

# Nuclear Welding Inspection Technician level 4 – Assessment Plan

## Introduction

The nuclear industry requires a high level of confidence that fabrication and installation activities including welding have been correctly completed. The industry has high standards of specification driven partly by the nature of the substances involved and partly by the nature of the facilities which, due to contamination post commissioning, become increasingly difficult to repair. These factors therefore increase the drive to apply standards in excess of those deployed in other industries. Once a facility has been commissioned, the ability to return to make repairs becomes almost non-existent. The potential consequences of failure are either a multi-million pound plant rendered useless or worse a nuclear incident. The desire to get things right first time is of paramount importance in the nuclear industry and welding inspection plays a vital role to ensuring this is achieved.

There is no existing process which as a 'one stop shop' provides the level of knowledge to understand the welding, inspect the welding and deploy Non Destructive Testing (NDT) techniques whilst understanding nuclear specifications in a radiological environment and also delivers the behavioural attributes expected of this highly regulated industry. The historical route is to convert craftsmen into nuclear welding inspectors by extensive training and examination over a period of years to develop inspection skills and knowledge of the particular unique requirements of the nuclear industry. This apprenticeship is intended to replace this process with a shorter more focussed and intensive alternative and equivalent which will cut training periods whilst achieving all of the end skills, knowledge and behavioural requirements of the role.

There is compelling evidence that there is a shortage of experienced nuclear welding inspectors and that this shortage will become more apparent due to the current demographics and an extensive nuclear construction programme, i.e. construction projects will seek the same resource from the existing small and ageing pool.

The Nuclear Welding Inspection Technician (NWIT) apprenticeship is a 'first of a kind' scheme that has been proposed and subsequently developed by the Nuclear Employer Group specifically for the nuclear industry. The group comprises site licence holders, various companies (large and small) who directly supply/manufacture goods and services to the industry and the relevant professional institutions for welding inspection and Non Destructive Testing (NDT). The scheme will typically take 4 years to complete and will provide a new route to recruitment of young talent to produce competent technicians who perform a vital role for the current and future UK nuclear civil programme (current operations, decommissioning, new build) and UK nuclear defence.

A successful apprentice is one who is deemed to be competent for the specific role and has achieved all of the requirements stipulated within the Apprenticeship Standard. In this instance the apprentice will have the required skills, knowledge and behaviours to undertake the role of a Nuclear Welding Inspection Technician (NWIT). This Assessment Plan details the requirements that employers, further education providers and professional bodies must meet to ensure all apprentices, irrespective of company and location are assessed in a rigorous, robust and consistent manner.

