

End-point assessment plan for Pipe Welder apprenticeship standard

Apprenticeship standard reference number	Apprenticeship standard level	Integrated end-point assessment
ST0851	3	No

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Introduction and overview

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

Full time apprentices will typically spend 48 months on-programme (before the gateway) working towards the occupational standard and complete the required amount of off-the-job training in line with the apprenticeship funding rules. All apprentices will spend a minimum of 12 months on-programme.

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

All pre-requisites for EPA assessment methods must also be complete and available for the assessor as necessary.

Achieved English and mathematics qualifications in line with the apprenticeship funding rules.

The EPA must be completed within an EPA period lasting typically three months, beginning when the apprentice has passed the EPA gateway.

The EPA consists of three discrete assessment methods.

The individual assessment methods will have the following grades:

Assessment method 1: Multiple choice knowledge test

- Fail
- Pass
- Distinction

Assessment method 2: Professional Discussion supported by portfolio

- Fail
- Pass
- Distinction

Assessment method 3: Practical Skills Test

- Fail
- Pass
- Distinction

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

- Fail
- Pass
- Distinction

EPA summary table

On-programme (typically 36 months)	<p>Training to develop the occupation standard's knowledge, skills and behaviours.</p> <p>complete training towards English and mathematics qualifications in line with the apprenticeship funding rules.</p> <p>Compilation of a portfolio of evidence</p>
End-point assessment gateway	<ul style="list-style-type: none"> • employer is satisfied the apprentice is consistently working at, or above, the level of the occupational standard. • achieved English and mathematics qualifications in line with the apprenticeship funding rules • apprentice compiled a portfolio of evidence, to support the Professional Discussion • employer welding procedure specifications shall be provided by the employer to support the practical skills tests and preparations of equipment, consumables and materials at the test venue
End Point Assessment (which would typically take 3 months)	<p>Assessment Method 1: Multiple choice knowledge test</p> <p>With the following grades:</p> <ul style="list-style-type: none"> • Fail • Pass • Distinction <p>Assessment Method 2: Professional Discussion supported by portfolio</p> <p>With the following grades:</p> <ul style="list-style-type: none"> • Fail • Pass • Distinction <p>Assessment Method 3: Practical Skills Test</p> <p>With the following grades:</p> <ul style="list-style-type: none"> • Fail • Pass • Distinction <p>Overall EPA apprenticeship graded:</p> <ul style="list-style-type: none"> • Fail • Pass • Distinction
Professional recognition	<p>Aligns with recognition by:</p>

- The Welding Institute Engineering Technician

Length of end-point assessment period:

The EPA (including all assessment methods) will typically be completed within three-months of the apprentice passing the gateway.

If an EPA assessment method is failed, it should be retaken in-line with the requirements set out in this assessment plan.

Order of assessment methods

The assessment methods can be delivered in any order. The result of one assessment method does not have to be known before an apprentice starts the next one.

Gateway

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

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

- achieved English and mathematics qualifications in line with the apprenticeship funding rules

For the multiple choice knowledge test:

- no specific requirements

For the professional discussion supported by portfolio, the apprentice must have completed and submitted a portfolio of evidence.

Portfolio of evidence requirements:

- apprentices must compile a portfolio of evidence during the on-programme period of the apprenticeship
- The format and structure of the portfolio needs to be agreed between the employer, the apprentice and the EPAO (for example hard copy or on-line). However, the content must be sufficient to evidence the apprentice can apply the knowledge, skills and behaviours required as mapped to the assessment method
- it will typically contain 12 discrete pieces of evidence
- evidence must be mapped against the KSBs
- evidence may be used to demonstrate more than one KSB; a qualitative as opposed to quantitative approach is required

- any employer contributions should focus on direct observation of evidence (for example witness statements) of competence rather than opinions
- naturally occurring evidence from production welding quality records. Collectively these shall cover the processes, materials groups, welding positions and welding joint geometries selected by the apprentice and employer as per S17, S18, S19, S20, S21 and S22. These shall also meet the quality requirements of recognised international standards for welding for example ISO 9606, ISO5817. This is expected to include:
 - current welder approval certificates validated by a recognised third party organisation that are held by the apprentice, with six monthly prolongation signatures where appropriate
 - production welding records showing welding procedure specification, production control card used, method of inspection and acceptance criteria applied to the finished weld, volumetric inspection acceptance report for the identified weld authenticated by a suitably qualified welding inspector or Non-destructive testing (NDT) technician
 - these records must be authenticated or signed by an employer representative (for example quality engineer, welding inspector, NDT technician), a list of these individuals and their email address and contact telephone numbers shall be held within the portfolio to allow independent validation of authenticity.
- Each piece of evidence can be referenced against more than one knowledge, skill or behavioural requirement.
- The portfolio should contain written accounts of activities that have been completed and referenced against the knowledge, skills and behaviours, supported by appropriate evidence, including photographic evidence and work products, such as work instructions, safety documentation, company policies and procedures as appropriate to the activities. Progress review documentation, witness testimonies, and feedback from colleagues and/or clients should also be included. The apprentice's Manager and or Mentor will typically support the development of the portfolio in accordance with company policy and procedures, although the assessment organisation will provide further guidance on the content.
- It is not expected that the portfolio will contain a daily diary of production work, but selectively record the activities that contribute to covering the range of skills statements listed above.

