

Engineering Design and Draughtsperson Apprenticeship Standard

Assessment Plan

March 2016

Assessment plan: Engineering Design and Draughtsperson

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Foreword

The early talent pipeline is critical to the future success of all businesses. It is key to the sustainability of skills in industry and we are committed to ensuring that our industry standards are first class. Development of the required skills by way of apprenticeships is fundamental to the future of engineering. They ensure that employers have competent people to deliver their business requirements.

The Engineering Design and Draughtsperson Trailblazer working group came together to develop this apprenticeship standard with industry experts from a diverse group of employers working across many sectors. Our group members shared their own vast experience and consulted widely across the industry to develop this standard. We have also worked alongside colleagues from sector skills academies, professional bodies and industry training boards.

This assessment plan assures the skills, knowledge and behaviour of the apprentice will meet the rigorous demands of the role of Engineering Design and Draughtsperson in the industry. A variety of assessment methods challenge the apprentice and give them the opportunity to showcase their newly developed talent. Successfully passing the rigorous, independent, graded End-point assessment proves that the qualified apprentices are competent to work in the engineering industry.

With thanks,

~~Kirsten Lightfoot, Amec Foster Wheeler (Group Chair)~~

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1. Summary of Assessment

This apprenticeship is designed to operate as the professional standard for people working as an Engineering Design and Draughtsperson. Typically, jobholders work in a wide range of industries of national importance including power and water infrastructure, petrochemical, oil and gas, nuclear, food and drink processing.

Jobholders are based at office locations within project design teams and occasionally work at on-site locations. They are also required to understand on-site hazards and health and safety requirements.

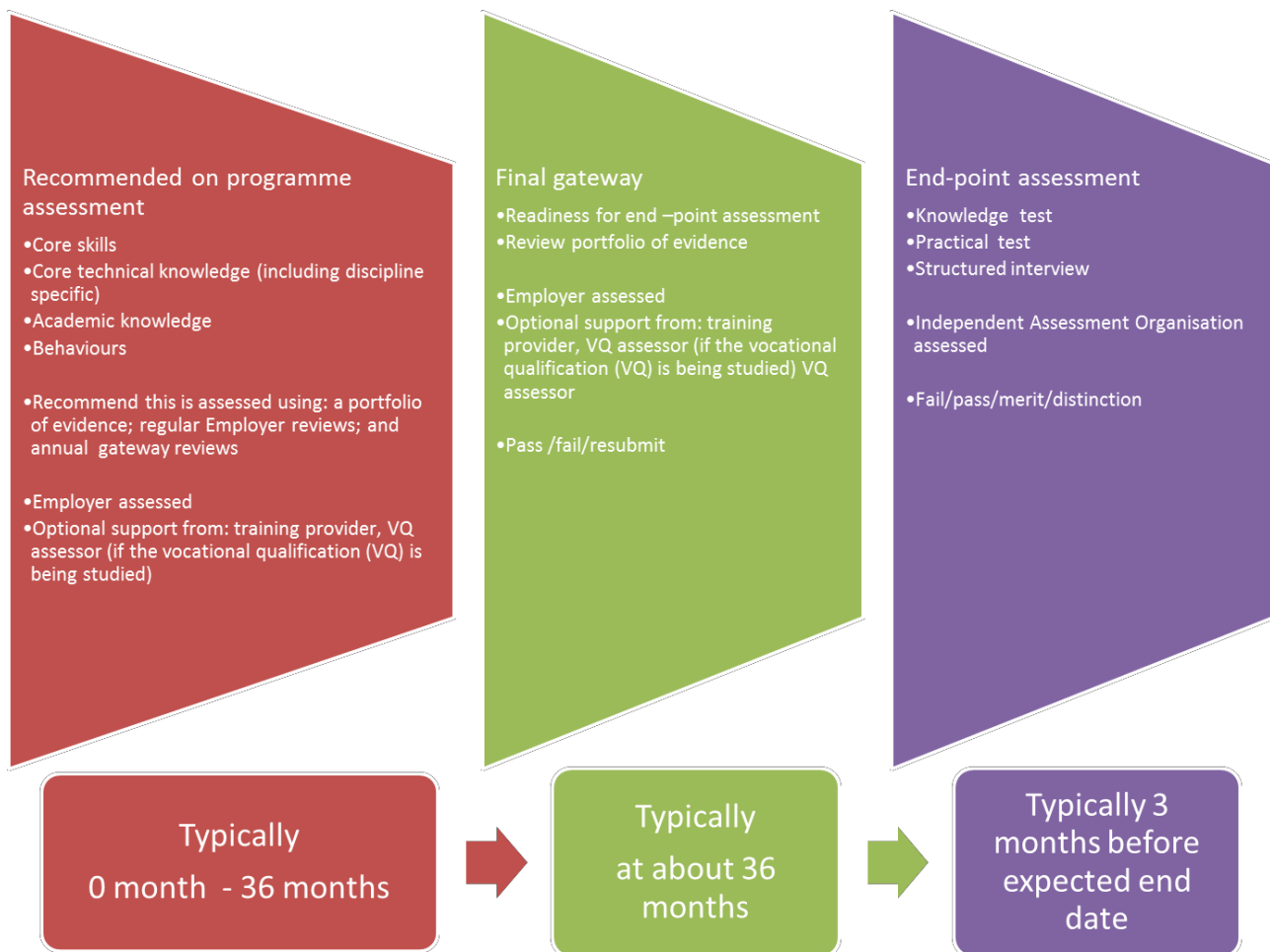
Successful achievement of this Apprentice Standard enables the apprentice to take the next steps in their career as it:

demonstrates that the apprentices are able to competently work as an engineering design and draughtsperson

demonstrates to the relevant professional organisation that they have the knowledge and skills necessary to be awarded EngTech Status (if they wish to apply for this)

demonstrates to Universities (and similar level of institution) that a level of knowledge has been acquired which will enable the apprentice to access further education such as a foundation degree /degree (if they wish to do so).

Diagram 1: Assessment Overview



The following considerations were taken into account when designing this assessment plan:

1. clear links with the Apprentice Standard
2. maximum relevance to the job and day-to-day responsibilities wherever possible
3. added value to the apprentice's journey, both during and at the end of the apprenticeship
4. assessment of the optional technical discipline specialisms, as appropriate:
 - Control and instrumentation
 - Electrical
 - Mechanical
 - Piping
 - Structural.

