ST1344/V

**Draft end-point assessment plan for the Tunnel engineer apprenticeship**

| Apprenticeship reference number | Level of this end-point assessment (EPA) | Integration |
|---|---|---|
| ST1344 | 7 | Degree-apprenticeship |

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## Introduction and overview

This document explains the requirements for end-point assessment (EPA) for the tunnel engineer degree-apprenticeship. End-point assessment organisations (EPAOs) must follow this when designing and delivering the EPA.

Tunnel engineer apprentices, their employers and training provider should read this document.

A degree-apprenticeship awards a degree with the achievement of the apprenticeship. The degree learning outcomes must be aligned with the knowledge, skills and behaviours (KSBs) in the apprenticeship. The degree must be completed, passed and awarded alongside the tunnel engineer degree-apprenticeship.

The apprentice must complete their training and meet the gateway requirements before starting their EPA. The EPA will assess occupational competence.

A degree-apprenticeship must be delivered by a Higher Education Provider (HEP) that is on the apprenticeship providers and assessment register (APAR). The selected HEP must be the training provider and the EPAO. The apprentice's employer must select a HEP from this register.

If the HEP is using a credit framework, the EPA must contribute to the total credit value, and must be delivered in line with this EPA plan. However, the number of credits devoted to EPA may vary across HEP's. The recommended EPA contribution is 10% of the total credit value.

A full-time tunnel engineer apprentice typically spends 30 months on-programme. The apprentice must spend at least 12 months on-programme and complete the required amount of off-the-job training in line with the apprenticeship funding rules.

This EPA should be completed within an EPA period lasting typically 9 months.

Occupational competence is outlined by the EPA grade descriptors and determined, when assessed in line with this EPA plan, by an independent assessor who is an occupational expert and confirms the overall EPA grade.

This EPA has 2 assessment methods.

Assessment method 1 - project with report, presentation and questioning:

- fail
- pass

Assessment method 2 - professional discussion underpinned by a portfolio of evidence:

- fail
- pass

- distinction

The result from each assessment method is combined to decide the overall degree-apprenticeship grade. The following grades are available for the degree-apprenticeship:

- fail
- pass
- distinction

**EPA summary table**

| | |
|---|---|
| **On-programme - typically 30 months** | The apprentice must:<br>• complete training to develop the knowledge, skills and behaviours (KSBs) outlined in this degree-apprenticeship's standard<br>• complete training towards English and mathematics qualifications in line with the apprenticeship funding rules<br>• compile a portfolio of evidence<br>• work towards all required elements of the tunnel engineer degree-apprenticeship except undertaking the EPA.<br>The qualification required is:<br>MSc in tunnel and underground space engineering |
| **End-point assessment gateway** | The apprentice's employer must be content that the apprentice is occupationally competent.<br>The apprentice must:<br>• confirm they are ready to take the EPA<br>• have achieved English and mathematics qualifications in line with the apprenticeship funding rules<br>• have completed and passed all required elements of the tunnel engineer degree-apprenticeship except the EPA<br>For the project with report, presentation and questioning, the apprentice must submit a project brief. To ensure the project allows the apprentice to meet the KSBs mapped to this assessment method to the highest available grade, the EPAO should sign-off the |

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|---|---|
| | project's title and scope at the gateway to confirm it is suitable. A brief project summary must be submitted to the EPAO. It should be no more than 500 words. This needs to show that the project will provide the opportunity for the apprentice to cover the KSBs mapped to this assessment method. It is not assessed.<br><br>For the professional discussion underpinned by a portfolio of evidence, the apprentice must submit a portfolio of evidence.<br><br>Gateway evidence must be submitted to the EPAO, along with any organisation specific policies and procedures requested by the EPAO. |
| **End-point assessment - typically 9 months** | **The grades available for each assessment method are below**<br><br>Project with report, presentation and questioning:<br><br>• fail<br>• pass<br><br>Professional discussion underpinned by a portfolio of evidence:<br><br>• fail<br>• pass<br>• distinction<br><br>**Overall EPA and degree-apprenticeship can be graded:**<br><br>○ fail<br>○ pass<br>○ distinction |
| **Professional recognition** | This degree-apprenticeship aligns with:<br><br>• The Institution of Civil Engineers (ICE) for Chartered Engineer<br><br>This degree-apprenticeship aligns with:<br><br>• The Institute of Materials, Minerals and Mining (IOM3) for Chartered Engineer |
| **Re-sits and re-takes** | The details for re-sits and re-takes are below:<br><br>• re-take and re-sit grade cap: pass |

| | |
|---|---|
| | • re-sit timeframe: typically 2 months<br>• re-take timeframe: typically 4 months |

