solving technique used for analysis.	Demonstrates no knowledge of problem solving tools relevant to anlysis.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
	explain reasons for choosing each in the examples offered.			
K8: How to interpret and evaluate information, concepts and ideas from existing systems to maintain and continually improve the food manufacturing process, for example designing out repeated failure and delivering higher output with the same quality and consistency of product	Gives an example of interpretation or evaluation of information, concepts and ideas from an existing system and explain how these interpretations may influence future working.	Gives an example of interpretation or evaluation of information, concepts and ideas from an existing system and explain how this interpretation may influence future working.	Gives an example of interpretation or evaluation of information, concepts or ideas from an existing system.	Fails to demonstrate interpretation or evaluation of information, concepts or ideas.
K13: Effective planning and scheduling including effective communication, team working and project management techniques	Demonstrates ability to plan a sequence of acitivites logically for self and others, communicating this to others and demonstrates how this fits with the	Demonstrates ability to plan a sequence of acitivites logically for self and others, communicating this to others.	Demonstrates ability to plan a sequence of own acitivites logically.	Fails to demonstrate evidence of planning or scheduling in any way including commuinication with others, team working or project management.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
	wider management of a given task or project.			
K17: Factory digitisation/optimisation (Iot, Factory 2020 principles) e.g. 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	Demonstrates a knowledge of three methods of factory digitisation/optimisation and can state potential benefits and drawbacks of these, using these to justify the use of a particular digitisation/optimisation technique in a particular application within the food industry.	Demonstrates a knowledge of three methods of factory digitisation/optimisation and can state potential benefits and drawbacks of these.	Demonstrates a knowledge of three methods of factory digitisation/optimisation.	Fails to demonstrate any understanding of factory digitisation/optimisation .
S1: Use engineering principles to deliver products/packaged food consistently to specification that meets	Demonstrate through evidence the delivery of products/packaged foods to a given specification.	Demonstrate through evidence the delivery of a product/packaged food to a given specification.	Demonstrate through evidence the delivery of a product/packaged food to a given specification.	Fails to use engineering principles to deliver products/packaged food consistently to specification that meets

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
business, customer, sector and legislative requirements	Able to distinguish the business, customer, sector and legislative requirements of the given specification, as relevant to the product being delivered.	Able to distinguish the business, customer, sector and legislative requirements of the given specification, as relevant to the product being delivered.		business, customer, sector and legislative requirements
S2: Comply with standard operating procedures, company, legal and regulatory requirements and customer/consumer and engineering standards		Demonstrates ability to Comply with and distinguish between standard operating procedures, company, legal and regulatory requirements and customer/consumer and engineering standards	Demonstrates ability to Comply with standard operating procedures, company, legal and regulatory requirements and customer/consumer and engineering standards	Fails to comply with standard operating procedures, company, legal and regulatory requirements and customer/consumer and engineering standards
S3: Planning: coordinate labour and engineering materials with operational plans to optimise availability of plant and equipment	Able to propose, with justification, improvements to wider operational plans and elicit how this affects labour or engineering	Demonstrates ability to coordinate labour and materials with wider operational plans and can identify advantages of this.	Demonstrates ability to coordinate labour or materials with wider operational plans.	Fails to coordinate labour and engineering materials with operational plans to optimise availability of plant and equipment

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
	material coordination for optimisation purposes.			
S4: Influence and communicate with colleagues and others, including engineers, other functions and teams	Demonstrates through evidence communication with others wherein the apprentice's communication has positively influenced subsequent activity of the team. Able to evidence communication beyond immediate team to others from other departments or specialisms.	Demonstrates through evidence communication with others wherein the apprentice's communication has positively influenced subsequent activity of the team.	Demonstrates through evidence communication with others.	Fails to demonstrate influencing or communication with others.
S5: Assess team and individual performance, providing feedback to improve; coach and mentor to grow skills and	Able to assess own and others performance and demonstrate awareness of areas for improvement and how	Able to assess own and others performance and demonstrate awareness of areas for improvement and how this may be	Able to assess own performance and demonstrate awareness of areas for improvement and how this may be	Fails to assess performance of team or individual or support the