The apprenticeship is expected to typically take 42 months to complete.

It is recommended that the apprentice's progress is assessed throughout the apprenticeship through 'on-programme' assessment with annual gateways to ensure the apprentice is progressing as expected. There is a final gateway assessment, the purpose of which is to assess whether or not the apprentice is ready to be put forwards for the final End-point assessment. This is a mandatory three-part End-point assessment that typically takes place during 3 months before the expected end date of the apprenticeship.

The aim of this three-part End-point assessment is to comprehensively establish if the apprentice has achieved the skills, knowledge and behaviours listed in the Apprenticeship Standard (see Annex 1) and is able to work as an Engineering Design and Draughtsperson. The three parts of the End-point assessment are as follows:

1. a theoretical, applied knowledge test using multiple choice questions
2. a practical test to assess the apprentice's ability to apply core skills in design and draughting
3. a structured interview to further explore the apprentice's workplace performance to assess that the application of their skills, knowledge and occupational behaviours meet the specified requirements.

2. Assessment Overview

	Assessment method	Focus of assessment	Assessed by	Feedback
Recommended On programme	Review of Apprentice progress against all elements of the Standard	Core skills Core technical knowledge Core behaviours Discipline specific technical knowledge Progress with the portfolio of evidence	Employer Optionally supported by: training provider and Awarding organisation (if VQ*is being taken)	Recommend the Employer feeds back to the apprentice if on target, or needs to improve in some areas.

	Assessment method	Focus of assessment	Assessed by	Feedback
Final gateway review	Formal review of completed portfolio of evidence	Core skills Core technical knowledge Core behaviours Discipline specific technical knowledge	Employer Optionally supported by: training provider and Awarding organisation (if VQ*is being taken)	Progress to End-point assessment Resubmit

	Assessment method	Focus of assessment	Assessed by	Grading	Weighting
End-point assessment	Knowledge Assessment	Core technical knowledge Discipline specific knowledge	Independent Assessment Organisation**	Fail Pass Merit Distinction	25%
	Practical test	Core skills Application technical knowledge	Independent Assessment Organisation**	Fail Pass Merit Distinction	35%
	Structured interview	Core behaviours Core skills Core technical knowledge Discipline specific knowledge	Independent Assessment Organisation panel ** (optional to have an employer representative)	Fail Pass Merit Distinction	40%

* VQ is vocational qualification (see section 2.1)

**See Annex 2 for Independent Assessment Organisation.

2.1 Professional qualifications (recommended approach)

The apprentice is likely to gain the core skills, knowledge and discipline specific knowledge through a mixture of external and internal training and on-the-job learning. There are a number of learning programmes leading to qualifications that the apprentice can study to gain the knowledge needed to underpin the gaining of competence in this occupation. Employers may choose to use other suitable qualifications. See Annex 3 for suggestions of recommended qualifications.

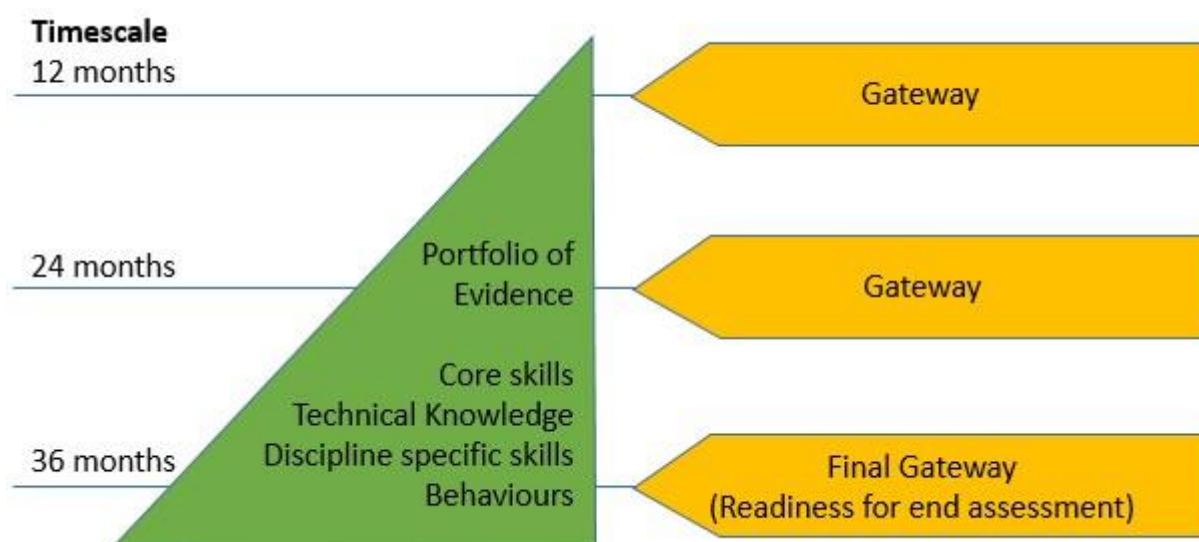
It is recommended that the employer considers using level 3 qualifications to ensure the Apprentice gains the necessary skills and knowledge needed to pass the End-point assessment:

Recommended qualification	Link to Apprentice Standard
Level 3 vocational diploma that covers design and draughting (linked to the relevant National Occupational Standards and relevant Professional Body's requirements)	This includes training in the core technical knowledge and the collation of vocational evidence that proves application of the core skills.
BTEC qualification in a relevant engineering subject	This provides the theoretical knowledge needed especially the application of maths and science to engineering (see Annex 4 for recommended learning outcomes)

It is highly recommended that evidence gathered when studying these qualifications is used in the collation of the portfolio of evidence which is submitted for assessment as part of the final gateway review. Evidence of achieving any qualifications such as these should be included within the portfolio. The achievement of certain qualifications may support an apprentices' application to join a professional body on completion of their apprenticeship.

The application of theoretical knowledge will be tested during the formal End-point assessment. The achievement of any qualifications will not contribute to the grading of the apprenticeship award.

2.2 Recommended on-programme assessment



The purpose of the on-programme assessment is to ensure that the apprentice is progressing as expected. It also provides a framework within which the apprentice is supported by the company in

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which they work. It is recommended that each apprentice has regular reviews along the lines of each individual company's performance review scheme. Good practice recommends quarterly reviews.

