

# Nuclear Health Physics Monitor Apprenticeship – Assessment Plan

## Introduction

This document focusses predominantly on the ‘end-point assessment’ that must be carried out to enable a Nuclear Health Physics Monitor (NHPM) 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 for guidance in Annex 1.

Health Physics Monitoring is a specialised field of radiological protection and is the term used to describe the protection and control of exposure of people and environment to the effects of ionising radiation. Protection is achieved by various means such as regulations, standards, measurements and physical controls.

The nuclear industry requires a high level of confidence that health physics monitoring activities are undertaken to the highest possible standards for the continued safe operation of nuclear facilities. The Nuclear Health Physics Monitor (NHPM) performs this vital role to ensure that radiation and contamination levels within nuclear facilities are maintained within safe limits of this highly regulated industry to ensure the health and safety of nuclear personnel, the general public and the environment

There is compelling evidence that there is a shortage of experienced nuclear health physics monitors and this shortage will become more apparent due to the current demographics of an ageing nuclear workforce and resource demands for extensive nuclear construction and decommissioning programmes over the next 5 to 50 years lifetime. Historically, many health physics personnel have come from operational roles or external recruitment, requiring extensive reskilling and retraining over a period of years, however this option is in short supply and not sufficient to enable the required numbers to support the industry going forward.

The NHPM apprenticeship will typically take 2 years to complete and will provide a vital route to recruitment of young talent for employers. It will produce competent nuclear health physics professionals achieving all of the skills, knowledge and behavioural requirements of the role, for the current and future UK nuclear civil programme (current operations, decommissioning, new build) and UK nuclear defence.

The NHPM Apprenticeship Standard and Assessment Plan will replace and build on the current ‘Nuclear Working’ Apprenticeship Framework ID: FR02915 (England), which has a pathway for radiological protection. The development has been carried out by the Nuclear Employer Group specifically set up for the nuclear industry. The group comprises nuclear site licence holders, various companies (large and small) within the supply chain for nuclear who directly have a responsibility for radiological protection and health physics monitoring, and the Nuclear Institute (NI).

## 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 Apprenticeship Standard and for the apprentice to be successful in achieving a minimum of a ‘pass’ grade at completion.