## Section A - Summary of assessment

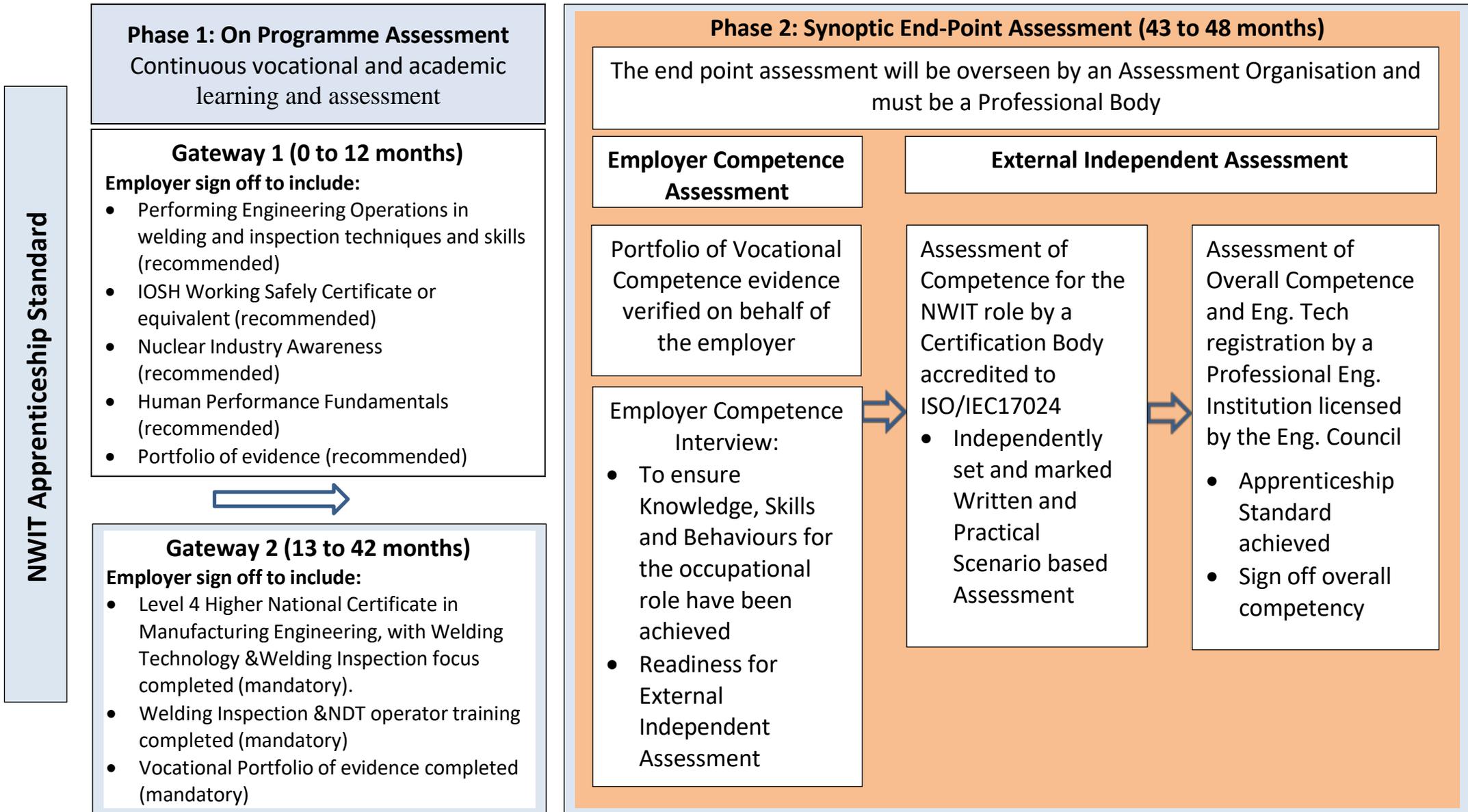
This Assessment Plan has been developed to provide a structured approach to enable the apprenticeship to be completed in accordance with the approved NWIT Apprenticeship Standard and for the successful apprentice to be deemed competent.

This document focusses on the 'end-point assessment' required to be carried out by the employer or nominated training provider and professional institute to enable the apprentice to be tested in a consistent and fair manner to determine successful completion of the Apprenticeship. The On Programme training and assessment recommended to ensure an apprentice is working on the right track / right level to be ready for end-point assessment is provided in Annex 1.

**Section A - Summary of assessment**

The formal end-point assessment will be synoptic and assess skills, knowledge and behaviours in an integrated way at the end of the programme.

**Nuclear Welding Inspection Technician (NWIT) - The Assessment Approach**



## Section B - Detailed explanation of the end-point assessment

### What will be assessed and how will the assessment be carried out?

The apprentice will be assessed on their ability to undertake welding inspection duties before, during and after welding to ensure that nuclear related fabrications meet the exacting quality requirements specified in nuclear industry regulations, specifications, standards and detailed engineering documents. These broad range of Skills, Knowledge and Behaviours to achieve this are detailed within the NWIT Apprenticeship Standard

The synoptic end-point assessment will start typically after 42 months into the 4 year programme and will consist of two main components:

- Employer Competence Assessment, followed by;
- External Independent Assessment

The end-point assessment will be overseen by an Assessment Organisation that must be a Professional Engineering Institution (Professional Body).