As above, it is highly recommended that throughout the on-programme learning and development the apprentice collates a portfolio of evidence – this will enable the apprentice to apply and gain professional membership on completion of the apprenticeship; apply for EngTech registration and; use as a source of evidence for the structured interview. This portfolio should include evidence of development and achievement of the skills, knowledge and behaviours as outlined in the Apprentice Standard (see Annex 1). Examples of what could be included in the portfolio are as follows:

Area to be assessed from Standard	Recommended evidence
Core skills	evidence of application evidence collated and assessed when studying a relevant vocational qualification relevant qualification certificate of achievement
Core technical knowledge	evidence of learning courses attended relevant qualification certificate of achievement
Discipline specific knowledge	evidence of learning courses attended relevant qualification certificate of achievement
Core behaviours	evidence of application evidence of feedback / evaluation log courses attended relevant qualification certificates of achievement
EngTech readiness	evidence required in order to gain EngTech status

For more details on evidence required for EngTech readiness refer to the relevant professional body and the Engineering Council website. Also see section 6.2.

Recommended annual on-programme gateway reviews: at these the portfolio of evidence should be formally reviewed in order to ensure the apprentice is on-track to pass the final gateway review and achieve the apprentice standard. These reviews should be undertaken by the employer with support from the training provider (if this is relevant) and an independent assessor (as appropriate, if the apprentice is undertaking a Vocational Qualification). At these reviews the apprentice should receive feedback so he or she knows if they are on track or if he/she needs to improve or focus in specific areas.

2.3 Final Gateway

Once the apprentice has made significant progress in terms of skills, knowledge and behavioural development then he/she is probably ready for End-point assessment. When an Employer believes an apprentice is at this stage then the apprentice is put forward for the final gateway review.

The Employer should assess the apprentice to check that he or she is ready to undertake the End-point assessment. The Employer has overall responsibility for this review and may wish to seek feedback from training providers and assessors (if the apprentice is undertaking a VQ). This assessment should take the form of a review of the portfolio of evidence that the apprentice has built up throughout his or her apprenticeship and should consider:

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1. has the apprentice achieved the core knowledge, skills and behaviours?
2. has the apprentice achieved the relevant technical discipline knowledge?
3. is he/she able to successfully demonstrate their ability to work as an engineering design and draughtsperson?

Prior to taking the End-point assessment the apprentice must have achieved level 2 English and maths.

The apprentice will either progress to the End-point assessment or be asked to resubmit. If the apprentice fails to reach the required standard, they will be given feedback which will identify what needs to be re-submitted or, what evidence is missing.

The apprentice can resubmit their evidence for the final gateway review. It is at a company's discretion how many times an apprentice can undertake the final gateway review as the company will know the circumstances and capabilities of the individual apprentices.

2.4 End-point assessment

2.4.1 What is being assessed?

The End-point assessment assesses the apprentice's ability to apply the knowledge, skills and behaviours learnt in order to undertake the occupation of engineering design and draughtsperson. The core skills, technical knowledge, technical discipline specific knowledge and behaviours required are detailed in the apprentice standard for Engineering design and draughtsperson (see Annex 1).

Successful achievement of the End-point assessment will lead to final certification of the apprenticeship and demonstrate that the apprentice is a fully competent person in their occupational job role. The End-point process utilises the following assessment tools:

- Knowledge test
- Practical test
- Structured interview

There is some overlap across the three components e.g. application of technical knowledge, however each component is assessing a different aspect of an apprentice's overall competence. A candidate must pass all three components in order to achieve their Design and Draughtsperson Apprenticeship. All End-point assessments must be carried out by a registered Assessment Organisation. All Assessment Organisations must be on the Skills Funding Agency's Register of Apprentice Assessment Organisations (RoAAO) (For more information see section 4).

2.4.2 Knowledge test

This provides each apprentice with an opportunity to demonstrate the knowledge and understanding required by the occupational job role. The test will be administered in accordance with the Assessment Organisation's processes. The apprentice takes the knowledge test in a controlled environment where there is an independent assessor that acts as an invigilator. The knowledge test assesses the apprentice's ability to apply his or her core knowledge and discipline specific knowledge and should include both:

- multiple choice
- scenario based written answers.

Grading: this test is graded fail, pass, merit or distinction. This contributes 25% to the overall mark and that the level of grade awarded will be determined by the following percentage points achieved in the test:

Fail	Pass	Merit	Distinction
<60%	60% and above	70% and above	85% and above

Focus: Specifically the knowledge test includes questions that test the application of the following knowledge:

- relevant national and industry health and safety, standards and legislation and those relevant to the specific disciplines, as appropriate
- company management systems, policies and procedures (the principles of, as appropriate) including:
 - document management, version management and change control
- engineering codes and standards
- common engineering principles and the application of maths and science to engineering
- fundamentals of engineering drawing and design
- the appropriate application of CAD software including 2D and 3D modelling
- the impact of relevant factors that are important to the design e.g. the context in which work is being undertaken, the cost, materials, components, assemblies, ergonomics, aesthetics, the end use and purpose of the design
- manufacturing and/or construction methods as appropriate to the specific disciplines
- relevance and application of Building Information Modelling (BIM)

It must also test the apprentice's ability to pick up errors and identify inaccuracies or discrepancies in engineering drawings and specifications and propose solutions (a core skill which is not fully tested by the practical test).

The knowledge test must include questions that test the apprentice's knowledge on their specific technical disciplines, as appropriate:

Discipline	Knowledge
Electrical	<ul style="list-style-type: none"> • Electrical power generation & distribution including the principles of voltage transformation • Lighting & small power systems design • The principles of earthing & lightning protection • Cable types, specification, and installation requirements
Control and Instrumentation	<ul style="list-style-type: none"> • Combinational and sequential logic and control systems • Process and Instrument Diagrams (P&ID) • Instrument principles and application • Digital and analogue devices and circuits and their application in measurement and control • Cable types, specification, and installation requirements
Mechanical:	<ul style="list-style-type: none"> • Mechanical principles, material selection and application • Mechanical annotation including geometrical tolerances, limits and fits, surface finishes • Mechanical handling • Welding, fasteners and fabrications
Piping:	<ul style="list-style-type: none"> • Piping and flow control • Service conditions such as flow rates, material characteristics, temperature and working pressures • Isometrics • Pipe supports, welding, fittings, valves and associated equipment • Process and Instrument Diagrams (P&ID)
Structural:	<ul style="list-style-type: none"> • Structural principles and application • General arrangements of structures showing multiple materials including: steel, concrete, masonry, timber • Construction processes, methods and details • Detailed production drawings for steel and reinforced concrete

2.4.3 Practical test

This provides each apprentice with an opportunity to demonstrate the core skills and related knowledge, and behaviours required by the occupational job role. The test will be administered in accordance with the Assessment Organisation's processes.