**Duration of end-point assessment period**

The EPA is taken in the EPA period. The EPA period starts when the EPAO confirms the gateway requirements have been met and is typically 9 months.

The EPAO should confirm the gateway requirements have been met and start the EPA as quickly as possible.

**EPA gateway**

The apprentice's employer must be content that the apprentice is occupationally competent. That is, they are deemed to be working at or above the level set out in the apprenticeship standard and ready to undertake the EPA. The employer may take advice from the apprentice's training provider, but the employer must make the decision. The apprentice will then enter the gateway.

The apprentice must meet the gateway requirements before starting their EPA.

They must:

- confirm they are ready to take the EPA
- have achieved English and mathematics qualifications in line with the apprenticeship funding rules
- have completed and passed all required elements of the MSc in tunnel and underground space engineering degree-apprenticeship except the EPA
- submit a project brief for the project with report, presentation and questioning
- submit a portfolio of evidence for the professional discussion underpinned by a portfolio of evidence

**Portfolio of evidence requirements**:

The apprentice must compile a portfolio of evidence during the on-programme period of the apprenticeship. It should only contain evidence related to the KSBs that will be assessed by the professional discussion. It will typically contain 10 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 suggested.

Evidence sources may include workplace documentation and records, for example:

- demonstrating compliance with workplace policies and procedures

- witness statements
- annotated photographs
- video clips with a maximum total duration 10 minutes; the apprentice must be in view and identifiable

This is not a definitive list; other evidence sources can be included.

The portfolio of evidence should not include reflective accounts or any methods of self-assessment. Any employer contributions should focus on direct observation of performance, for example, witness statements, rather than opinions. The evidence provided should be valid and attributable to the apprentice; the portfolio of evidence should contain a statement from the employer and apprentice confirming this.

The EPAO should not assess the portfolio of evidence directly as it underpins the discussion. The independent assessor should review the portfolio of evidence to prepare questions for the discussion. They are not required to provide feedback after this review.

Gateway evidence must be submitted to the EPAO, along with any organisation specific policies and procedures requested by the EPAO.

**Order of assessment methods**

The assessment methods can be delivered in any order.The result of one assessment method does not need to be known before starting the next.

**Project with report, presentation and questioning**

**Overview**

The project assessment method involves the apprentice completing a significant and defined piece of work that has a real business application and benefit. This process may include for example, research, analysis and the completion of tasks or activities to achieve the outcome. The assessment method will have an output at the end of the defined piece of work. The work completed for the project assessment method must meet the needs of the employer's business and be relevant to the apprentice's occupation and apprenticeship.

This assessment method has 2 components:

- completion of the defined piece of work for the project with a project output
- completion of the defined piece of work for the presentation with questions and answers

Together, these components give the apprentice the opportunity to demonstrate the KSBs mapped to this assessment method. They are assessed by an independent assessor.

**Rationale**

This assessment method is being used because:

- it allows for the assessment of KSBs that take place over a long period of time
- it allows for a broad set of KSBs to be evidenced during the post-gateway period
- it assesses KSBs holistically
- it can produce something that is of genuine business benefit to the apprentice's employer
- it can be conducted remotely, potentially reducing cost

**Delivery**

The apprentice must complete a project based on any of the following:

The project should be based on a substantial tunnelling project that has the opportunity to evidence the mapped knowledge, skills and behaviours. Some example projects include:

- Design for a Tunnelled crossing between Great Britain and Ireland
- Underground Freight Transport: Civil Engineering Design
- Transpennine Tunnel: Long Tunnel Rail or Road Study
- Bristol Metro: Critical Evaluation of Options

To ensure the project allows the apprentice to meet the KSBs mapped to this assessment method to the highest available grade, the EPAO must sign-off the project's title and scope at the gateway to confirm it is suitable. The EPAO must refer to the grading descriptors to ensure that projects are pitched appropriately.