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
support the development of professional standards	this may be implemented to support development in alignment with professional standards, offering mentorship to others in this development.	implemented to support development in alignment with professional standards.	implemented to support development in alignment with professional standards.	development of professional standards.
S7: Use IT, digitisation and manual methods to collect and analyse data from systems to support engineering activity within the business	Evaluates a range of data collection methods and justifies the one selected for data collection. Identifies trends in the data collected and suggests reasons for these trends and make suggestions for future working based on the data collected and trends identified.	Evaluates a range of data collection methods and justifies the one selected for data collection. Identifies trends in the data collected and suggests reasons for these trends.	Collects data from a system and identifies patterns/trends within this data.	Fails to use any method to collect and analyse data from systems to support engineering activity within the business

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
S12: Apply engineering knowledge and specialist techniques e.g. reliability, to prevent or reduce the likelihood or frequency of failures	Identifies an area within the business where reliability or failure issues can arise, explaining the (possible) cause(s) of this issue and propose improvements to the system using engineering knowledge and specialist techniques relevant to the system investigated.	Identifies an area within the business where reliability or failure issues can arise, explaining the (possible) cause(s) of this issue using engineering knowledge.	Identifies an area within the business where reliability or failure issues can arise.	Fails to apply engineering knowledge and specialist techniques for reliability or failure reduction purposes.
B3: Pride in work: strong work ethic; displays a positive mind set; pays attention to detail; looks for new ways of working that improve outcomes and results	Through examples, demonstrates pride in work and high work standards. Examples show how they embrace new ways of thinking. Examples illustrate a positive mind set with demonstrations of a willingness to learn,	Provides an example to demonstrate pride in their work and high work standards. Example shows how they embrace new ways of thinking. Example illustrates a positive mind set and a willingness to learn, displays proactive approach.	Provides an example to demonstrate pride in their work and high work standards. Example shows how they embrace new ways of thinking. Example illustrates a positive mind set and a willingness to learn.	Does not provide an example to demonstrate pride in their work and high work standards. Example does not illustrates a positive mind set nor a willingness to learn.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
	displays proactive approach and ability to act on their own initiative.			
B4: Self-development: seeks learning, drives the development of self and others; maintains and enhances own practice through continuing professional development activity	Describes with examples, their own self-development: to always give their best, sets themselves challenging targets, confident decision maker, has ambition to continuously improve self.	Describes with examples, their own self-development: to always give their best, sets themselves challenging targets, confident decision maker.	Describes, their own self-development: to always give their best, sets themselves new targets and able to make decision.	Unable to describe their own self-development: does not demonstrate giving their best, nor setting themselves new targets.
B5: Integrity and respect: promotes integrity in process and site standards, respects others, promotes good communication at all levels, adapts personal style to meet work needs	Using examples, able to describe their professional integrity in process or site standards or respect for colleagues respect for colleagues: descriptions illustrates three of the following	Uses an example, to describe their professional integrity in process or site standards or respect for colleagues respect for colleagues: description illustrates three of the following attributes: shows respect for others;	Uses an example, to describe their professional integrity in process or site standards or respect for colleagues respect for colleagues: description illustrates two of the following attributes: shows respect for others; promotion	Unable to give an example of their professional integrity in process or site standards or respect for colleagues: description does not illustrate any of the following attributes:

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
	attributes: shows respect for others; promotion of good communication or adaptation of personal style to meet needs of the work.	promotion of good communication or adaptation of personal style to meet needs of the work.	of good communication or adaptation of personal style to meet needs of the work.	shows respect for others; promotion of good communication or adaptation of personal style to meet needs of the work.
B6: Working in a team: drives good relationships with others, works collaboratively, contributes ideas and challenges appropriately	Gives more than one example demonstrating ability to foster good relationships, work collaboratively and contribute ideas or challenges to a team.	Gives an example demonstrating ability to foster good relationships, work collaboratively and contribute ideas or challenges to a team.	Gives an example of ability to foster good relationships, work collaboratively or contribute ideas or challenges to a team.	Unable to give an example of good relationships with others, working collaboratively or contributing ideas and challenges.
B7: Problem solving: applies appropriate solutions; works to identify and ensure root causes of problems are eliminated, demonstrating a tenacious approach	Gives an example of problem solving, presenting more than one solution and justifying final chosen solution and explaining how it eliminated root cause(s) of the problem.	Gives an example of problem solving, demonstrating an appropriate solution, ensuring elimination of root causes.	Gives an example of problem solving, demonstrating an appropriate solutions.	Unable to provide any evidence of problem solving.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
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	Evaluates specialist reliability techniques for an identified reliability/failure issue and justify why a particular reliability technique was chosen for this scenario, evaluating its effectiveness on the issue.	Evaluates specialist reliability techniques for an identified reliability/failure issue and justify why a particular reliability technique was chosen for this scenario.	Demonstrates application of a specialist reliability technique.	Fails to apply specialist reliability techniques.
MS5: Design and improve steam, water and air systems	Evaluates multiple improvements before designing a final solution for a steam, water or air system, justifying choices made.	Identifies potential and designs an improvement to a steam, water or air system.	Demonstrates design of a steam, water or air system.	Fails to design and improve steam, water and air systems.
EK1: Electrical and electronic systems, design techniques and their applications to British Standards	Justifies decisions made in the design process, with reference to British Standards.	Designs an electrical/electronic system conforming to British Standards and can explain	Designs an electrical/electronic system conforming to British Standards.	Fails to work on electrical and electronic systems, designing them to British Standards.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
		how these standards are met.		
ES1: Design and configure electrical systems i.e. add distribution boards to circuits	Designs and configures an electrical system, justifying reasons for the design and configuration.	Designs and configures an electrical system.	Configures an electrical system.	Fails to design and configure electrical systems.
ES2: Model dynamic systems utilising software tools	Explains the advantage of modelling of a dynamic system using software for the apprentice's chosen application.	Interprets data provided by the modelling of a dynamic system using software.	Models a dynamic system using software.	Fails to model dynamic systems utilising software tools.
Technical Interview				
K5: Hygienic engineering principles relating to type of material, machine assembly, design and practice; and their importance to delivering food hygiene and safety and	Demonstrates knowledge of more than three examples of hygienic engineering principles relating to type of material,	Demonstrates knowledge of three examples of hygienic engineering principles relating to type of material, machine assembly, design and practice and identifies	Demonstrates knowledge of three examples of hygienic engineering principles relating to type of material,	Fails to demonstrate knowledge of any hygienic engineering principles related to type of material, machine assembly, design and

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
employee health and safety requirements in a food and drink process	machine assembly, design and practice and identifies the importance of each in relation to food hygiene/safety or employee health and safety across more than one process.	the importance of each in relation to food hygiene/safety or employee health and safety.	machine assembly, design and practice.	practice; and their importance to delivering food hygiene and safety and employee health and safety requirements in a food and drink process.
K9: Overall Equipment Efficiencies (OEE), for example Smart Reliability Driven Maintenance approaches including Reliability Centred Maintenance (RCM)/ Failure mode, effects, and critical analysis (FMECA), Condition Monitoring Techniques and applications, Single minute change of Die (SMED), Line balance	Compares examples of overall equipment efficiency methods, their advantages and drawbacks and their applicability to a process/section of the apprentices' company.	Describes more than one example of an overall equipment efficiency and their applicability to a process/section of the apprentices' company.	Describes an example of an overall equipment efficiency.	Demonstrates no knowledge of overall equipment efficiencies.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
K10: Risk management techniques, reliability/criticality tools and how they are used to reduce operational losses/wastage operations	Evaluates more than one Risk management techniques or reliability/criticality tools within the context of the apprentice's company, identifying the optimum for a particular process, with reasoning.	Describes the use of a Risk management techniques or reliability/criticality tool and its impact on reducing operational loss/wastage within the context of the apprentice's company.	Describes the use of a Risk management technique or reliability/criticality tool within the context of the apprentice's company.	Demonstrates no knowledge of risk management techniques, reliability/criticality tools and how they are used to reduce operational losses/wastage operations
K11: Life Cycle Asset Management (LCAM), Criticality Analysis & Technology Selection (CATS), Intelligent Maintenance, Repair and Operations (inventory) (MRO) Optimisation	Justifies the use of more than one technique listed in the standard statement for a particular process within the apprentice's company.	Describes more than one of the techniques listed in the standard statement compares their applicability in the apprentice's company.	Describes one of the techniques listed in the standard statement and its application in the apprentice's company.	Demonstrates no knowledge of Life Cycle Asset Management (LCAM), Criticality Analysis & Technology Selection (CATS), Intelligent Maintenance, Repair and Operations (inventory) (MRO) Optimisation