#### **Employer Competence Assessment:**

There are two elements to the employer competence assessment, the first element being a verification of the portfolio of evidence collated throughout the apprenticeship and the second element will be in the form of a competence interview. These two elements will collectively ensure that the employer competence assessment will assess skills, knowledge and behaviours in an integrated way to cover the range of the occupation role and demonstrate the apprentice's ability across the Standard. The outcome of both elements will be submitted for external independent assessment, details of each element are as follows:

#### **Element 1: Portfolio of Evidence**

Portfolio of Vocational Competence evidence verified on behalf of the employer
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The apprentice will present a completed portfolio of evidence for the employer to undertake a review. This will ensure that throughout the apprenticeship, the apprentice has undertaken a range of inspection activities and gained sufficient and suitable experience to meet the broad range of skills requirements of the Apprenticeship Standard. The portfolio will be signed off by a Suitably Qualified Experienced Person (SQEP) on behalf of the employer who is approved by the Professional Engineering Institution (PEI).

Guidance on the criteria to be covered in the portfolio will be provided by the PEI.

The portfolio will typically take a number of forms consistent with the skill being assessed and could include:

- Products such as drawings, reports and presentations
- Reflective accounts/personal statements
- Professional discussion
- Expert witness evidence/testimony
- On the job and task observation

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### Element 2: Competence Interview

#### Employer Competence Interview:

- To ensure Knowledge, Skills and Behaviours for the occupational role have been achieved
- Readiness for External Independent Assessment

This will be used to assess the ability of the apprentice to undertake the occupational role. Typically the interview will be of 1 hour duration to allow sufficient time for questioning and responses and to record the details of the interview.

The Nuclear Employer Group has decided that a scenario based interview is crucial when determining the overall competency of the NWIT. The apprentice will be asked a series of questions to enable the employer to determine role competence skills, knowledge and behaviours have been achieved. The employer will present to the apprentice a range of situations to:

- determine what course of action they would take
- ensure the behaviours stipulated in the Apprenticeship Standard have been embedded.

The employer will conduct an interview that meets the published requirements of the external independent assessment set out and developed by the assessing PEI. The questions asked will take into consideration, the type of welding inspection activities undertaken as well as the areas of deployment. The NWIT apprenticeship scheme is designed to supply SQEP resource throughout the nuclear industry and extended supply chain, hence the work environment to which they will be deployed is extremely varied.

The assessment will be carried out by SQEP approved by the PEI. On successful completion of the employer competence assessment, the employer will submit the following evidence to the PEI on behalf of the apprentice for External Independent Assessment:

- Confirmation that the competence evaluation Portfolio has been completed and signed off
- Competency interview record completed and signed

### External Independent Assessment:

Assessment of Competence for the NWIT role by a Certification Body accredited to ISO/IEC17024

- Independently set and marked Written and Practical Scenario based Assessment

#### NWIT certification of competence in accordance with:

- **BS EN ISO 17637 Non-destructive testing of welds – Visual testing of fusion-welded joints**
- **BS EN ISO 9712 Non-destructive testing – Qualification and certification of NDT personnel (at Level 2)**

These existing industry based certifications utilised globally are specifically designed to assure competence in welding inspection responsibilities and tasks. Examination takes place away from the employer's place of work, at an assessment centre and independently set, invigilated and marked. Certification is awarded by accredited certification bodies that provide independence, impartiality and quality assurance required throughout the assessment phase of the apprenticeship.

The examination method contains theory based questioning to ensure the apprentice has a sound knowledge of the discipline attained throughout the apprenticeship as well as a practical assessment

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where welding inspection skills will be deployed to assess and report on welds to acceptance levels. For the practical assessment/trade test the apprentice will be given welded samples (plate and pipe) and will be required to ensure all pre-inspection checks are complete and that tools and techniques are selected correctly and deployed during inspection and measurement. The inspection of the weld is undertaken against defined nuclear specific standards and subsequent reports must be completed to acceptable quality standards.