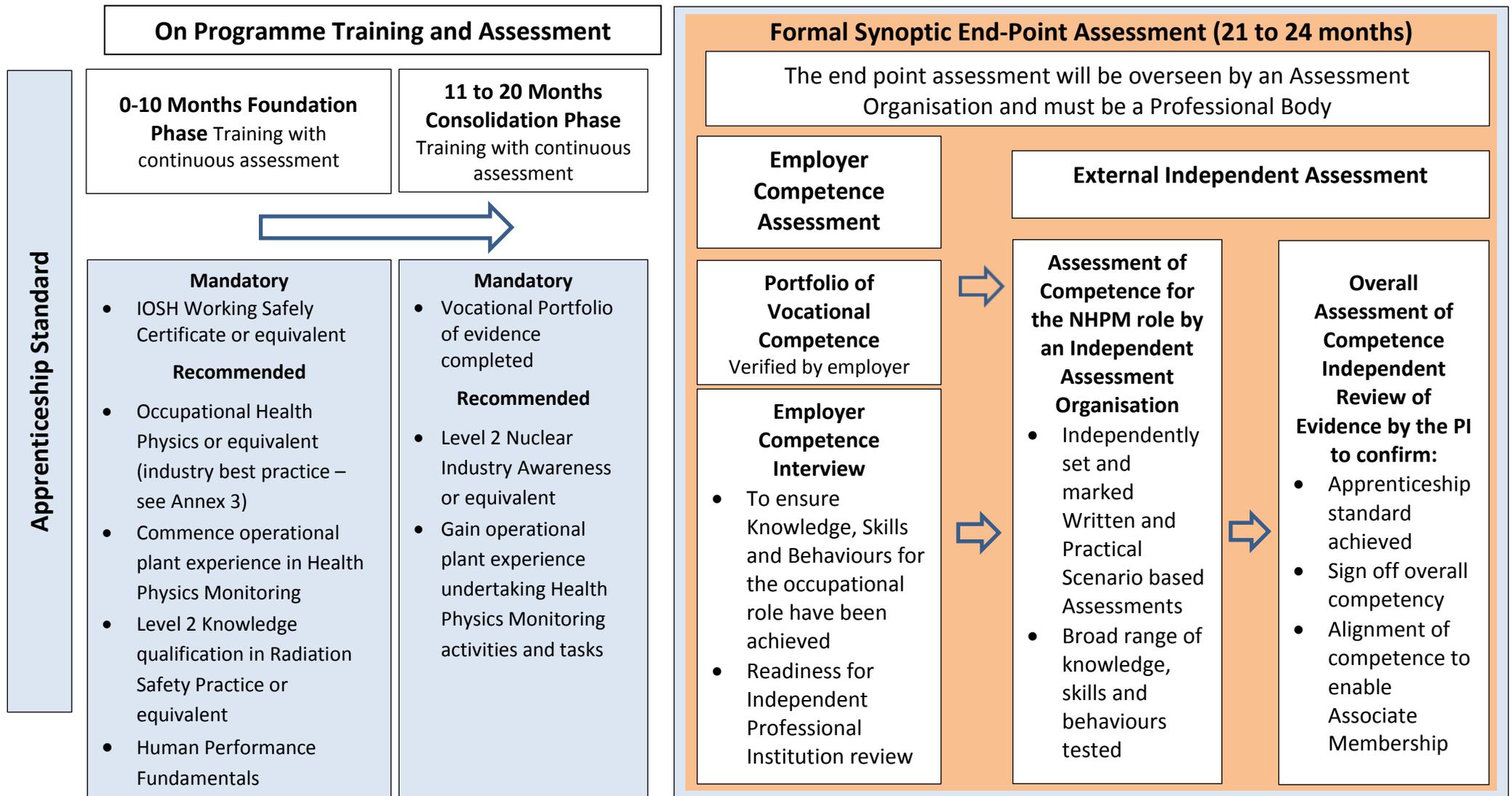
A successful apprentice is one who is deemed by their employer to be competent for the specific role and has achieved all of the requirements stipulated within the published Apprenticeship Standard. This Assessment Plan details the requirements that apprentices, employers and further education providers must meet to ensure all apprentices, irrespective of company and location are assessed in a rigorous, robust and consistent manner.

Diagram 1 (see Page 2) provides a visual appreciation of the Apprenticeship route. The formal end-point assessment will be synoptic and assess skills, knowledge and behaviours in an integrated way at the end of the programme. The end-point assessment will start typically after 20 months into the 2 year programme, once the apprentice, employer and training provider (if applicable) are satisfied that all requirements have been met and the apprentice is ready to be able to fully undertake the occupational role. 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.

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Diagram 1: Route to End-Point Assessment and Apprenticeship Award



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## Section B

### Detailed explanation of the end-point assessment

#### What will be assessed?

The apprentice will be assessed on their ability to demonstrate the broad range of Skills, Knowledge and Behaviours detailed in the NHPM Apprenticeship Standard. Further explanation on this is provided under 'How' the assessment will be carried out.

#### How will the assessment be carried out?

There will be two main elements to the end-point assessment:

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

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

#### Employer Competence Assessment

There are two elements to the employer competence assessment. The first element will be a verification of the 'portfolio of evidence' collated throughout the apprenticeship. The second element will be an 'interview of competence'. 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 Apprenticeship Standard. The outcome of both elements will help determine the apprentice's readiness for end-point assessment and the outputs will be submitted for external independent assessment, details of which are as follows:

##### Element 1: Portfolio of Evidence

**Portfolio of Vocational Competence**  
evidence verified by employer

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 broad range of health physics monitoring activities and gained sufficient and suitable experience to meet the broad range of skills and knowledge requirements of the Apprenticeship Standard. The portfolio will be signed off by the employer and will be verified by the Professional Institution (PI).