Grading: this test is graded fail, pass, merit or distinction. This contributes 35% to the overall mark and that the level of grade awarded will be determined by the following percentage points achieved in the test:

Fail	Pass	Merit	Distinction
<60%	60% and above	70% and above	85% and above

The practical test takes place in an observed, controlled environment and tests the apprentice's ability to define and detail a fit-for-purpose solution and so demonstrate:

- the core skills learnt

- the underpinning technical knowledge for the different disciplines (piping, structural, mechanical, electrical, control and instrumentation)

- safety awareness and attention to detail.

Focus: The practical test, tests the apprentice's ability to apply the following **core skills** that are detailed in the Apprentice Standard (see Annex 1):

- safety awareness (i.e. work safely at all times, complying with relevant national and industry health and safety requirements)

- review and interpret technical information and requirements from different sources e.g. specifications, concepts, stakeholders

- identify inaccuracies or discrepancies in an engineering brief

- identify and assess factors that affect designs e.g. materials, application, location and environment

- design engineering concepts to solve engineering challenges

- develop effective solutions which satisfy the required standards and constructability principles

- evaluate engineering designs to determine the most effective solution

- produce detailed engineering drawings to relevant standards and codes, using paper and computer

- check completed drawings for quality and completeness - both own or those of peers

- communicate engineering design options to relevant stakeholders, colleagues and clients using sketches, schemes, detailed drawings and reports

How the practical test works

A week before the practical test the apprentice is given background information in the form of a fictitious project assignment. This allows some preparation time and selection of background information relating to relevant engineering codes and standards. The apprentice can bring notes into the test. The practical test:

- is seen for the first time on the day of the actual test

- must be based on real work scenarios

- offers a choice of questions that relate to the different technical disciplines - the apprentice

- selects the questions that relate to their technical specialities

- must test the apprentice's ability to deal with a small-scale change in the client's requirements

- e.g. a change in the voltage supply / an additional door i.e. a change that impacts on what has been done not a rework.

On the day of the test, the apprentice receives a brief, a set of drawings and additional information. The apprentice then has to:

- identify a solution and develop it in detail
- produce sketches on paper and on CAD (i.e. 2D and 3D where appropriate)
- identify omissions from the brief given
- provide evidence of safety awareness in their work
- demonstrate knowledge of factors that affect designs e.g. types of materials
- demonstrate their written communication skills.

Note: there are two core skills that are not assessed through the practical test and it is recommended that these are assessed as part of the structured interview:

1. work in accordance with company management systems, policies and procedures
2. employ appropriate use of computer based technology.

2.4.4 Structured interview

The structured interview takes place after successful completion of the knowledge test and the practical test. This means that the interview can be used to question the apprentice on any specific areas that he or she may have failed to demonstrate through either the knowledge or practical test.

The interview will be administered in accordance with the Assessment Organisation's processes. It is recommended that the interview is led by an independent assessor from the Assessment Organisation and that there is a minimum of two independent assessors (Annex 2) on the interview panel. The presence of an employer representative is optional. The employer representative can be from the employing company of the apprentice but must NOT be their line manager.

The structured interview is designed to enable the apprentice to showcase how he/she combines their core skills, technical knowledge and core behaviours in order to carry out his/her occupational role effectively. The apprentice should expect to discuss evidence of work so the interview panel can ascertain the apprentice's role in completing the work, what barriers they overcame etc. It is a rigorous review and should assess the apprentice's readiness to:

- work as an engineering design and draughtsperson
- submit for Professional Registration at EngTech level.

The structured interview typically lasts about an hour and consists of:

- professional discussion (Annex 5)
- behavioural questions (optional element, see Annex 6).

There is a standard discussion record for the interview and each member of the interview panel annotates a copy this discussion record during the professional discussion element to indicate where standards have been evidenced. In addition to this a record of the behavioural questions asked and responses provided should be made and retained by the interview panel.

Grading: this structured interview is graded fail, pass, merit or distinction. The interview contributes 40% to the overall mark and that the level of grade awarded will be determined by the following percentage points achieved in the test:

Fail	Pass	Merit	Distinction
<60%	60% and above	70% and above	85% and above

Focus: Specifically the following are assessed through the interview:

Comply with health and safety requirements and company policies and procedures at all times

Have a strong work ethic including attention to detail and commitment to completing the task in hand

Take personal responsibility for own work, set the right example for others and actively seek opportunities for quality improvement

Apply and uphold principles of ethics and sustainability

Commitment to advancing own learning and competence, showing a willingness to learn new skills and an openness to others' ideas and input

Use effective communication and interpersonal skills, showing sensitivity to others and working collaboratively

Accept and promote equality and diversity

Plus:

- Working in accordance with and knowledge of Company specific management systems, policies and procedures
- Employing the appropriate use of computer based technology
- Any areas of related sector specific knowledge

How the structured interview should work

The aim of the interview is to assess that the apprentice exhibits the core behaviours as detailed in the Apprentice Standard (Annex 1). This is the main way in which evidence of an Apprentice's behaviour and attitude is measured – especially attitude towards safety and the application of company management systems. It is also used to provide the opportunity to probe any particular gaps in the apprentice's skills and/or knowledge identified through the knowledge and practical tests.

The Independent Assessment Organisation develops a structured discussion record to be used in all interviews – this will ensure consistency in delivery. The Independent Assessment Organisation should also develop a structure for how the grading will work with related guidance on how the interviewers should assess the apprentice during the interview so that they are able to award a fail/pass/merit or distinction.

In advance of the interview the apprentice receives information about how the structured interview will work and a template evidence report that they will be asked to complete and submit to the Independent Assessment Organisation in advance of the interview. In this evidence report it is expected that the apprentice will:

identify and expand on examples from his/her portfolio of evidence of application of the core skills, core technical knowledge and core behaviours (typically 3-4 examples of each) in the workplace

include additional evidence from the employer, as appropriate

include separate evidence from any relevant training bodies on the apprentice's behaviour, as appropriate.