For the practical skills test:

- Employer to supply a summary of the selected material groups (four) and welding processes (two) applicable to the apprentice.
- Employer to supply a suite of employer welding procedure specifications (WPSs) for subsequent selection by Independent Assessor suitable for the range of materials and processes selected, and covering the range of main pipe weld joint configurations, from which the Independent Assessor can select the Practical Skills test pieces.

Assessment methods

Assessment Method 1: Multiple choice knowledge test

Overview

The rationale for this assessment method is that it:

- assesses the apprentice's depth of understanding in the knowledge elements that may not naturally occur during the observation.
- allows for the efficient testing of knowledge where there is a right or wrong answer
- does not require independent assessor time, reducing cost
- allows for flexibility for when and where the test is conducted

Test Format

The test can be:

- computer based
- paper based

It will consist of 30 questions:

- five questions must relate to the health and safety knowledge statements K24 and K25
- five questions must relate to the materials knowledge statements K1 and K2
- ten questions must relate to the process knowledge statements K4, K5, K6, K16 and K17
- ten questions must relate to the quality knowledge statements K18, K20, K21, K22 and K28

The test will consist of closed response questions (multiple-choice questions). Apprentices must choose one correct answer from a choice of four.

Each question answered correctly will be awarded one mark. Any incorrect or missing answers will be assigned nil marks.

Apprentices will have 60 minutes to complete the test.

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

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

The EPAO is responsible for ensuring the security of testing they administer to ensure the test remains valid and reliable (this includes any arrangements made using online tools).

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

Marking

Tests must be marked by independent assessors or markers employed by the EPAO following a marking guide produced by the EPAO. Alternatively, marking by computer is permissible where question types allow this, to improve marking reliability.

Question and resources development

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

Required supporting material

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

- a test specification
- sample tests and mark schemes
- live tests and mark schemes
- analysis reports which show areas of weakness for completed tests/exams and an invigilation policy

Assessment Method 2: Professional Discussion supported by portfolio

The rationale for this assessment method is:

- the professional discussion is supported by a portfolio of evidence, enabling the apprentice to demonstrate the application of skill and behaviours as well as knowledge
- it allows for testing of responses where there are a number of potential answers that couldn't be tested through the multiple-choice or practical tests
- it is a cost effective assessment method and does not require additional resources
- it allows the apprentice to be assessed against KSBs that may not occur naturally on a daily basis, would take too long to observe or do not lend themselves to direct observation

Delivery

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

The independent assessor will ask a minimum of 6 open, competence-based questions.

The independent assessor must combine questions from the EPAO's question bank and those generated by themselves. Follow-up questions devised by the EPAO assessor are allowed to seek clarification.

The EPAO assessor will conduct and assess the professional discussion on a one-to-one basis.

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

The professional discussion must cover the following themes:

- health, safety and environment
- quality, quality system, defects, identification and avoidance
- materials and properties
- welding processes, parameters and controls
- professional integrity, collaboration, personal and organisational development

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

Evidence from the questioning must be assessed holistically using the grading criteria for this assessment method. The independent assessor will make all grading decisions.

Venue

The professional discussion, supported by a portfolio of evidence can take place in any of the following:

- employer's premises
- a suitable venue selected by the EPAO, for example a training provider's premises

Video conferencing can be used to conduct the professional discussion, but the EPAO must have processes in place to verify the identity of the apprentice and ensure the apprentice is not being aided in some way.

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

Other relevant information

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

It is recommended that questions are developed in consultation with employers of this occupation. EPAOs must maintain the security and confidentiality of their questions when consulting employers.

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

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

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

- outline of the assessment method's requirements
- assessment recording documentation including marking materials
- guidance for apprentices and employers

Assessment Method 3: Practical Skills Test

The rationale for this assessment method is:

- The occupation involves practical activity best assessed through practical demonstration as it is relatively simple to replicate the working environment in a valid way and one in which employers would accept the occupational competence of an individual. It is expected that apprentices will be assessed in their workplace to ensure they are able to demonstrate competence in the real work environment. Where this is not possible (for example where the access to the employer's location is limited for security reasons), the EPAO is responsible for ensuring that the apprentice is assessed under normal conditions, in a familiar environment, using familiar resources and equipment that are representative of the apprentice's workplace. The external quality assurance provider is responsible for determining the impact of an alternative location on the validity and comparability of end-point assessments. Where access to an employer's site requires the independent assessor to be accompanied by a facility escort, the employer is responsible for liaising with the EPAO to ensure that this is provided.
- the practical demonstrations reflect tasks that would be completed by pipe welders on a regular basis; tasks not best suited to a practical skills test are assessed via the other assessment methods

Delivery

Apprentices must be observed by an independent assessor completing three practical skills tests in which they will demonstrate the KSBs assigned to this assessment method. The independent assessor shall select a range of test pieces to allow demonstration of skills on different materials, processes and welding positions. The end-point assessment organisation will arrange for the practical skills tests to take place, in consultation with the employer. Practical skills tests must be carried out over a maximum total assessment time of nine hours. Questioning must be completed within the total time allowed for the practical demonstration.