The project output must be in the form of a report and presentation.

The apprentice must start the project after the gateway. The employer should ensure the apprentice has the time and resources, within the project period, to plan and complete their project.

The apprentice may work as part of a team to complete the project, which could include internal colleagues or technical experts. The apprentice must however, complete their project report and presentation unaided and they must be reflective of their own role

and contribution. The apprentice and their employer must confirm this when the report and any presentation materials are submitted.

**Component 1: Project report**

The report must include at least:

- an executive summary (or abstract)
- an introduction
- the scope of the project (including key performance indicators, aims and objectives)
- a project plan with clear methodological steps (mapped to objectives)
- research outcomes
- data analysis outcomes
- project outcomes
- discussion of findings
- recommendations and conclusions
- references
- appendix containing mapping of KSBs to the report.

The report must also include:

There are no further project requirements.

The project report must have a word count of 15000 words. A tolerance of 10% above or below is allowed at the apprentice's discretion. Appendices, references and diagrams are not included in this total. The apprentice must produce and include a mapping in an appendix, showing how the report evidences the KSBs mapped to this assessment method.

The apprentice must complete and submit the report and any presentation materials to the EPAO by the end of week 24 of the EPA period.

**Component 2: Presentation with questions**

The presentation with questions must be structured to give the apprentice the opportunity to demonstrate the KSBs mapped to this assessment method to the highest available grade.

The apprentice must prepare and deliver a presentation to an independent assessor. After the presentation, the independent assessor must ask the apprentice questions about their project, report and presentation.

The presentation should cover:

- an overview of the project
- the project scope (including key performance indicators)
- summary of actions undertaken by the apprentice
- project outcomes and how these were achieved

The presentation with questions must last 60 minutes. This will typically include a presentation of 30 minutes and questioning lasting 30 minutes. The independent assessor must use the full time available for questioning. The independent assessor can increase the time of the presentation and questioning by up to 10%. This time is to allow the apprentice to complete their last point or respond to a question if necessary.

The independent assessor must ask at least 4 questions. They must use the questions from the EPAO's question bank or create their own questions in line with the EPAO's training. Follow up questions are allowed where clarification is required.

The purpose of the independent assessor's questions is:

- to verify that the activity was completed by the apprentice
- to seek clarification where required
- to assess those KSBs that the apprentice did not have the opportunity to demonstrate with the report, although these should be kept to a minimum
- to assess level of competence against the grading descriptors

The apprentice must submit any presentation materials to the EPAO at the same time as the report - by the end of week 24 of the EPA period. The apprentice must notify the EPAO, at that point, of any technical requirements for the presentation.

During the presentation, the apprentice must have access to:

- audio-visual presentation equipment
- flip chart and writing and drawing materials
- computer

The independent assessor must have at least 2 weeks to review the project report and any presentation materials, to allow them to prepare questions.

The apprentice must be given at least 2 weeks' notice of the presentation with questions.

The apprentice may choose to end the presentation early. The apprentice must be confident they have demonstrated competence against the assessment requirements for the assessment method. The independent assessor or EPAO must ensure the apprentice is fully aware of all assessment requirements. The independent assessor or EPAO cannot suggest or choose to end the assessment methods early, unless in an emergency. The EPAO is responsible for ensuring the apprentice understands the implications of ending an assessment early if they choose to do so. The independent assessor may suggest the assessment continues. The independent assessor must document the apprentice's request to end the assessment early.

**Assessment decision**

The independent assessor must make the grading decision. They must assess the project components holistically when deciding the grade.

The independent assessor must keep accurate records of the assessment. They must record:

- the KSBs demonstrated in the report and presentation with questions
- the apprentice's answers to questions
- the grade achieved

**Assessment location**

The presentation with questions must take place in a suitable venue selected by the EPAO for example, the EPAO's or employer's premises. It should take place in a quiet room, free from distractions and influence.