A copy of this evidence report is retained by the interview panel as evidence that the apprentice:

- a) understands the required standards of workplace performance
- b) has reflected on his/her learning and can identify how their performance meets the standard.

The professional discussion is designed to allow the apprentice to present evidence of competence to demonstrate the skills, knowledge and understanding by discussing the evidence and showing how it relates to the requirements of the Standard i.e. how it relates to carrying out their occupational role

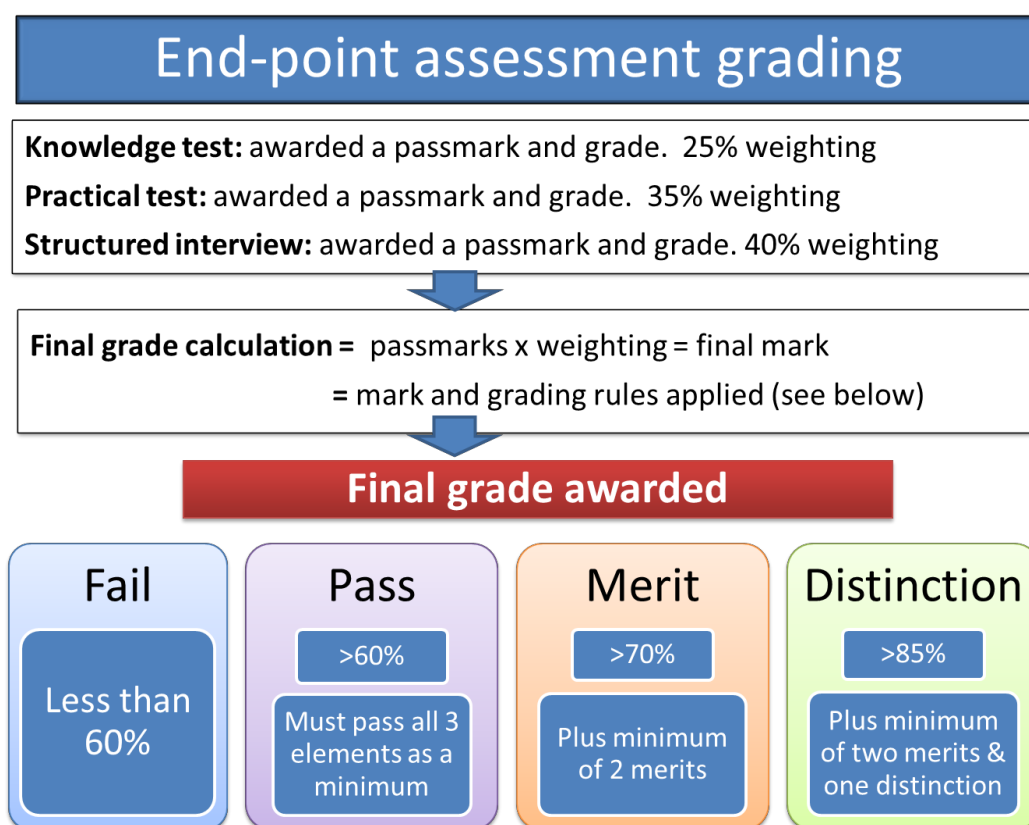
effectively. The discussion based approach is important as it enables consideration of how the apprentice has performed, and also their analytical and decision-making abilities.

At the end of the professional discussion element of the structured interview there may be gaps where evidence has not been identified against aspects of the Apprenticeship Standard. Where there are gaps in relation to the core behaviours, the Interview Panel can extend the interview and use an agreed set of behavioural questions (see Annex 6) to provide an opportunity for each apprentice to address these gaps.

3. End-point - final grading

The final decision on the grade awarded to the apprentice is made by the Independent Assessment Organisation. This will be based on the outcomes from the: knowledge test, practical test and structured interview.

Independent Assessment Organisations are required to develop an appropriate assessment model to support consistent, valid and reliable assessment decisions. The criteria and exemplars for assessing pass, fail or distinction will be developed by Independent Assessment Organisations working in partnership with employers. The Independent Assessment Organisations will also develop appropriate marking schemes to determine the difference in levels between fail, pass, merit or distinction using the recommended grades and weighting below to work out the final grade mathematically:



Grading: each element of the End-point assessment is individually marked and awarded a fail, pass, merit or distinction. To obtain the final grade the mark awarded to each element is multiplied by the weighting to create a final mark mathematically. The same grading rules should then be applied to award a fail, pass, merit or distinction taking into account the following rules to agree the final grade:

Pass	Merit	Distinction
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Must pass all 3 elements as a minimum	Must gain a minimum of 2 merits	Must gain at least one distinction and 2 merits
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On completion of the structured interview the Chair (from the Independent Assessment Organisation) together with panel members will award a fail, pass, merit or distinction to the apprentice using all the information gained in the final three part End-point assessment. In cases where a decision is borderline, or panel members have conflicting views regarding the standards being met, the Chair (from the Independent Assessment Body) will make the final decision.

The Independent Assessment Organisation moderates, validates and verifies the assessments and the grades awarded by different assessors to ensure that these are fair and comparable, in the event of an appeal against the grade awarded, the Assessment Organisation will operate an appeals' procedure.

4. Independence

Independence and impartiality are achieved through the End-point assessment being undertaken by independent assessors who are employed by organisations that have been approved on the **SFA Register of Apprentice Assessment Organisations**.

Employers will not be required to make any grading judgement.

Independent Assessment Organisations should ensure that all assessment methods are designed to produce assessment outcomes that are consistent and reliable, allowing fair and proper comparison between apprentices employed in different types and sizes of organisation.

4.1 Assessment Organisation (see also Annex 2 which details requirements of Independent Assessment Assessors)

Assessment Organisations involved in delivering the End-point assessment of the apprenticeship must:

1. develop the tools and materials to deliver the End-point assessment
2. have expertise in developing training, tests and assessments
3. establish an employer review group to approve the assessment materials and grading model
4. have current technical and sector knowledge and understanding and have credibility with employers
5. have robust governance, including leadership and management arrangements
6. provide access to an assessment infrastructure with an appropriate geographical coverage
7. provide the location and equipment necessary for each element of the assessment
for the practical test the employer should have the option to provide their own equipment for the practical test if they wish to (with the proviso that the employer ensures that the outputs are provided in an pre-agreed format that the assessment organisation is able to assess)
8. provide pre-notification of End-point assessment dates (exact details to be agreed with the Employer when contracted)
9. be able to verify the candidates' identities
10. ensure the tests take place in a controlled environment without distractions
11. invigilate, manage, deliver, mark and report on all elements of the End-point assessment
12. develop and manage a complaints and appeals procedure.