The practical skills test will be expected to be undertaken over 2 working days, preferably concurrent working days. The assessor has the discretion to increase the time of the practical skills tests by up to 10% to allow the apprentice to complete the last task that is part of this element of the EPA.

The independent assessor may conduct and observe up to a maximum of four apprentices during this assessment method. To allow for cost effective use of resources while maintaining quality and rigour the assessor should be assisted by an invigilator when more than two candidates are being assessed concurrently, though by staggering the start times the necessity for an invigilator may be negated. The invigilator's role is to observe the apprentice during the time when the assessor is observing or questioning the other apprentices. The invigilator cannot play a role in assessing the apprentice.

Their role is to ensure that the apprentice carries out the task unaided during the period when the assessor is absent.

Practical skills tests will be conducted in separate welding work stations. Adequate separation shall be implemented during questioning (for example separate welding bays, screening). This will reflect the specific environment of the test location, including line of sight, noise levels etc, to ensure reliability and fairness are not compromised.

There may be breaks during the practical demonstration to allow the apprentice to move from one location to another and for meal and or comfort breaks. During these breaks, the clock must be stopped and restarted to ensure that the assessment duration is not reduced.

KSBs observed and answers to questions must be documented by the independent assessor.

The independent assessor will make all grading decisions, using clarifying questions as part of this decision making process.

The apprentice welder shall not be advised of the specific test piece details ahead of the start of the practical assessment test. To allow for the requisite test piece materials and consumables to be obtained, prepared and conditioned the following steps will be followed:

At gateway submission the employer will provide and confirm

- the selected Material types (four) and Processes (two) applicable to the Pipe Welder apprentice
- the contact person, contact details to arrange material and consumable provision
- the necessary lead time needed to obtain and suitably prepare materials, (the lead time is necessary due to the time required to machine complex); branch test pieces and compound angle butt welds, to be ready for the assessment day
- a suite of welding procedure specifications (WPSs) to cover the range of joint types defined in the pipe welder apprenticeship standard for these materials and processes

The EPAO will:

- select the specific WPSs to be used for practical skills test (defines materials, consumables and joint configurations)
- confirm to the test location (employer or training provider) to ensure test piece are ready on the day. This detail shall NOT be communicated to the apprentice.

The EPAO will only confirm the specific test Piece details at the start of the practical skills assessment, which will include the selected test piece position and orientation to be tested.

The practical skills tests should be conducted in the following way to take account of the occupational context in which the apprentice operates:

- personal protective equipment (PPE) must be worn
- test pieces (prepared) and welding consumables must be agreed in advance
Where the apprentice is assessed in the workplace (preferred), the employer is responsible for ensuring that the apprentice has access to the resources used on a daily basis. Where the apprentice is not assessed in the workplace, the EPAO is responsible for ensuring that the apprentice has access to those resources. The EPAO may liaise with the employer to agree this provision in advance.

The following activities **MUST** be observed during the practical skills tests; that is a practical skills test without these tasks would seriously hamper the opportunity for the apprentice to demonstrate occupational competence in the KSBs assigned to this assessment method.

- set-up of equipment, consumables and test-pieces.
- welding activities
- interpreting and complying with welding procedure specification
- dressing, cleaning and removal of materials and contaminants
- working safely
- setting up and restoring working area

EPAOs will create and set open questions to assess related underpinning knowledge associated with knowledge, skills and behaviours that do not occur naturally during the practical skills test (for example dealing with emergent problems). The questions must be asked after each stage of the practical skills tests:

Stage 1 planning and preparation for welding; the independent assessor must ask a minimum of 4 questions (typically 20 minutes).

Stage 2 welding operations; the independent assessor must ask a minimum of 4 questions (typically 20 minutes).

Stage 3 post welding activities; the independent assessor must ask a minimum of three questions (typically 15 minutes).

Questioning must be completed within the total time allowed for the practical demonstration.

KSBs observed and answers to questions must be documented by the EPAO assessor.

The EPAO assessor will make all grading decisions.

Questions and resources development

EPAOs will create and set open questions to assess related underpinning knowledge, skills and behaviours.

EPAOs will produce specifications to outline in detail how the practical demonstrations will operate, what it will cover and what should be looked for. It is recommended that this be done in consultation with employers. EPAOs should put measures and procedures in place to maintain the security and confidentiality of their specifications if employers are consulted. Specifications must be standardised by the EPAO.

EPAOs must develop 'practical specification banks' of sufficient size to prevent predictability and review them regularly (and at least once a year) to ensure they, and

the specifications they contain, are fit for purpose. The specifications, including questions relating to underpinning knowledge, skills and behaviours must be varied, yet allow assessment of the relevant KSBs.