**Please note: The above standards are referred to as ‘Level 2’ within the industry. This is an industry designation and the level has no connection to the Qualification & Credit Framework (QCF) Level 2 descriptor. BS EN ISO 9712 section 6.2 sets out the roles and responsibilities an individual certified to Level 2 may be authorised to undertake.**

**Please note: BS EN ISO/IEC17024 Conformity assessment – General requirements for bodies operating certification of persons.**

On successful completion of the Practical and Written Assessment the apprentice will be able to competently:

- understand factors which influence the quality of fusion welds in steels
- recognise characteristics of commonly used welding processes in relation to quality control
- interpret drawing instructions and symbols to ensure that specifications are met
- set up and report on inspection of welds
- assess and report on welds to acceptance levels
- confirm that incoming material meets stipulated requirements and recognise the effects on weld quality of departure from specification

Assessment of Overall Competence and Eng. Tech registration by a Professional Eng. Institution licensed by the Eng. Council

- Apprenticeship Standard achieved
- Sign off overall competency

It is a fundamental requirement of the NWIT Apprenticeship Standard that mapping to UK-SPEC is achieved and that the apprentice will be eligible for Engineering Technician registration on completion of the scheme.

The external independent assessment will be undertaken by the assessing PEI against the competence and commitment requirements detailed within UK-SPEC (UK Standard for Professional Engineering Competence). This ensures the successful apprentice is EngTech ready and provides a platform for future continued professional development. The assessment will incorporate all of the competence and commitment standards for Engineering Technicians, which are as follows:

- 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.

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On completion of the External Independent Assessment the PEI will:

- Advise the employer and apprentice on the outcome
- Request further evidence if required
- For successful apprentices, advise the appropriate certification body that the Apprenticeship Standard has been achieved and can be awarded.

### **Who will carry out the assessment?**

The assessment responsibilities are set out in Annex 2.

#### **The Employer Competence Assessment**

The assessment will be carried out by Suitably Qualified Experienced Person (SQEP) approved by the PEI. The assessing PEI will hold a list of registered SQEPs who can conduct the employer competence assessment. The evidence from the assessment will be submitted for independent external assessment. The employer will select interviewers who have not been directly involved in mentoring or direct supervision of the apprentice to ensure a level of independence and impartiality. The outcome of the assessment will be the responsibility of the employer.

#### **The External Independent Assessments**

The Practical and Written assessment of competence for the NWIT role will be carried out by a Certification Body accredited to ISO/IEC17024.

The assessment of competence for EngTech registration will be carried out by a PEI licensed by the Engineering Council. The assessing PEI will carry out a desk top review of the evidence submitted for all apprentices. The assessing PEI will select a suitable panel from their membership who are not directly associated with the Employer or training delivery to provide independency, impartiality and ensure all apprentices are assessed in a fair and objective manner. The PEI will utilise an approved method and process to enable all apprentices to be assessed in the same manner and same criteria for scoring. This external assessment will be required for all apprentices and the assessing PEI will make the final judgement on whether an apprentice has achieved the requirements of the standard for the apprenticeship to be awarded. The output of this apprenticeship scheme is mapped to professional membership and registration eligibility.

## **Section C - Grading**

The NWIT apprenticeship scheme is mapped directly to the UK-SPEC entry requirements for Engineering Technician and as a result will not be graded.

As the ultimate aim of the NWIT Apprenticeship is to achieve EngTech registration it is the strongly held and unanimous view of the employers that the application of an overall grade on the Apprenticeship Certificate is not appropriate. The achievement of the stretching and internationally recognised EngTech standard as assessed by the PEI will be sufficient. This is the accepted norm amongst all professional communities as a binary pass/fail benchmark.

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The Engineering Council, as the UK regulatory body for the engineering profession sets and maintains the internationally recognised standards of professional competence and ethics that govern the award and retention of the titles Engineering Technician (EngTech), Incorporated Engineer (IEng) and Chartered Engineer (CEng). This ensures that employers, government and wider society, both in the UK and overseas can have confidence in the knowledge, experience and commitment of professionally registered engineers and technicians.