The presentation with questions can be conducted by video conferencing. The EPAO must have processes in place to verify the identity of the apprentice and ensure the apprentice is not being aided.

**Question and resource development**

The EPAO must develop a purpose-built assessment specification and question bank. It is recommended this is done in consultation with employers of this occupation. The EPAO must maintain the security and confidentiality of EPA materials when consulting with employers. The assessment specification and question bank must be reviewed at least once a year to ensure they remain fit-for-purpose.

The assessment specification must be relevant to the occupation and demonstrate how to assess the KSBs mapped to this assessment method. The EPAO must ensure that

questions are refined and developed to a high standard. The questions must be unpredictable. A question bank of sufficient size will support this.

The EPAO must ensure that the apprentice has a different set of questions in the case of re-sits or re-takes.

EPAO must produce the following materials to support the project:

- independent assessor EPA materials which include:
    - training materials
    - administration materials
    - moderation and standardisation materials
    - guidance materials
    - grading guidance
    - question bank
- EPA guidance for the apprentice and the employer

The EPAO must ensure that the EPA materials are subject to quality assurance procedures including standardisation and moderation.

**Professional discussion underpinned by a portfolio of evidence**

**Overview**

In the professional discussion, an independent assessor and apprentice have a formal two-way conversation. It gives the apprentice the opportunity to demonstrate the KSBs mapped to this assessment method.

**Rationale**

This assessment method is being used because:

- it assesses KSBs holistically and objectively
- it allows for the assessment of KSBs that do not occur on a predictable or regular basis
- it can be conducted remotely, potentially reducing cost

**Delivery**

The professional discussion must be structured to give the apprentice the opportunity to demonstrate the KSBs mapped to this assessment method to the highest available grade.

An independent assessor must conduct and assess the professional discussion.

The purpose of the independent assessor's questions will be to assess the apprentice's competence against the following themes:

- project and risk management
- professional conduct
- communication
- construction
- ground investigation
- digital

The EPAO must give an apprentice 2 weeks' notice of the professional discussion.

The independent assessor must have at least 2 weeks to review the supporting documentation.

The apprentice must have access to their portfolio of evidence during the professional discussion.

The apprentice can refer to and illustrate their answers with evidence from their portfolio of evidence however, the portfolio of evidence is not directly assessed.

The professional discussion must last for 80 minutes. The independent assessor can increase the time of the professional discussion by up to 10%. This time is to allow the apprentice to respond to a question if necessary.

The independent assessor must ask at least 6 questions. The independent assessor must use the questions from the EPAO's question bank or create their own questions in line with the EPAO's training. Follow-up questions are allowed where clarification is required.

The apprentice may choose to end the assessment method early. The apprentice must be confident they have demonstrated competence against the assessment requirements for the assessment method. The independent assessor or EPAO must ensure the apprentice is fully aware of all assessment requirements. The independent assessor or EPAO cannot suggest or choose to end the assessment methods early, unless in an emergency. The EPAO is responsible for ensuring the apprentice understands the implications of ending an assessment early if they choose to do so. The independent assessor may suggest the assessment continues. The independent assessor must document the apprentice's request to end the assessment early.

The independent assessor must make the grading decision.

The independent assessor must keep accurate records of the assessment. They must record:

- the apprentice's answers to questions
- the KSBs demonstrated in answers to questions
- the grade achieved

**Assessment location**

The professional discussion must take place in a suitable venue selected by the EPAO for example, the EPAO's or employer's premises.

The professional discussion can be conducted by video conferencing. The EPAO must have processes in place to verify the identity of the apprentice and ensure the apprentice is not being aided.

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

**Question and resource development**

The EPAO must develop a purpose-built assessment specification and question bank. It is recommended this is done in consultation with employers of this occupation. The EPAO must maintain the security and confidentiality of EPA materials when consulting with employers. The assessment specification and question bank must be reviewed at least once a year to ensure they remain fit-for-purpose.

The assessment specification must be relevant to the occupation and demonstrate how to assess the KSBs mapped to this assessment method. The EPAO must ensure that questions are refined and developed to a high standard. The questions must be unpredictable. A question bank of sufficient size will support this.