Venue

Practical skills-tests must be conducted in one of the following locations:

- the employer's premises
- a suitable venue selected by the EPAO and agreed by the employer (for example a training provider's premises or another employer's premises)

The venue must be able to provide the following:

- electrical power supply
- gas supply
- lighting
- ventilation
- fume extraction
- screening and access barriers
- welding equipment

Supporting material

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

- outline of the assessment method's requirements
- welding procedure specifications to be followed. The EPAO may present range of standard test pieces to be selected through consultation with the employer or may select from those used by the employer and submitted within the portfolio of evidence.
- assessment recording documentation including marking materials
- guidance for apprentices and employers

Weighting of assessment methods

All assessment methods are weighted equally in their contribution to the overall EPA grade.

Grading

Assessment method 1: Multiple choice knowledge test

KSBs	Fail	Pass	Distinction
K1, K2, K4, K5, K6, K16, K17, K18, K20, K21, K22, K24, K25, K28	Below 18 marks (60%) or Less than 4 marks for K24 and K25	18 to 23 marks (60% to 79%) and a minimum of 4 marks for K24 and K25	24 marks (80%) or above and a minimum of 4 marks for K24 and K25

Assessment method 2: Professional Discussion supported by portfolio

To achieve a pass in the professional discussion supported by portfolio all the pass grading statements must be achieved.

To achieve a distinction in the professional discussion a distinction grade must be achieved for all grading descriptors, in two or more sections, one of which must be the **welding capability section**.

Welding Capability	
K3, K9, K10, K11, K12, K26, S12, S19, S20, B1, B2	
Fail	Does not meet pass criteria
Pass	<p>Explains fundamental features of each welding process, and key differences in productivity, shielding of the arc and weld pool</p> <p>Interprets a given welding procedure specification from portfolio or selected from practical observation testing, to explain features of welding preparation, welding process and consumable selection, welding parameters, thermal treatment.</p> <p>Explains sources of information available where further clarification is needed in welding and associated activities within their organisation and the limitations in their authority to proceed.</p> <p>Illustrates through reference to portfolio completing pipe or tube welding activities to cover:</p> <ul style="list-style-type: none"> • 2 selected welding processes from TIG, MMA, PAW, MIG or MAG, FCAW • 4 selected material groups, • 3 main joint configurations (Pipe Butt, Set-on Branch, Socket

	<p>weld)</p> <ul style="list-style-type: none"> • covering ALL welding positions (either upward or downward progression) • achieves international acceptance requirements for example ISO5817 Category B, ASME IX <p>Gives clear examples of organisational reporting systems for welding quality control for the organisation and describe how welding data is captured into production quality records.</p> <p>Explains the process used in the purging of pipework, covering equipment, remediation and contamination.</p> <p>Explains the welding processes used and method of weld root protection using fluxing systems and considerations based on the bore contamination.</p>
Distinction - apprentices must demonstrate all of the grading statements	<p>In addition to the criteria for a PASS</p> <p>Explains the preparation methods, and how they may affect the mechanical properties of materials (for example thermal cycling), steps to address any changes and therefore their limitations for certain materials and operating conditions.</p> <p>Calculates welding heat input for a given welding condition, and can describe what steps can be taken to either increase or decrease the heat input (by adjusting current, arc voltage, travel speed).</p> <p>Explains the relative merits and limitations of purging of pipework, covering equipment, remediation, cost and contamination.</p> <p>Explains the relative merits of welding processes and method of weld root protection using fluxing systems and considerations based on the bore contamination.</p>

Quality, Health and Safety, Environment

K14, K23, K26, K27, S2

Fail	Does not meet pass criteria
Pass	<p>Identifies the factors which will contribute to successful performance including the types of inspection reports required, the checks to be made in relation to product dimensions and non-destructive testing requirements.</p> <p>Explain the time factors related to productivity for example for a given joint dimension and process the duration the welding activity should take as a norm.</p> <p>Explain their role in the quality cycle and the organisational documentation that may be required to be completed.</p> <p>Participate in continuous improvement practices and explain methods of</p>

	<p>identifying and reporting where continuous improvement can be achieved.</p> <p>Explain the reasons why only approved organisational documentation should be used and the impacts of not using it.</p> <p>Explain the types of risks and hazards associated with the welding activity and how these are controlled in the working environment.</p>
Distinction - apprentices must demonstrate all of the grading statements	<p>Analyses and makes recommendations for improvements in performance through application of the organisational continuous improvement processes.</p> <p>Demonstrates the impact of not using the organisational documentation.</p> <p>Evaluates and makes recommendations on the risk mitigation measures and contributes to the organisational HSE management processes.</p> <p>Provides illustrative examples of the use of quality control documentation where suggested continuous improvements have been put forward for review.</p>

Personal Integrity

S15, B3, B4, B5, B6 and B8

Fail	Does not meet pass criteria
Pass	<p>Describes typical problems in their area of responsibility, the importance of dealing with these in a timely and effective manner and how to escalate problems they are not able to resolve to the appropriate person.</p> <p>Identifies and explains a range of methods (for example diagnostic testing) and techniques that can be used to resolve problems.</p> <p>Explains how they have planned and prepared for and reflected on safety, quality and production goals taking into account their competence and continuing professional development opportunities.</p> <p>Describes an occasion where they have confidently intervened and challenged poor practice.</p> <p>Identifies how and when to share feedback with others in order to implement change.</p> <p>Demonstrates how they have carried out their work role in accordance with organisational requirements in safety, quality, ethics and self-development.</p> <p>Explains the importance of risk assessments and how to complete these at their point of work.</p> <p>Describes an occasion where they have encouraged and supported the development of others.</p> <p>Explains the importance of self-reflection and describes how they have</p>