5. Quality assurance

5.1 Internal quality assurance

Quality assurance of the End-point assessment will be assured through the Independent Assessment Organisation meeting the following requirements:

1. the capability to identify, quality assure and use independent assessors that meet the requirements detailed in Annex 2
2. have an internal quality management system and quality control procedures
3. develop and provide a grading structure and related guidance which enables standardisation and consistency in the attainment of a pass, merit and distinction
4. provide training for independent assessors on the End-point assessment, the structured interview, applying the grading and how to report and communicate the final grading decisions
5. hold regular standardisation events for independent assessors, technical experts and panel members to ensure consistent application of the assessment guidance
6. ensure Assessment Organisation staff are trained in assessment and moderation processes and undertake regular continuing professional development
7. commit to resource annual standardisation meetings including but not limited to collaboration with other Assessment Organisations and sector experts.

5.2 External quality assurance

~~We are considering employer led approaches for quality assurance and governance, and are working through the options with BIS.~~ External Quality Assurance (EQA) will be provided by the Engineering Construction Industry Training Board (ECITB), Blue Court, Church Lane, Kings Langley, Hertfordshire WD4 8JP.

6. Implementation

6.1 Affordability

The group of employers has considered costs and the most appropriate form of assessment in great detail. A key driver for our assessment model has been to ensure our approach is consistent and directly linked to our standard. Our assessment process is robust, and will ensure the best use of management time. The costs and practicality of assessments have been an important consideration in the development of this approach, and at this stage we do not anticipate high numbers. This has resulted in an approach which will be very easy to manage and will be affordable in all firms regardless of size or numbers of apprenticeships or the geographical location.

It is anticipated that the End-point assessment will be about 10 % of the overall apprenticeship cost.

6.2 Professional body recognition

This Apprenticeship Standard and Assessment plan has been reviewed by the following four professional bodies:

- Institution of Mechanical Engineers (IMechE) (for piping and mechanical)
- Institution of Structural Engineers (IStructE)
- Institution of Engineering and Technology (IET) (for electrical and mechanical)
- Institution of Engineering Designers (IED)

It has also been reviewed against the UK Spec set by the Engineering Council to ensure it meets their requirements. The scope of the standard and the associated assessment plan has been developed to ensure that on completion of their apprenticeship the apprentice has undergone the training needed and

gained the relevant work experience so that he/she can apply for professional registration such as Eng Tech, should they wish to.

It is recommended that the Apprentice checks the requirements of the specific professional body that he/she is considering applying to as these are subject to change and although the professional bodies' general requirements match the Engineering Council requirements each Professional Body has some of their own specific requirements.

6.3 Consistency

To ensure consistency the Assessment Organisation(s) should work with Employers to develop the elements of the End-point assessment tools that assess the core skills, knowledge and behaviours included in the Apprentice Standard in a way that:

- is specified in the standard
- meets the occupational needs as detailed in the National Occupational Standards for Design and Draughting (against which the Standard has been mapped)***
- meets the learning outcomes for the underpinning application of maths and science to engineering (see Annex 4)
- meets the EngTech requirements as set out by the Engineering Council (see the Engineering Council's website).

*** there are National occupational standards that detail the practical ability and knowledge required of a Design and Draughtsperson. These are owned by the Crown, are independent and have been developed by companies for companies.

6.4 Volumes

There are expected to be about 90 apprentice starts each year.

7. Annex

Annex 1	Apprentice Standard: Engineering design and draughtsperson
Annex 2	Requirements for independent assessors
Annex 3	Recommended on-programme qualifications
Annex 4	Recommend Maths and Science learning outcomes to underpin the application of maths and science to engineering
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Annex 6	Structured interview: example behavioural questions

Annex 1 Apprentice Standard: Engineering design and draughtsperson

Engineering Design and Draughtsperson Apprenticeship Standard – Level 3

Introduction

Engineering design and draughtspersons produce designs and drawings for structures, piping, electrical systems, control and instrumentation systems and mechanical components used in industrial and commercial construction. Typically, jobholders work in a wide range of industries of national importance including power and water infrastructure, petrochemical, oil and gas, nuclear, food and drink processing.

Jobholders are based at office locations within project design teams and occasionally work at on-site locations. They are required to understand on-site hazards and health and safety requirements.

The jobholder must: Understand technical drawings and specifications and be able to create their own; identify factors likely to affect design decisions; produce CAD (computer aided design) models and engineering drawings and; be able to communicate design information to internal and external parties. Most will begin with minor amendments to existing drawings or designs and will be expected to take on increasingly complex tasks as their experience and understanding of their specialism increases.

Occupation

There are five main disciplines within the occupation of Engineering Design and Draughtsperson. An apprentice gains an understanding across all these disciplines and will typically specialise in one or more:

- Electrical Design and Draughtsperson
- Control and Instrumentation Design and Draughtsperson
- Mechanical Design and Draughtsperson
- Piping Design and Draughtsperson
- Structural Design and Draughtsperson

Duration of Apprenticeship

The duration of this apprenticeship is typically 42 months study.

Suggested Entry Requirement

Individual employers will set the selection criteria for their Apprenticeships. This will typically include a requirement for a minimum of 5 GCSE grades A* - C (or equivalent qualifications) including mathematics (preferably B); English (Language); a science or technical subject. Apprentices must have achieved a GCSE to at least a grade C, a level 2 qualification in Functional Skills, or an equivalent qualification in both English and mathematics before being entered for their final apprenticeship assessment.

The following sections describe the essential core skills, knowledge and behaviours that the jobholder will demonstrate on completion of their programme.