The EPAO must ensure that the apprentice has a different set of questions in the case of re-sits or re-takes.

The EPAO must produce the following materials to support the professional discussion underpinned by a portfolio of evidence:

- independent assessor assessment materials which include:
    - training materials
    - administration materials
    - moderation and standardisation materials
    - guidance materials

    - grading guidance
    - question bank
- EPA guidance for the apprentice and the employer

The EPAO must ensure that the EPA materials are subject to quality assurance procedures including standardisation and moderation.

**Grading**

**Project with report, presentation and questioning**

Fail - does not meet pass criteria

| **Theme**<br><br>**KSBs** | **Pass**<br><br>**Apprentices must demonstrate all of the pass descriptors** |
|---|---|
| Analysis and feasibility K4 K6 S2 S3 S4 | Interprets, analyses and critically evaluates the ground investigation, geological, hydrogeological, stratigraphy and existing built environment data as required by the project brief. (K4, S2)<br><br>Analyses and interprets project and desk study data of the tunnel and associated underground structures and the ground to develop feasibility plans and alignments for tunnel projects that consider data, project requirements and constraints in line with the project brief requirements. (K6, S3, S4) |
| Design for construction and operation of tunnels and associated underground structures K3 K5 K7 K8 K10 K11 S5 S6 S9 B3 B5 | Interprets the client's operational requirements from the project brief. Translates these requirements to actions in the design, construction or maintenance approach of the structure to meet the project brief requirements. (K3, K5, S5)<br><br>Works with autonomy and takes responsibility for designs and decisions by comparing different options on their |

| Theme<br><br>KSBs | Pass<br><br>Apprentices must demonstrate all of the pass descriptors |
|---|---|
| | relative merit, and selects the most suitable to meet client and stakeholder needs, technical requirements and other project brief-specific criteria. (K7, S6, B3)<br><br>Takes a whole lifecycle view of the tunnel or other underground structure and produces designs for tunnel linings and other underground structures in accordance with engineering design principles, methods and codes, using information such as site investigation data, evaluation of construction methodology, and appropriate material performance. (K3, K6, K10, K11, S9, B5) |
| Professional conduct K18 K23 S7 S18 | Plans and manages own time and undertakes research to support the selection of solutions in the design, construction and maintenance of tunnel and underground space works to meet the project brief. (K18, K23, S7, S18) |

**Professional discussion underpinned by a portfolio of evidence**

Fail - does not meet pass criteria

| **Theme**<br><br>**KSBs** | **Pass**<br><br>**Apprentices must demonstrate all of the pass descriptors** | **Distinction**<br><br>**Apprentices must demonstrate all of the pass descriptors and all of the distinction descriptors** |
|---|---|---|
| Project and risk management K13 K14 K15 K17 S15 S16 S17 B4 | Articulates how they use project management and planning techniques, for example, estimating, ensuring contractual compliance, programming, cost and budget control, resource management and handover to follow-on projects and programmes in line with organisational requirements. (K13, K17, S15)<br><br>Articulates how they identify and comply with legal and statutory requirements, including Health and Safety, CDM regulations, environmental protection and sustainability. (K15, S16)<br><br>Articulates how they develop, promote and support a risk aware culture and explains how they use risk management techniques to identify, quantify, assess, mitigate and manage risks | Critically evaluates their approach to project management and analyses the impact to the wider organisation. (K13, S15)<br><br>Critically evaluates the organisations approach to risk management and assesses its effectiveness in line with organisational policies and procedures. (K14, S17) |

| Theme<br><br>KSBs | Pass<br><br>Apprentices must demonstrate all of the pass descriptors | Distinction<br><br>Apprentices must demonstrate all of the pass descriptors and all of the distinction descriptors |
|---|---|---|
| | associated with tunnel engineering activities, including for emergency situations in line with organisational procedures. (K14, S17, B4) | |
| Professional conduct K16 S8 B1 B6 | Articulates how they develop tunnel engineering solutions in line with the client brief, and articulates how they evaluate the potential impacts of these, including economic sustainability, ethical, societal and environmental and sustainability perspectives and practical considerations such as buildability and long-term asset management in line with organisational procedures, regulations, and professional requirements. (K16, S8, B1)<br><br>Explains how they remain committed to their own and others' continued | Analyses their approach to evaluating tunnel solutions in line with organisational requirements. (K16, S8, B1) |