	<p>done this to reflect on their current and past performance, with regard to improving their performance as a pipe welder.</p> <p>Demonstrates when they have provided information and made recommendations to drive continuous improvements that have enhanced the efficiency and effectiveness of working practices</p>
Distinction - apprentices must demonstrate all of the grading statements	<p>Analyses typical problems in their work area of responsibility and investigates how and why they occur.</p> <p>Evaluates their current and past performance to identify training and development needs to inform current performance improvements and onward career progression within their organisation or wider industry.</p> <p>Describes the why continuous improvement is important and how this is key to enhancing the efficiency and effectiveness of working practices.</p>

Assessment method 3: Practical Skills Test

To achieve a pass in the practical skills test all the pass grading statements must be achieved.

Preparation for Welding	
K8, K13, K19, S3, S4, S5, S6, S7, S9, S10, S11	
Fail	Does not meet pass criteria
Pass - apprentices must demonstrate all of the grading statements	<p>Interpret the welding procedure specification to determine the welding consumables, welding parameters, progression and control measures to be applied.</p> <p>Identifies, selects and uses welding components and ancillary equipment suitable for the welding process being applied.</p> <p>Inspect and ensure that the welding materials are assembled in accordance with welding procedure specification.</p> <p>Identify risks associated with subsequent welding and preparation processes, and demonstrate mitigation steps are in place in accordance with organisational requirements.</p> <p>Inspect and ensure that the welding consumables are prepared and conditioned in accordance with welding procedure specification</p> <p>Explains why remedial work may be required and steps to report within organisational requirements.</p> <p>Demonstrate methods of bore contamination, steps to avoid bore contamination and bore purging</p>

Welding Pipework	
K7, K15, S1, S8, S17, S18, S21, S22	
Fail	Does not meet pass criteria
Pass - apprentices must demonstrate all of the grading statements	<p>Demonstrate welding within the requirements defined within the welding procedure specification including the adjustment and monitoring of welding process controls, and spatial access limitations (for example adjacent pipework, walls, floors, or ceilings).</p> <p>Demonstrate compliance with health and safety requirements as specified in the organisational procedures and risk assessments.</p> <p>Interprets the welding procedure specification to determine the welding consumables, welding parameters, progression and control measures to be applied.</p> <p>Demonstrates welding within the requirements defined within the welding procedure specification including the adjustment and monitoring of welding process controls.</p> <p>Demonstrates compliance with health and safety requirements as specified in the procedures and risk assessments of the EPA location.</p> <p>Identifies areas of risk associated with Health and Safety within the selected welding practical demonstration set for example asphyxiation from welding gases, welding fume, hand-arm vibration from rotary tools.</p> <p>Employ appropriate manual processes (powered or non-powered) to remove material for initial, intermittent and final cleaning of the welded component, for example chipping hammer, file, wire brush.</p> <p>Produce pipe butt weld joints in inclined welding position (fixed 45 degrees) using a minimum of two welding processes (from TIG, PAW, MMA, MIG or MAG, FCAW) and a minimum of four material groups (from Carbon Steel, Low Alloy Steel, High Alloy Ferritic or Martensitic Steel, Austenitic Stainless Steel, Nickel and Nickel Alloys, Aluminium and Aluminium alloys, Titanium and Titanium Alloys, Copper and Copper Alloys).The weld surface shall be inspected and defects shall comply with:</p> <ul style="list-style-type: none"> • Shall not include crack(s) in, around the surface or underneath of the weld; lack of fusion visible on either surface; incomplete root penetration if visible on the inside of the weld; inclusions; end crater shrinkage pipe; stray arc marks; continuous undercut; overlap, cold lap or cold lapping ;incomplete filled groove or under filled weld joint; burn through or melt through; root concavity or suck-back • excessive weld metal: $0 < \text{cap height} \leq (1 + \text{Weld Cap width } 5)$. Maximum 7mm • excessive penetration: root height $\leq 4\text{mm max}$ ($\leq 3\text{mm max}$ where pipe wall thickness is $< 3\text{mm}$)

	<ul style="list-style-type: none"> intermittent undercut: less than 25% of total weld circumference. total undercut depth \leq (pipe thickness 10), maximum of 1mm
Distinction - apprentices must demonstrate all of the grading statements	<p>In addition to the criteria for a PASS:</p> <p>Produce pipe butt weld joints in inclined welding position (fixed 45 degrees) using a minimum of two welding processes (from TIG, PAW, MMA, MIG or MAG, FCAW) and a minimum of four material groups (from Carbon Steel, Low Alloy Steel, High Alloy Ferritic or Martensitic Steel, Austenitic Stainless Steel, Nickel and Nickel Alloys, Aluminium and Aluminium alloys, Titanium and Titanium Alloys, Copper and Copper Alloys). The weld surface shall be inspected and defects shall comply with the higher tolerances:</p> <ul style="list-style-type: none"> excessive weld metal: $0 < \text{cap height} \leq (1 + \text{weld cap width } 10)$. maximum 5mm excessive penetration: root height $\leq 3\text{mm max}$ ($\leq 2\text{mm max}$ where pipe wall thickness is $< 3\text{mm}$) intermittent undercut: less than 15% of total weld circumference. Total undercut depth \leq (pipe thickness 10), maximum of 1mm <p>Identifies areas of risk associated with weld defects within the selected welding practical demonstration for example slag entrapment, root over-penetration, undercut.</p>