Core Skills

- Work safely at all times, complying with relevant national and industry health and safety requirements
- Work in accordance with company management systems, policies and procedures
- Employ the appropriate use of computer based technology
- Review and interpret technical information and requirements from different sources e.g. specifications, concepts, stakeholders
- Identify inaccuracies or discrepancies in engineering drawings and specifications and propose solutions
- Identify and assess factors that affect designs e.g. materials, application, location, risk and environment
- Design engineering concepts to solve engineering challenges
- Develop effective solutions which satisfy the required standards and can be manufactured, proven, operated and maintained in a cost-effective way whilst minimising costs
- Evaluate engineering designs to determine the most effective solution
- Produce detailed engineering drawings to relevant standards and codes, using paper and computer
- Check completed drawings for quality, technical compliance and completeness - both own or those of peers
- Communicate and co-ordinate engineering design options with relevant stakeholders, colleagues and clients using sketches, schemes, models, detailed drawings and reports

Core Technical Knowledge

- Relevant national and industry health and safety, standards and legislation and those relevant to the specific disciplines, as appropriate
- Company management systems, policies and procedures

- Document management and change control
- Engineering codes and standards
- Common engineering principles and the application of maths and science to engineering
- Fundamentals of engineering drawing and design
- Computer Aided Design (CAD) software, its appropriate application including 2D and 3D modelling
- Understand the impact of relevant factors that are important to the design e.g. the context in which you are working, the materials, components, assemblies, cost, quality, safety, security, risk, environmental impact, ergonomics, aesthetics, the end use and purpose of the design
- Manufacturing and/or construction methods as appropriate to the specific disciplines
- Relevance and application of Building Information Modelling (BIM)

Core Behaviours

- Comply with health and safety requirements and company policies and procedures at all times
- Have a strong work ethic including attention to detail and commitment to completing the task in hand
- Take personal responsibility for own work, set the right example for others and actively seek opportunities for quality improvement
- Apply and uphold principles of ethics and sustainability
- Commitment to advancing own learning and competence, showing a willingness to learn new skills and an openness to others' ideas and input
- Use effective communication and interpersonal skills, showing sensitivity to others and working collaboratively
- Accept and promote equality and diversity

All jobholders require the core key skills, technical knowledge and behaviours. They will additionally need to acquire and apply the following technical knowledge from a minimum of one of these five disciplines:

Discipline	Knowledge
Electrical	<ul style="list-style-type: none"> • Electrical power generation & distribution including the principles of voltage transformation • Lighting & small power systems design • The principles of earthing & lightning protection • Cable types, specification, and installation requirements
Control and Instrumentation	<ul style="list-style-type: none"> • Combinational and sequential logic and control systems • Process and Instrument Diagrams (P&ID) • Instrument principles and application • Digital and analogue devices and circuits and their application in measurement and control • Cable types, specification, and installation requirements
Mechanical:	<ul style="list-style-type: none"> • Mechanical principles, material selection and application • Mechanical annotation including geometrical tolerances, limits and fits, surface finishes • Mechanical handling • Welding, fasteners and fabrications
Piping:	<ul style="list-style-type: none"> • Piping and flow control • Service conditions such as flow rates, material characteristics, temperature and working pressures • Isometrics • Pipe supports, welding, fittings, valves and associated equipment • Process and Instrument Diagrams (P&ID)
Structural:	<ul style="list-style-type: none"> • Structural principles and application • General arrangements of structures showing multiple materials including: steel, concrete, masonry, timber • Construction processes, methods and details • Detailed production drawings for steel and reinforced concrete

Professional Recognition and Career Progression

This standard has been designed to meet the professional standards of the Engineering Council for registration as an Engineering Technician (EngTech) in partnership with the appropriate institutions as shown below:

- Institution of Mechanical Engineers (IMechE) (for piping and mechanical)
- Institution of Structural Engineers (IStructE)
- Institution of Engineering and Technology (IET) (for electrical and mechanical)
- Institution of Engineering Designers (IED)

Professional registration is subject to candidates successfully completing this apprenticeship and undergoing professional review.

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Governance and Review Date: This apprentice standard will be reviewed by an industry-led working group in 3 years.

Annex 2 Requirements for independent assessors provided by the Assessment Organisation

Independent Assessment Organisations as provided on the Register of Approved Assessment Organisations register.

The Independent Assessment Organisation must maintain a register of independent assessors for the End-point assessment and commit to ensuring that the independent assessors are competent to deliver the role they provide in the End-point assessment. The assessors must receive training to ensure they assess the apprentices against the requirements of the Apprentice Standard in a consistent manner.

The following recommendations are made as a basis for the selection of suitable independent assessors:

- be independent from the Apprentice they are assessing i.e. not their trainer or line manager
- have relevant experience in teaching/training/assessing /interviewing
- have good interpersonal skills
- have effective communication skills
- have a thorough technical knowledge of what constitutes effective performance and good working practices in the occupational context
- are technically knowledgeable in engineering design and draughting, ideally with an appropriate technical qualification, relevant Vocational Qualification or industry accepted equivalent discipline qualification or equivalent technical experience
- understand and be familiar with the Engineering Technician UK spec and the evidence requirements to meet the EngTech (engineering technician (UK spec)) criteria.

Annex 3 Recommended on-programme qualifications

	Qualification name
Core skills, technical design and draughting knowledge	Level 3 Diploma in Engineering Construction Design and Draughting
Core skills, technical design and draughting knowledge	Level 3 Extended Diploma in Engineering Technical Support
Technical knowledge	BTEC Level 3 Diploma in Operations & Maintenance Engineering
Technical knowledge	BTEC Level 3 Diploma in Construction and the Built Environment
Technical knowledge	BTEC Level 3 Diploma in Mechanical Engineering
Technical knowledge	BTEC Level 3 Diploma in Engineering
Technical knowledge	BTEC Level 3 Diploma in Electrical / Electronic Engineering

If the employer decides their apprentices are to study a qualification it may be possible to work with a training provider to tailor the qualification to meet any specific sector and/or other needs . The decision on qualifications used should be based upon such factors as:

- the apprentice's prior learning
- the anticipated role of the apprentice within the company
- associated activities the employer requires the apprentice to undertake during the on-the-job learning
- the career aspirations of the apprentice

an assessment of the academic qualifications achieved by the apprentice prior to undertaking the apprenticeship to determine if the apprentice will have the ability to achieve a more academically demanding technical knowledge qualification
 the preferred learning style of the apprentice
 custom and practice within the Sector, including any legislative requirements.