### Section D - Implementation

#### Predicted cost of the Apprenticeship and End-Point Assessment

The major costs for delivering the NWIT apprenticeship are:

- The On Programme training and assessment, including:
  - the initial engineering and welding vocational skills qualification
  - the IOSH safety course
  - the nuclear awareness course
  - the human performance fundamentals course
  - the NDT Operator training
  - the nuclear welding inspection training
  - the delivery of the Higher National Certificate knowledge component
  - the ongoing support and progress monitoring of the individual apprentices
- The Synoptic End-Point Assessment, including
  - the practical and written assessment
    - the NDT Operator certification
    - the Nuclear Welding Inspection certification
  - the assessment against Engineering Council registration EngTech
  - the quality assurance of all the processes involved in the assessment.

The cost of the end point assessment is currently estimated to be of the order of 10% of the overall cost of the NWIT apprenticeship.

#### Delivery of the end-point assessment across the country and in a variety of businesses

The Group recognises that the assessment approach is open to PEIs and an approach has been agreed with relevant Welding Inspection and Non Destructive Testing Professional Bodies to work together to undertake all assessments for the NWIT apprentices. This will ensure that that the end point assessment is:

- ✓ Undertaken by discipline specific experts
- ✓ Carried out in a rigorous and consistent manner by an independent body
- ✓ Subject to existing external Quality Assurance arrangements
- ✓ Mapped to UK-Spec EngTech entry requirements and compliant with international standards
- ✓ Overseen and co-ordinated consistently in an integrated way

Employers will have the assurance that their apprentices have had their competence independently assessed and in meeting the UK-SPEC Eng Tech requirements have the ability to establish their commitment to Continuing Professional Development (CPD).

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## Annex 1 - Overview of the Apprenticeship

### Introduction

The Nuclear Employer Group recommends to employers who adopt the NWIT Apprenticeship to develop their employees, to use an approach of on programme training and assessment with gateways so that an apprentice is being continuously monitored, assessed and provided with feedback on their performance, to help ensure the end-point assessment can be successfully achieved. Additionally, where qualifications and training courses exist that help to underpin the knowledge, skills and behaviours for the NWIT occupational role, these should be included during the apprenticeship delivery.

There will be two main phases to the NWIT apprenticeship:

- Phase 1: On Programme Training and Assessment – typically from 0 to 42 months
- Phase 2: Synoptic End-Point Assessment – typically from months 43 to 48 at the end of the apprenticeship programme.

**Phase 1 On Programme Training and Assessment:** Typically a 42 month phase where the apprentice will develop the specific skills, knowledge and behaviours required for the occupational role. This will comprise of two gateways during which a body of evidence will be collected and utilised to determine role competence of the apprentice.

### Gateway 1 (0 –12 Months)

#### **Gateway 1 (0 to 12 months)**

##### **Employer sign off to include:**

- Performing Engineering Operations in welding and inspection techniques and skills
- IOSH Working Safely Certificate or equivalent
- Nuclear Industry Awareness
- Human Performance Fundamentals
- Portfolio of evidence

The first year will build the foundations for the occupational role and may take place in the workplace or in a largely simulated working environment. This will consist of a significant period of off-the-job training and will include basic engineering skills followed by a welding specific module designed to introduce the apprentice to the practical and theoretical elements of the subject. Knowledge based modules will be delivered throughout the year to underpin skills and behavioural development and will be delivered by suitably qualified and experienced person (SQEP) from the employer or their nominated training partner. Gateway 1 will provide assurance that the apprentice has a fundamental understanding of the principles of material science, welding technology, welding

inspection, NDT techniques and working safely in a nuclear environment. Evidence of completion of Gateway 1 will be required for the apprentice to progress onto Gateway 2.