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
K14: Customer/food trade association standards, such as British Retail Consortium, Retailer and Engineering standards	Demonstrates ability to describe the customer/food trade association standards and the applicability to the apprentice's workplace, justifying reasons for ways of working with reference to these standards.	Demonstrates ability to describe the customer/food trade association standards and the applicability to the apprentice's workplace.	Demonstrates ability to describe the customer/food trade association standards.	Demonstrates no knowledge of customer/food trade association standards.
K18: Digitisation: 4.0, modelling of lines/process, 3d modelling scanning and printing, product dimensional measurement, rheology measurement	Gives specific examples of the use of digitisation from the apprentice's workplace and identifies the reasoning for this approach and advantages seen by it.	Discusses the advantages and drawbacks of different digitisation techniques within the food and drink industry.	Able to offer examples of digitisation within the food and drink industry.	Demonstrates no knowledge of digitisation.
S6: Use continuous improvement techniques to drive continual quality improvement, including	Demonstrates with evidence examples of continuous improvement implemented and	Demonstrates with evidence an example of continuous improvement implemented and describe the system	Demonstrates with evidence an example of continuous improvement implemented.	Demonstrates no use of continuous improvement.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
ensuring the application of quality management principles, to participate in failure investigations to ensure process effectiveness and to contribute to and implement practical engineering solutions for efficiency and/or profitability	describe the system improvements (i.e. efficiency, reliability etc.)	improvements (i.e. efficiency, reliability etc.)		
S8: Use and develop planned preventative maintenance (PPM) strategies incorporating appropriate proactive maintenance routines i.e. vibration analysis, thermography, to simple visual/part measurement	Demonstrates with evidence implementation of more than one PPM strategy, comparing and contrasting these strategies and their effectiveness.	Demonstrates with evidence implementation of a PPM strategy and explains the reasons for this strategy and its scheduling.	Demonstrates with evidence implementation of a PPM strategy.	Fails to demonstrate use or development of PPM strategies.
S9: Analyse operational performance, specification and data to minimise system	Demonstrates analysis of operational performance, specification and data.	Demonstrates analysis of operational performance, specification and data. Identifies trends/patterns,	Demonstrates analysis of operational performance, specification and data. Identifies a trend/pattern and	Fails to conduct data analysis for the purpose of minimising failures or

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
failures to increase equipment reliability and availability	Identifies trends/patterns, and from this evaluates methods for system improvement before choosing one method and justifying the choice made.	and from this proposes a method for system improvement.	from this proposes a method for system improvement.	increasing reliability/availability.
S10: Evaluate possible failure modes and identify the most cost-effective strategy for your business e.g. technical risk assessment methods, PPM to RCM techniques	Evaluates a system and identifies points of failure, proposing strategies for managing these, selecting the most effective and justifying the choices made.	Evaluates a system and identifies points of failure, proposing strategies for managing these.	Identifies a failure mode and proposes a method for addressing this.	Fails to demonstrate evaluation of possible failure modes or cost-effective strategies for dealing with these.
S11: Contribute to the construction and commissioning of equipment and machinery used for producing preserved/fresh			Demonstrates with evidence, contribution to construction or commissioning of equipment and machinery used for producing	Fails to demonstrate their contribution to the construction and commissioning of equipment and machinery used for