Post Welding Activities	
S13, S14, S16, B7	
Fail	Does not meet pass criteria
Pass - apprentices must demonstrate all of the grading statements	<p>Returns tools and equipment to required storage location and classify un-used consumables in line with organisational procedure.</p> <p>Identifies risks associated with post-weld remediation steps, and demonstrate mitigation steps are in place in accordance with organisational requirements.</p> <p>Demonstrates adherence to specified procedures and controls during the Practical Skills Test for example working safely, meeting production expectations.</p> <p>Demonstrates full adherence to procedures and controls and identifies opportunities for personal development for example additional training and development needs and qualifications</p>

To achieve a distinction in the practical skills test a distinction grading statement must be achieved for all grading statements detailed in Welding Pipework

Overall EPA grading

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

Independent assessors must individually grade each assessment method, according to the requirements set out in this plan.

EPAOs must combine the individual assessment method grades to determine the overall EPA grade.

Apprentices who fail one or more assessment method will be awarded an EPA 'fail'.

In order to 'pass' overall apprentices must achieve at least a pass in all three assessment methods.

In order to achieve a 'distinction' apprentices must achieve a distinction in assessment method 3: the **practical skills test** and **one** other assessment method: either the professional discussion or the multiple-choice knowledge test.

Where apprentices re-sit or re-take an assessment method, the Grading will be Pass or Fail – see the re-sit and re-take section.

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

Assessment method 1 – multi choice knowledge test	Assessment method 2 – professional discussion supported by portfolio	Assessment method 3 – practical skills test	Overall grading
Fail	Any grade	Any grade	Fail
Any grade	Fail	Any grade	Fail
Any grade	Any grade	Fail	Fail
Pass	Pass	Pass	Pass
Pass or Distinction	Pass or Distinction	Pass	Pass
Pass	Distinction	Distinction	Distinction
Distinction	Pass	Distinction	Distinction
Distinction	Distinction	Distinction	Distinction

Roles and responsibilities

Role	Responsibility
Apprentice	<ul style="list-style-type: none"> • participate in development opportunities to improve their knowledge skills and behaviours as outlined in the standard • meet all gateway requirements when advised by the employer • understand the purpose and importance of EPA and undertake EPA
Employer	<ul style="list-style-type: none"> • support the apprentice to achieve the KSBs outlined in the standard to their best ability • determines when the apprentice is working at or above the level outlined in the standard and is ready for EPA • select the EPAO • confirm all EPA gateway requirements have been met • confirm arrangements with EPAO for the EPA (who, when, where) in a timely manner • ensure apprentice is well prepared for the EPA
Facility Escort	<p>If necessary, an inducted and responsible individual familiar with the test location will accompany the independent assessor to ensure safety and security requirements are maintained.</p>
EPAO	<p>As a minimum EPAOs should:</p> <ul style="list-style-type: none"> • understand the occupational role • appoint administrators/invigilators and markers to administer/invigilate and mark the EPA • provide training and CPD to the EPAO assessors they employ to undertake the EPA • provide adequate information, advice and guidance documentation to enable apprentices, employers and providers to prepare for the EPA • deliver the end-point assessment outlined in this EPA plan in a timely manner • prepare and provide all required material and resources required for delivery of the EPA in-line with best practices • use appropriate assessment recording documentation to ensure a clear and auditable mechanism for providing assessment decision feedback to the apprentice • have no direct connection with the apprentice, their employer or training provider i.e. there must be no conflict of interest • maintain robust internal quality assurance (IQA) procedures and processes, and conducts these on a regular basis • conform to the requirements of the nominated external

	<p>quality assurance body</p> <ul style="list-style-type: none"> • organise standardisation events and activities in accordance with this plan's IQA section • organise and conduct moderation of EPOA assessors' marking in accordance with this plan • have, and operate, an appeals process • arrange for certification with the relevant training provider
Independent assessor	<p>As a minimum an Independent assessor should:</p> <ul style="list-style-type: none"> • understand the standard and assessment plan • deliver the end-point assessment in-line with the EPA plan • comply to the IQA requirements of the EPAO • be independent of the apprentice, their employer and training provider(s) i.e. there must be no conflict of interest • satisfy the criteria outlined in this EPA plan • hold or be working towards an independent assessor qualification e.g. A1 and have had training from their EPAO in terms of good assessment practice, operating the assessment tools and grading • have the capability to assess the apprentice at this level • attend the required number of EPAOs standardisation and training events per year (as defined in the IQA section)
Training provider	<p>As a minimum the training provider should:</p> <ul style="list-style-type: none"> • work with the employer to ensure that the apprentice is given the opportunities to develop the KSBs outlined in the standard and monitor their progress during the on-programme period • advise the employer, upon request, on the apprentice's readiness for EPA prior to the gateway <p>• Plays no part in the EPA itself</p>