Guidance on the criteria and evidence to be covered in the portfolio will be provided by the PI.

The portfolio will typically take a number of forms consistent with the skills and knowledge 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

##### Element 2: Competence Interview

#### **Employer Competence Interview:**

- To ensure Knowledge, Skills and Behaviours for the occupational role have been achieved
- Readiness for Independent Professional Institution review

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.

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The Nuclear Employer Group has decided that a scenario based interview is crucial when determining the overall competency of the NHPM.

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:

- find out 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 Professional Institution (PI). The questions asked will take into consideration, the type of health physics monitoring activities undertaken as well as the areas of deployment. The NHPM apprenticeship scheme is designed to supply competent individuals 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 Suitably Qualified Experienced Person (SQEP) approved by the PI. On successful achievement of the competence assessment, the employer on behalf of the apprentice will submit the following evidence to the PI 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:**

There are two elements to the external independent assessment. The first element will be practical and written assessments of the apprentices' abilities. The second element will be a desk top panel review.

### **Element 1: Practical and Written Assessments**

#### **Assessment Competence for the NHPM role by an Independent Assessment Organisation**

- Independently set and marked Written and Practical Scenario based Assessments
- Broad range of knowledge, skills and behaviours tested

The Practical and Written Assessments will be developed by the selected Independent Assessment Organisation registered with SFA, in consultation with the Nuclear Health Physics Employer Group. The Assessments will be developed, published and the marking schemes controlled to ensure that required independence is achieved and that all assessments and subsequent grading are undertaken in a consistent manner, irrespective of the location and size of the employer.

The Practical and Written Assessment will be carried out at either the employers or providers premise and will be invigilated to ensure a fair and rigorous process is demonstrated for all apprentices.

**The Practical Assessment** will be used to assess the broad range of skills attained throughout the apprenticeship. Typically this will be scenario based to ensure the NHPM apprentice can demonstrate their ability to undertake the health physics monitoring occupational role in a variety of

practical situations related to the radiological protection of people, plant and the environment. The scenarios will cover normal and abnormal operational conditions. The practical assessment should be carried out in a realistic environment that does not expose the apprentice to the risks associated with radiation, for the sole purpose of the assessment. The assessment will be developed to enable a competent apprentice to complete the required scenarios tested typically within 1 day.

**The Written Assessment** will be used to assess the broad range of knowledge attained throughout the apprenticeship. Typically this test will comprise a range of multiple-choice, true/false and short answer questions covering normal and abnormal operational conditions. The assessment will be developed to enable a competent apprentice to complete the required scenarios tested typically within 3 hours.

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On successful completion of the Written and Practical Assessments, the employer on behalf of the apprentice will submit the following evidence to the Professional Institution for Assessment of overall competence:

- Practical and Written Assessment evidence
- Portfolio of Vocational Competence verification evidence
- A record of the Competence Interview, with a proforma completed and signed off by the employer Assessor

## Element 2: Assessment of Overall Competence

### Assessment of overall competence

Independent Review of evidence by the PI to confirm:

- Apprenticeship standard achieved
- Sign off overall competency
- Alignment of competence to enable Associate Membership

The culmination of the apprenticeship end-point assessment will be an independent review of evidence. This must be carried out by a Professional Institution (PI) licensed by the Engineering Council or the Science Council, supported where necessary by a professional assessment organisation.

The PI will organise and hold sufficient judging panels to meet the demand of NHPM end point assessments required. The panel will carry out a review of the evidence submitted to determine whether the apprentice has met the required criteria for the Apprenticeship Standard. An apprentice who meets the required criteria will be awarded a graded Apprenticeship certificate from the appropriate certification body. An apprentice who has not yet achieved the required criteria will be informed of the panel's decision and areas for improvement prior to resubmission.