### Gateway 2 (13 – 42 Months)

#### **Gateway 2 (13 to 42 months)**

##### **Employer sign off to include:**

- Level 4 Higher National Certificate in Manufacturing Engineering, with Welding Technology & Welding Inspection focus completed
- Welding Inspection & NDT operator training completed
- Vocational Portfolio of evidence completed

During the next two and a half years the apprentice will focus on developing further skills capability, knowledge and nuclear behaviours supported by further knowledge based learning modules thus enabling the apprentice to ultimately work effectively and independently without supervision.

The apprentice will work towards a qualification recognised by the professional bodies as suitable for registration for EngTech and as per the published

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Apprenticeship Standard will include Level 2 industry based certification of role specific competence in at least one NDT method.

For Gateway 2 the apprentice will have completed their training and through on-going assessment they will have generated a range of evidence to show they meet the Apprenticeship Standard. This will be captured in a competence evaluation portfolio. The employer determines that the portfolio has been completed and is ready for review in the end point assessment.

To ensure the knowledge requirements of the NWIT occupational role are fully established, an academic Level 4 Higher National Certificate in Manufacturing Engineering shall be undertaken. The following HNC units are required as a minimum:

- Core Units
  - Analytical Methods for Engineers
  - Engineering Science
  - Project Design, Implementation and Evaluation
- Specialist Units
  - Materials Engineering
  - Fabrication and Welding Processes in Manufacturing
  - Welding Inspection (to be developed)
  - Quality and Business Improvement

It is important that the behavioural competence of the apprentice is monitored throughout the duration of the apprenticeship. Employers may wish to assess behavioural competence using their internal mentoring and appraisal systems and for this to be tracked at the end of each year. Evidence will also be available via the portfolio of evidence.

### **Phase 2 (43 – 48 Months)**

Please refer to Section B in the main body of this Assessment Plan.

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## Annex 2 - NWIT Assessment Responsibilities

### 1. Summary of roles in relation to the Employer Competence Assessment Process

#### Competence Evaluation Portfolio:

	Preparation	Assessment
<b>Apprentice</b>	<ul style="list-style-type: none"> <li>Collates evidence required to meet the NWIT Apprenticeship Standard</li> </ul>	<ul style="list-style-type: none"> <li>Completes the portfolio to the best of their ability</li> </ul>
<b>Employer / Provider</b>	<ul style="list-style-type: none"> <li>Introduces the standards and expectation to complete the portfolio</li> <li>Organises time and place for regular reviews with the apprentice</li> <li>Sets target, reviews progress and evidence</li> <li>Allows time away from the workplace to complete portfolio</li> <li>Selects appropriate SQEPs to undertake the review</li> </ul>	<ul style="list-style-type: none"> <li>Review portfolio of evidence submitted</li> <li>Signs off the portfolio as complete and provides evidence to the PEI to confirm this assessment has been completed successfully.</li> </ul>
<b>PEI</b>	<ul style="list-style-type: none"> <li>Provides review criteria</li> <li>Holds list of registered SQEP who can undertake the review</li> <li>Provides guidance on the criteria to be covered in the portfolio</li> </ul>	<ul style="list-style-type: none"> <li>Has oversight of the process to ensure it is carried out in a consistent and rigorous manner</li> </ul>