Internal Quality Assurance (IQA)

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

- appoint independent assessors who have knowledge of the following occupational areas:
 - comprehensive experience of pipe/tube welding, welding supervision, welding inspection, welding engineering i.e. three years or more experience in the sector
 - relevant experience of the occupation/sector i.e. worked in the sector in the last five years or can demonstrate current knowledge and skills developed through continued professional development
 - hold or be working towards an independent assessor qualification, for example TAQA (Training and Quality Assessment)
- provide training for independent assessors in terms of good assessment practice, operating the assessment tools and grading
- have robust quality assurance systems and procedures that support fair, reliable and consistent assessment across the organisation and over time.
- operate induction training and standardisation events for independent assessors when they begin working for the EPAO on this standard and before they deliver an updated assessment method for the first time

Re-sits and re-takes

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

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

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

The timescales for a resit or retake is agreed between the employer and EPAO. A resit or retake is typically taken within 3 months of the EPA outcome notification.

Re-sits and re-takes are not offered to apprentices wishing to increase their grading from 'Pass' to 'Distinction'.

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

Affordability

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

- assessing multiple apprentices simultaneously
- online assessment
- using an employer's premises
-

Professional body recognition

This apprenticeship is designed to prepare successful apprentices to meet the requirements for registration as Engineering Technician with the Welding Institute

Reasonable adjustments

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

Mapping of knowledge, skills and behaviours (KSBs)

Assessment method 1: Multiple choice knowledge test

Knowledge
K1: The mechanical properties (strength, ductility, toughness, etc.), physical properties (dimensions, weight, corrosion susceptibility, contamination) of commonly welded materials.
K2: The fundamentals of welding metallurgy (Weld Metal Solidification and Heat Affected Zone) and how this can affect weldability of materials and final joint integrity
K4: Pipe and tube weld joint types (Butt, Socket, Set-on Branch, Set-In Branch, Set-Through Branch, Flange) and the relative merits of the multiple preparation types (e.g. J-, V-, U- and double/triple compound angles) and their effect on pre-welding pipe preparation times, weld shrinkage, restrictive access to the pipe weld preparation, welding technique to be adopted and risk of causing defects during welding production
K5: The welding positions and progression directions associated with welding pipe e.g. Rotated Pipe; Horizontal - Fixed Vertical Pipe; Vertical Weld - Fixed Horizontal Pipe (either upward or downward progression); Inclined - Fixed 45 degree Pipe Overhead (either upward or downward progression)
K6: Pipe bore contamination and how weld root profile affects product performance in service (corrosion, erosion, flow restriction, post-weld conditioning treatments, product contamination (e.g. food, beverage, pharmaceutical) or damage to other components within the piping system (e.g. valves/turbines).
K16: Identification and the causes of typical welding defects and how their occurrence can be reduced
K17: Non-destructive testing reports and radiographs to identify particular defect types and the associated improvements to process and technique needed to prevent recurrence.
K18: The requirements for correct storage, handling and segregation of materials and tooling to prevent cross contamination between sensitive materials
K20: Supporting activities often provided by others and the essential to the successful production of pipe welding activities (bore alignment, ovality, bore contamination, fitting, purging, thermal treatment)
K21: Welding quality documentation, organisational reporting systems, procedures and their role within the overall quality process
K22: Performance success factors in production, inspection reporting, productivity, bore cleanliness/contamination
K24: Statutory, quality, organisational and health, safety and environmental

regulations
K25: Typical problems that may arise within their normal work activities/environment
K28: Non-destructive testing reports and radiographs including identification of particular defect types and the associated improvements to process and techniques needed to prevent recurrence

Assessment method 2: Professional Discussion supported by portfolio

Knowledge
K3: The common manual arc welding processes and the relative merits for a given application including Tungsten Inert Gas (TIG), Manual Metal Arc (MMA), Plasma Arc Welding (PAW), Metal Inert Gas (MIG), Metal Active Gas (MAG), Flux Cored Arc Welding (FCAW).
K9: Purging systems and damming mechanisms, including their relative merits and limitations, locating relative to the weld and subsequent removal from the piping system (e.g. dams, bungs, foams, ashless paper, soluble films etc.).
K10: Purging gas selection and its relative merits for a given material and weld location/orientation within a piping system, considering its buoyancy, leakage path, risk of asphyxiation, reaction with the molten weld pool and potential change to weld metal properties.
K11: The relative merits of purge gas injection into the bore to consider the route of gas supply, orifice diameter, volume to be purged, flow rate, acceptable oxygen levels, turbulence effects, waiting time to achieve specified levels and trigger point for withdrawal of purge protection from pipe bore.
K12: Flux based bore side root protection mechanisms (bore side fluxes, pastes, flux-carrying consumables such as flux coated and flux-cored rod stock (e.g. MMA, TIG, FCAW etc.), deoxidants within solid wires) and their relative merits, limitation and risks (post weld conditioning processes, foreign material exclusion requirements, product media contamination, downstream component degradation).
K14: Welder Approval Certificates content and definitions to determine scope of coverage.
K23: Risks and mitigation measures associated with welding and the working environment, and the organisational risk management processes.
K26: Organisational systems to control and administer approved processes, procedures, documentation and the potential implications for the organisation if not followed.
K27: Continuous improvement processes, performance review and how this is undertaken in their organisation.