## 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 PI. The assessing PI will hold a list of registered SQEPs who can conduct the employer competence assessment and review and sign off the portfolio of evidence. The completion 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 NHPM role will be carried out by the Independent Assessment Organisation.

The assessment of Overall Competence will be undertaken by a Professional Institution licensed by the Engineering Council or the Science Council, and will be a desk top review of the evidence submitted for each apprentice. The assessing PI 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 PI 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 PI will make the final judgement on whether an apprentice has achieved the requirements of the standard for the NHPM apprenticeship to be awarded.

Currently, the **Nuclear Institute (NI)** has provided its support for the NHPM apprenticeship and agreed to perform the External Independent Assessment requirements. Additionally the NI has agreed that NHPM

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apprentices can initially register (should they so wish to) as an Affiliate member (non-paying) at the starting point of their apprenticeship and provide eligibility for Associate membership (paying) at the successful end point of the apprenticeship. The NI will introduce an alignment of competence of the NHPM apprenticeship to NI Associate Membership. This Associate Membership notifies to the apprentice they have reached a recognised level of nuclear professionalism providing access to professional development opportunities that can support them in acquiring the competences required for professional registration with either the Engineering or Science Council and professional Membership of the NI at an appropriate time in their future. An apprentice who joins the NI as an Associate Member will have access to professional development opportunities to support them in acquiring the competences required for professional registration and professional Membership of the NI.

Where required by the nuclear industry, other suitable Professional Institutions may also be considered by employers to provide the External Independent Assessment for the NHPM apprenticeship.

## **Quality Assurance**

We are considering employer led approaches for quality assurance and governance and are working through the options with BIS. At the present time awarding organisations who wish to deliver against the standard will need to be on the SFA register of assessment organisations

## **Section C**

### **Grading**

The Independent External Assessment Practical and Written Assessments must each be passed.

The grading of the apprenticeship will be based on the Written Assessment:

- Distinction (80%+)
- Merit (70 to 79%)
- Pass (60 to 69%)

An apprentice who has achieved a pass will be deemed fully competent against the NHPM Apprenticeship Standard.

Where a 'Pass' is not achieved, the apprentice may re-take the Practical and Written assessments. The timescale for this will be agreed between the apprentice and their employer based on the shortcomings identified by the assessment outcome. Typically the assessments should be re-taken within 2 months and not more than 4 months from the date of the original assessment.

## **Section D**

### **Implementation**

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

The major costs for delivering the NHPM apprenticeship are:

- The On Programme training and assessment, including:
  - IOSH safety course or equivalent (mandated)
  - nuclear awareness course
  - human performance fundamentals course

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- the delivery of the Occupational Health Physics course (see Annexe 3)
- the Level 2 knowledge qualification in Radiation Safety Practice or equivalent
- the ongoing support and progress monitoring of the individual apprentices
- The Synoptic End-Point Assessment, including
  - the external practical and written assessments
  - the overall assessment of competence by the PI
  - the quality assurance of all the processes involved in the delivery.

The cost of the end point assessment is currently estimated to be of the order of 25% of the overall cost of the NHPM apprenticeship.

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

The Nuclear Employer Group recognises that the assessment approach is open to PIs and an approach has been agreed with a relevant Professional Body working in the nuclear sector to undertake the final end point overall assessment of competence giving assurance to nuclear employers that the assessment of their apprentices is:

- ✓ Undertaken by nuclear specific experts
- ✓ Carried out in a rigorous and consistent manner by an independent body
- ✓ Subject to external quality assurance arrangements
- ✓ Overseen and co-ordinated consistently in an integrated way
- ✓ Consistent with the methods deployed to ensure that membership entry requirements have been met and provide Continuing Professional Development (CPD) for future eligibility for Professional Registration and Professional Membership)

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## Annex 1 – On Programme Training and Assessment

### Introduction

The Nuclear Employer Group recommends to employers who adopt the NHPM Apprenticeship to train and develop their employees, to use an approach of 'On Programme Training and Assessment' 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 NHPM occupational role; these should be included during the apprenticeship delivery.