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
and safe food and drink products			preserved/fresh and safe food and drink products.	producing preserved/fresh and safe food and drink products.
B1: Safe working: promotes a culture of food safety and safe working practices	Through examples, demonstrates adoption of effective food safety and safe working approaches and promotes these with others.	Through examples, demonstrates adoption of effective food safety and safe working approaches.	Through an example, demonstrates adoption of effective food safety and safe working approaches.	Does not demonstrate food safety and safe working.
B2: Ownership of work: 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	Demonstrates with examples, the ownership of their work in all areas including: illustrating the taking of responsibility for decisions made; demonstration of instances where own initiative has been applied and reflections as the effectiveness of	Demonstrates with examples, the ownership of their work in three areas including: illustrating the taking of responsibility for decisions made; demonstration of instances where own initiative has been applied and reflections as the effectiveness of this; dependability; autonomy	Demonstrates with examples, the ownership of their work in two areas including: illustrating the taking of responsibility for decisions made; demonstration of instances where own initiative has been applied and reflections as the effectiveness of this; dependability; autonomy	Fails to demonstrate ownership of work in two or more areas outlined.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
	this; dependability; autonomy within sphere of responsibility.	within sphere of responsibility.	within sphere of responsibility.	
B8: Responsiveness to change: flexible to changing working environment and demands; resilient under pressure	Demonstrates an active and responsiveness to change, supporting a changing working environment, works under pressure delivering error free output.	Demonstrates responsiveness to change is flexible to a changing working environment and is resilient under pressure.	Slow to adopt change: demonstrates limited flexibility capability to changing working environment and periods of pressure.	Is resistant to change and needs support to work in demanding periods.
B9: Company/industry perspective: promotes the position of the business in relation to market and competition, keeps up to date with industry and market advancement, commercially aware	Can demonstrate commercial awareness within their industry, including of up to date industry and market advancements and how these relate to competition and the present position of their business.	Can demonstrate commercial awareness within their industry, including of up to date industry and market advancements, competition and the present position of their business in the marketplace.	Can demonstrate an awareness of their company's position in relation to the present market or direct competitors.	Fails to demonstrate any commercial awareness within their industry.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
MS1: Design, produce, and operate mechanical machinery	Demonstrates more than one of the: design, production or operation of more than one piece of mechanical machinery.	Demonstrates more than one of the: design, production or operation of a piece of mechanical machinery.	Demonstrates one of the: design, production or operation of a piece of mechanical machinery.	Fails to demonstrate design, production or operation of mechanical machinery.
MS2: Design power circuits, utilising software and calculation	Demonstrates the design of a power circuit justifying design choices through comparing and contrasting with alternative designs through use of software and calculation	Demonstrates the design of a power circuit explaining choices for design through use of software and calculation	Demonstrates the design of a power circuit using software and calculation	Fails to demonstrate the design of power circuits utilising software and calculation
MS4: Apply thermodynamic theory to more complex engineering systems, for example tempering chocolate, cleaning systems, sterilisation, vacuum cooling	Able to propose improvements to a system based on underlying thermodynamic theory.	Demonstrates ability to apply thermodynamic theory to more than one complex engineering system of different sorts.	Demonstrates ability to apply thermodynamic theory to a complex engineering system.	Fails to demonstrate application of thermodynamic theory.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
EK2: Installation of systems and supply systems following food safety standards e.g. tray work	Demonstrates the installation of more than one system or supply system and is able to describe working and how it aligns to food safety standards.	Demonstrates the installation of a system or supply system and is able to describe working and how it aligns to food safety standards.	Demonstrates the installation of a system or supply system and follows food safety standards.	Fails to demonstrate the installation of systems and supply systems following food safety standards.
ES3: Design and modify electrical control engineering systems i.e.: Engineering LAN/ network	Proposes designs or modifies for an electrical engineering system, down-selecting on solution and justifying choices made.	Designs or modifies an electrical engineering system, justifying choices made.	Designs or modifies an electrical engineering system.	Fails to design and modify electrical engineering systems.
ES4: Diagnose faults on complex control systems	Able to diagnose multiple faults and describe the process undertaken in diagnosing multiple faults on a complex control system.	Able to diagnose a fault and describe the process undertaken in diagnosing a fault on a complex control system.	Able to diagnose a fault on a complex control system.	Fails to demonstrate fault diagnosis on complex control systems.

Standard Statement	Distinction criteria:	Merit criteria:	Pass criteria:	Fail criteria:
ES5: Logically decipher complex programme sequences in higher and lower level languages	Demonstrates logical deciphering of a series of complex programme sequences in higher and in lower language.	Demonstrates logical deciphering of a complex programme sequence in a higher and in a lower language (2 sequences; one higher; one lower).	Demonstrates logical deciphering of a complex programme sequence.	Fails to logically decipher complex programme sequences in higher and lower level languages.