#### Competence Interview:

	Preparation	Assessment
<b>Apprentice</b>	<ul style="list-style-type: none"> <li>Re-familiarises her/himself with the knowledge, skills and behaviours required to competently carry out the NWIT role</li> <li>Identifies positive aspects from their portfolio of evidence to highlight</li> <li>Provides portfolio of evidence to the SQEP prior to the interview.</li> </ul>	<ul style="list-style-type: none"> <li>Responds to interview questions to the best of their ability</li> <li>Provides further information as requested</li> </ul>
<b>Employer</b>	<ul style="list-style-type: none"> <li>Provides guidance to the apprentice on aspects of their recent work to highlight</li> <li>Allows time away from the workplace to prepare for and attend interview</li> <li>Selects appropriate SQEPs to undertake the interview</li> <li>Provides guidance to the SQEPs on the interview process</li> <li>Organises the time and place for the interview</li> <li>SQEPs identify aspects of the apprentice's work in the portfolio to be probed/explored at interview</li> <li>Produces Competence Interview criteria and guidance for the SQEP to assess the apprentice based on the external independent assessment checklist</li> </ul>	<ul style="list-style-type: none"> <li>Puts the apprentice at ease</li> <li>Probes/explores aspects of evidence and quality of the apprentice's work from the portfolio.</li> <li>Assesses the apprentice's responses to competence questions asked.</li> <li>Records key points about the apprentice's responses</li> <li>Signs off the competence interview as complete and provides evidence to the PEI to confirm this assessment has been completed successfully.</li> <li>Provides guidance on the criteria to be covered in the portfolio</li> </ul>
<b>PEI</b>	<ul style="list-style-type: none"> <li>Provides guidance on the criteria to be covered in the interview</li> <li>Holds list of registered SQEP who can undertake the interview</li> </ul>	<ul style="list-style-type: none"> <li>Has oversight of the process to ensure it is carried out in a consistent and rigorous manner</li> </ul>

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### 2. Summary of roles for the External Independent Assessment

#### Practical and Written Assessment by Certification Body:

	Preparation	Assessment
<b>Apprentice</b>	<ul style="list-style-type: none"> <li>Prepares by fully reviewing the NWIT role to ensure understanding and application of visual inspection and dimensional checks of completed weldments against specification requirements and drawings</li> </ul>	<ul style="list-style-type: none"> <li>Completes the practical and written assessments to the best of their ability</li> </ul>
<b>Employer</b>	<ul style="list-style-type: none"> <li>Selects an appropriate certification scheme</li> <li>Advises the apprentice on how the assessment will be conducted</li> <li>Enrols apprentice for the assessments</li> <li>Allows time away from the workplace to prepare and take the practical assessment</li> </ul>	
<b>Certification Body</b>	<ul style="list-style-type: none"> <li>Produces practical and written assessment to be used</li> <li>Produces assessment brief and assessment marking criteria</li> <li>Advises apprentice / employer on suitable dates and locations for the assessments</li> </ul>	<ul style="list-style-type: none"> <li>Invigilates the practical and written assessments</li> <li>Puts the apprentice at ease</li> <li>Scores the assessments using the marking criteria</li> <li>Provides feedback and certification</li> </ul>

#### Overall Competence and EngTech registration Assessment by PEI:

	Preparation	Assessment
<b>Apprentice</b>	<ul style="list-style-type: none"> <li>Is clear on the submission process and due date</li> <li>Gathers any other documents the PEI requests for the assessment</li> </ul>	<ul style="list-style-type: none"> <li>Provides responses to any questions that are raised by the PEI desk top review within the requested timescale</li> <li>Provides further supporting information as requested</li> </ul>
<b>Employer</b>	<ul style="list-style-type: none"> <li>Provides required evidence from the Employer Competence Assessment to the PEI</li> </ul>	
<b>PEI</b>	<ul style="list-style-type: none"> <li>Advises the apprentice and their employer on the assessment process and the criteria to be followed to provide evidence required for review by the panel</li> <li>Organises the independent panel to review apprentice applications and selects a panel Chair</li> <li>Advises the panel on the assessment criteria to be used</li> <li>Produces the assessment criteria</li> </ul>	<ul style="list-style-type: none"> <li>Assesses Apprentice applications against the agreed criteria</li> <li>Probes/explores aspects of evidence and quality of the apprentice's work</li> <li>Uses the evidence provided by the apprentice to inform the final decision on the Apprenticeship Standard having been achieved</li> <li>Advise the appropriate certification body on the outcome for the Apprenticeship to be awarded</li> <li>Advise Apprentice on outcome and offer of registration and membership</li> <li>Provides moderation in the case of dispute</li> </ul>