There will be two main components to the NHPM apprenticeship: (please refer to Diagram 1, in Section A)

- On Programme Training and Assessment – typically from 0 to 20 months
- End-Point Assessment – typically from 21 to 24 months at the end of the apprenticeship programme

### On Programme Training and Assessment:

This is the recommended approach to ensure an apprentice is ready to undertake the end-point assessment

Typically, it will be a 20 month phase where the apprentice will develop the skills, knowledge and behaviours required for the NHPM occupational role. This will comprise Foundation and Consolidation phases, during which a body of evidence will be collected in a portfolio and utilised as part of the end-point assessment to determine role competence of the apprentice.

#### Foundation Phase (0 –10 Months)

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 period of off-the-job training and will include nuclear fundamentals training, operational health physics training and will include familiarisation of radiological protection equipment to introduce the apprentice to the practical and theoretical elements of the subject. Knowledge based modules will be delivered throughout the period to underpin skills and behavioural development and will be delivered by suitably qualified and experienced personnel from the employer or their nominated training partner. Employers must choose to use the IOSH Working Safely certificate or an equivalent course or internal training appropriate to their organisation to ensure an apprentice has a good understanding of how to work safely in the nuclear industry. Employers will ensure an apprentice has undertaken and completed an Occupational Health Physics course (see Annex 3). Employers will also use the Radiation Safety Practice Level 2 course or equivalent to ensure the apprentice has a technical understanding of the requirements of the NHPM role. Employers may choose to use the Human Performance Standards developed by the UK Nuclear Human Performance Forum as the recognised industry standards, to help ensure an apprentice has a good appreciation and understanding of Human Performance Fundamentals for individual and team working to reduce the frequency of errors whilst building in better defence mechanisms.

Completion of the Foundation stage will provide assurance to the employer that the apprentice has a fundamental understanding of operational health physics monitoring, nuclear safety and radiological safety.

#### Consolidation Phase (11 – 20 Months)

The next 10 month phase will be used to embed further skills capability, knowledge and nuclear behaviours supported by further knowledge based learning modules thus enabling the apprentice to ultimately work effectively and independently at the end of the apprenticeship without supervision. Employers may choose to use the Award for Nuclear Industry Awareness level 2 qualification or suitable equivalent to ensure an apprentice has a good understanding of the nuclear industry. At the end of the Consolidation stage 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 Portfolio of Vocational Competence. The employer will determine that the portfolio has been completed and ready for review in the end point assessment. The apprentice should have completed all the requirements of On Programme training and assessment to be ready to undertake the end point assessment.

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## **Phase 2: End-Point Assessment:**

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

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## Annex 2 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 NHPM 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>Reviews portfolio of evidence submitted</li> <li>Signs off the portfolio as complete and provides evidence to the PI to confirm this assessment has been completed successfully.</li> </ul>
<b>Professional Institute</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 NHPM 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 an appropriate SQEP to undertake the interview</li> <li>Provides guidance to the SQEP on the interview process</li> <li>Organises the time and place for the interview</li> <li>SQEP identifies 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</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, practical test and written test</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 PI to confirm this assessment has been completed successfully</li> <li>Provides guidance on the criteria to be covered in the portfolio</li> </ul>
<b>Professional</b>	<ul style="list-style-type: none"> <li>Provides guidance on the criteria to be covered in the interview</li> </ul>	<ul style="list-style-type: none"> <li>Has oversight of the process to ensure it is carried out in a</li> </ul>

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<b>Institute</b>	<ul style="list-style-type: none"> <li>• Holds list of registered SQEP who can undertake the interview</li> </ul>	consistent and rigorous manner
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### 2. Summary of roles in relation to the External Independent Assessment Process