Skills

S2 Obtain, check and use appropriate documentation (such as job instructions, drawings, quality control documentation).

S12 Achieve a quality of work to meet international standards for dimensional, surface inspection (e.g. Visual, Magnetic Particle, Dye Penetrant) and volumetric inspection (e.g. Radiography, Ultrasonic inspection, including Time of Flight and Phased Array methods).

S15 Deal promptly and effectively with problems within the limits of their responsibility using approved diagnostic methods and techniques.

S19 Produce pipe welds covering ALL defined pipe welding positions. These are Flat - Rotated Pipe; Horizontal - Fixed Vertical Pipe; Vertical Weld - Fixed Horizontal Pipe (either upward or downward progression); Inclined - Fixed 45 degree Pipe Overhead (either upward or downward progression).

S20 Produce pipe welds in 4 main joint configurations or Single Sided Butt, Socket, Flange and Set-on Branch.

Behaviours

B1: Takes responsibility for decision-making, without autonomy and within the guidelines of the work instruction, for their workplace, the application of welding processes, and for their productivity.

B2: Enquires and to seek guidance, in order to understand the processes and associated industrial applications.

B3 Maintains competence through Continuing Professional Development planning, preparation and reflection to ensure safety, quality and production and Continuing Professional Development goals are achieved.

B4 Intervenes and challenges poor practices and the confidence to channel feedback to the appropriate authorities to implement change.

B5 Consistently and reliably delivers in accordance with expectations in safety, production, quality, ethics and self-development.

B6 Encourages and supports the development of others and complete point of work risk assessments.

B8 Reflects on current and past performance and provide information and recommendations for continuous improvements in efficiency and effectiveness of working practices, and training and development requirement.

Assessment method 3: Practical Skills Test

Knowledge

K7: Welding controls to establish and maintain the key primary parameters associated with the welding process (e.g. Current, Arc Voltage, Wire Feed Speed, Shielding Gas

Flow Rates, Electrode Polarity etc.).
K8: The major components of welding equipment, ancillary equipment, cabling and their assembly, including Power Source, Wire Feed System, TIG & PAW Arc Initiation System, interconnecting communications cables, torches, tongs, gas equipment etc.
K13: Welding Procedure Specification requirements, content and information derived to establish specific production information.
K15: Mechanisms to measure, monitor and control secondary welding parameters (e.g. Bore Cleanliness, Bore side Oxidation, Heat Input, Interpass Temperature), linear shrinkage.
K19: When and how to use material removal processes (powered and non-powered tools).

Skills
S1 Work safely at all times, comply with health & safety and environmental legislation, regulations and organisational requirements.
S3 Plan all preparatory tasks and interfaces and pipe welding activity, before commencing work.
S4 Obtain, position and assemble welding equipment and associated safety protection needed for each activity.
S5 Prepare, check and protect materials and work areas ready for welding.
S6 Inspect the assembly to be welded and undertake remedial work to comply with specification, or implement quality steps if rejected.
S7 Receive, inspect, condition and maintain consumables.
S8 Set, test, monitor key welding parameters as detailed within the Welding Procedure Specification and adjust as necessary to accommodate changing orientation as the weld progresses around the pipe joint.
S9 Set-up purge protection within the pipe bore and associate monitoring methods.
S10 Set-up bore side protection controls to avoid foreign material ingress into the pipe bore.
S11 Remove materials using manual processes, including powered and non-powered equipment.
S13 Monitor weld quality and dimensions throughout welding activity and on completion of welding and report any issues through organisational production / quality control process prior to release for formal examination by others.
S14 Restore the work area on completion of the activity and where applicable return any resources and consumables to the appropriate location.
S16 Complete any required documentation using the defined recording systems at the appropriate stages of the work activity.

S17 Produce pipe welds using two welding processes from TIG, PAW, MMA, MIG/MAG, FCAW.

S18 Produce pipe welds using four material groups from Carbon Steel, Low Alloy Steel, High Alloy Ferritic/Martensitic Steel, Austenitic Stainless Steel, Nickel & Nickel Alloys, Aluminium & Aluminium alloys, Titanium & Titanium Alloys, Copper & Copper Alloys.

S21 Produce pipe welds in by continually adjusting the orientation of the welder, welding torch, and welding consumable filler, including restricted access conditions.

S22 Produce pipe welds in restricted access conditions by welding with both left and right hands (e.g. boiler tube bundles, proximity of other plant and equipment, limited access locations, welds located with limited visibility of the weld joint).

Behaviours

B7 Follows the specified procedures and controls and be personally responsible and accountable for their production work and personal development.