Annex 4 Recommended Maths and Science learning outcomes to underpin the application of these to engineering

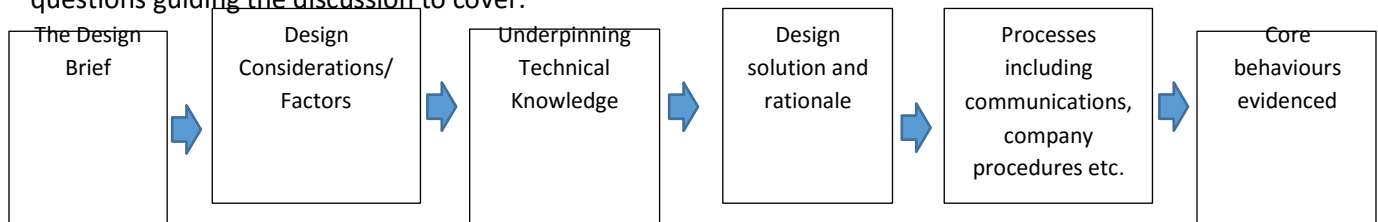
Maths	
Learning Outcome	
The learner will:	
1	Understand the mathematical expressions, equations and functions used in solving problems in engineering
2	Understand the trigonometric functions and equations and their application in engineering construction
3	Understand Differentiation and integration and their application in engineering
4	Understand complex numbers and their application in engineering
Science	
Learning Outcome	
The learner will:	
1	Understand the effects of static and dynamic forces on mechanical bodies and systems used in engineering construction
2	Understand the principles of electricity and magnetism, electric and magnetic components and the operation of direct current circuits and machinery used in engineering
3	Understand the relationships between energy, work and power in mechanical and thermal systems used in engineering
4	Understand closed-loop engineering systems and their behaviour in relation to engineering activities
5	Understand engineering frameworks and structures and their behaviour under the influence of external forces and loads in an engineering context
6	Understand the effects of external forces on mechanical engineering components used in engineering
7	Understand the principles and effects of rotational movement of mechanical bodies and systems used in engineering
8	Understand the means of mechanical power transmission and its uses in engineering

Annex 5 Structured interview: professional discussion guidance note

Conduct of the professional discussion

From the start the interview panel should lead with initial introductions and exploratory questions. The aim is to gather context about each candidate's role, workplace and responsibilities and to encourage the candidate to participate by discussing familiar aspects of their apprenticeship programme.

The candidate should then be asked to discuss their first selected example of evidence (as below), with questions guiding the discussion to cover:



The role of the assessment panel is to guide the discussion through the use of open questions and active listening, using their detailed knowledge of the Design and Draughtsperson Trailblazer standard to maintain focus. It can be helpful for one panel member to lead the discussion, with other members contributing either to probe evidence or to focus on particular aspects of the standard.

Discussion of second and subsequent examples of evidence can be progressed in the same way, with focus being directed towards the evidence report submitted by the apprentice in advance of the interview and specific aspects of the standards where further evidence is needed.

Evidence to support 'EngTech' Professional Registration

The Design and Draughtsperson Apprenticeship Standard has been designed to align with the requirements of the Engineering Council's Professional Standards, as detailed in the United Kingdom Specification of Professional Engineering Competence (UKSPEC) at Engineering Technician (EngTech) level. This has been confirmed by four Professional Engineering Institutions.

In the process of meeting the Apprenticeship Standard, the apprentice should generate sufficient evidence and demonstrate that he/she meets the professional standard.

The structured interview is an opportunity for candidates to draw together and to present their evidence as a cohesive whole, referencing to the five UKSPEC areas of competence. At EngTech level these are:

- A** Use engineering knowledge and understanding to apply technical and practical skills
- B** Contribute to the design, development, manufacture, construction, commissioning, operation or maintenance of products, equipment, processes, systems or services.
- C** Accept and exercise personal responsibility.
- D** Use effective communication and interpersonal skills.
- E** Make a personal commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment.

Records of the Structured interview

Each member should annotate a copy of a standard **discussion record** (to be provided by the Assessment Organisation), indicating where standards have been evidenced through the discussion.

Annex 6 Structured interview: example behavioural questions

At the end of the Professional Discussion phase of the structured interview, the apprentice should be advised that they will now proceed into a direct question and answer session using a standard set of questions. The apprentice should be advised that he/she can ask for the question to be repeated, and that he/she will then need to provide their answer drawing upon their apprenticeship training and experience, including from personal experience from outside of the workplace, if appropriate.

A record of the questions asked and responses provided should be made and retained by the interview panel. **Example questions:**

Comply with health and safety requirements and company policies and procedures at all times

Explain the importance of complying with health and safety requirements/company policies and procedures.

Give an example of a potential health and safety hazard you identified, how you identified the risk and what precautions you put in place to reduce/remove the hazard.

Give an example of a breach of company policy and procedure that had a significant impact and how you remedied it.

Have a strong work ethic including attention to detail and commitment to completing the task in hand

What tools or measures do you use to check your work? Why do you use these tools? Provide an example of where you have applied these.

Have you ever discovered a mistake that was overlooked by everyone else? How did you find this? What was the result?

Describe a situation when you had to overcome a number of obstacles to complete a task.

Take personal responsibility for own work, set the right example for others and actively seek opportunities for quality improvement

Tell me about a time when you learned from a mistake at work.

Why is it important to set the right example for others?

Give an example of when you have actively sought opportunities to improve the quality of your work.

Apply and uphold principles of ethics and sustainability

What is your understanding of ethics and sustainability in engineering?

Provide examples of how you have promoted ethical practice and sustainability in your work.

Commitment to advancing own learning and competence, showing a willingness to learn new skills and an openness to others ideas and input

Give examples of how you have advanced your own learning and competence either in the workplace or personally.

Give examples of your willingness to learn new skills, be open to ideas and input either in the workplace or personally.

Use effective communication and interpersonal skills, showing sensitivity to others and working collaboratively

Tell me about a time when you needed to persuade someone to do something that they did not want to do? How did you go about this?

We have all had times where we've worked in teams that did not get along. Describe a time this has happened to you. What happened? What role did you take? What was the result?

Describe your decision making process when you choose to communicate via the phone, email or face to face?

Accept and promote equality and diversity

What is your understanding of equality and diversity?

Give evidence of any work you have done that has promoted equality and diversity in your workplace or in another environment.