#### Practical and Written Assessment by Independent Assessment Organisation:

	Preparation	Assessment
<b>Apprentice</b>	<ul style="list-style-type: none"> <li>• Prepares by fully reviewing the NHPM role and how to ensure understanding and application of routine and non-routine radiological situations</li> </ul>	<ul style="list-style-type: none"> <li>• Completes the practical and written assessment to the best of their ability</li> </ul>
<b>Employer</b>	<ul style="list-style-type: none"> <li>• Advises the apprentice on how the assessment will be conducted</li> <li>• Allows time away from the workplace to prepare and take the assessments</li> <li>• Enrols the apprentice at the appropriate time for the assessments</li> </ul>	
<b>Independent Assessment Organisation</b>	<ul style="list-style-type: none"> <li>• Produces assessment to be used in conjunction with the NHPM Employer Group</li> <li>• Produces assessment brief and assessment marking criteria</li> <li>• Advises the employer on suitable dates and locations for the assessments</li> </ul>	<ul style="list-style-type: none"> <li>• Quality assures the assessment process</li> <li>• Ensure appropriate invigilation of the assessments taking place, at the employer's workplace, training provider premises or their own test centre</li> <li>• Scores the assessments using the marking criteria</li> <li>• Produces feedback on assessments for the apprentice</li> </ul>

#### Overall Competence Assessment by Professional Institution (PI):

	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 PI requests to accompany the application</li> </ul>	<ul style="list-style-type: none"> <li>• Provides responses to any questions that are raised by the PI panel 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 the required evidence for the apprentice to the PI</li> </ul>	<ul style="list-style-type: none"> <li>• Enables PI Members &amp; Fellows who are employed by the organisation to be called upon to support the end-point assessment panel review process. Note: Panel members selected will be independent from the apprentices being reviewed.</li> </ul>
<b>Professional Institute</b>	<ul style="list-style-type: none"> <li>• Advises the apprentice and their employer on the application 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</li> </ul>	<ul style="list-style-type: none"> <li>• Assess the apprentice's application 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</li> </ul>

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	<p>and selects a panel Chair</p> <ul style="list-style-type: none"><li>• Produces the assessment criteria</li></ul>	<p>decision on the Apprenticeship Standard having been achieved</p> <ul style="list-style-type: none"><li>• Advises the appropriate certification body on the outcome for the Apprenticeship to be awarded</li><li>• Advises apprentice on the outcome and offer of membership</li><li>• Provides moderation in the case of dispute</li></ul>
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## Annex 3 Occupational Health Physics course or equivalent

The UK nuclear industry has established that an Occupational Health Physics course is a recommended approach as best practice for NHPM apprentices to undertake to gain the required understanding.

### Course Aim

To enable delegates to demonstrate sufficient theoretical and practical knowledge to develop as Health Physics Monitors. The course includes site visits to gain practical knowledge/experience.

**Target Audience** - Health Physics Apprentices

### Course Objectives:

Typically upon successful completion of this course, you will be able to:

- Demonstrate knowledge of basic atomic physics
- Demonstrate knowledge of basic mathematics
- Demonstrate knowledge Radiological Legislation
- Demonstrate a working knowledge of radiation, its hazards and how to control it
- Demonstrate a working knowledge of radioactive contamination, its hazards and how to control it
- Demonstrate a working knowledge of airborne contamination, its hazards and how to control it

Typical course content is:

- Introduction to Radiation Protection
- Basic Radiation Physics
- Surface contamination monitoring
- Radiation monitoring
- Airborne contamination monitoring
- Monitoring of personnel
- Radiation and contamination control
- Clearance and exemption monitoring
- Use of radiation protection instrumentation
- Response to abnormal radiological conditions in the work place
- Record, interpret and report monitoring results

End Assessment to be completed (Pass Mark is set at 80%).

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Further training on plant is required typically up to 24 months.