| Theme<br><br>KSBs | Pass<br><br>Apprentices must demonstrate all of the pass descriptors | Distinction<br><br>Apprentices must demonstrate all of the pass descriptors and all of the distinction descriptors |
|---|---|---|
| | professional development in line with organisational and professional requirements, and how they promote innovation in the workplace to meet work goals. (B6) | |
| Communication K19 K20 S13 S19 B2 B7 | Articulates how they communicate and collaborate with colleagues and stakeholders, using a range of different methods and techniques, both verbal and written, including the production of reports to convey information. (K20, S13, B7)<br><br>Articulates how they are adaptable and lead and work with others, including how they develop themselves and others, and how they negotiate with and influence others, taking account of diversity, equality and inclusivity | Explains how they demonstrate a high fluency of professional communciation adapted to stakeholders. (K20, S13, B7) |

| Theme<br><br>KSBs | Pass<br><br>Apprentices must demonstrate all of the pass descriptors | Distinction<br><br>Apprentices must demonstrate all of the pass descriptors and all of the distinction descriptors |
|---|---|---|
| | requirements. (K19, S19, B2) | |
| Construction K2 K9 K12 K22 S10 S11 S12 S14 | Articulates how they interpret engineering drawings in line with organisational and client requirements. (S10)<br><br>Articulates how they interpret materials specifications for the construction, repair and maintenance of tunnels and associated underground space structures in line with client requirements. (S11)<br><br>Articulates how they interpret work method statements for the construction, repair and maintenance of tunnels and associated underground space structures in line with client requirements. (K12, S12)<br><br>Articulates how they assess onsite logistics to | Critically evaluates their approach to assessing onsite logistics to support proposed construction methodology in line with organisational and client requirements. (K2, K9, S14) |

| Theme<br><br>KSBs | Pass<br><br>Apprentices must demonstrate all of the pass descriptors | Distinction<br><br>Apprentices must demonstrate all of the pass descriptors and all of the distinction descriptors |
|---|---|---|
| | support proposed construction methodology, for example site layouts, spoil management, impacts on the local population and local area as part of an Environmental Impact Assessment, reduction of noise or vibration in line with client and organisational requirements. (K2, K9, S14)<br><br>Explains the daily review and assessment process during construction, and response to real-time information as excavation progresses to determine requirements on monitoring and construction activities going forward. (K22) | |
| Ground investigation K1 S1 | Articulates how they specify ground investigations to obtain | None. |

| Theme<br>KSBs | Pass<br>Apprentices must demonstrate all of the pass descriptors | Distinction<br>Apprentices must demonstrate all of the pass descriptors and all of the distinction descriptors |
|---|---|---|
| | geotechnical data, including in situ techniques, laboratory tests and instrumentation and monitoring techniques in line with organisational and client requirements. Evaluates the risks that exist when completing ground investigations to obtain geotechnical data. (K1, S1) | |
| Digital K21 S20 S21 | Articulates how they use information technology including producing as-built records to facilitate the handover of assets, for example digital tools for research, analysis, and presentation of data, Building Information Modelling (BIM), digital communication and collaboration packages.(K21, S20, S21) | Critically evaluates their use of information technology and the impact it has upon their role and the wider organisation. (K21, S20) |

**Overall EPA grading**

Performance in the EPA determines the overall grade of:

- fail
- pass
- distinction

An independent assessor must individually grade the project with report, presentation and questioning and professional discussion underpinned by a portfolio of evidence in line with this EPA plan.

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

If the apprentice fails one assessment method or more, they will be awarded an overall fail.

To achieve an overall pass, the apprentice must achieve at least a pass in all the assessment methods. To gain an overall distinction, the apprentice must gain a pass in the project assessment method, and a distinction in the professional discussion assessment method.

Grades from individual assessment methods must be combined in the following way to determine the grade of the EPA overall.

| Project with report, presentation and questioning | Professional discussion underpinned by a portfolio of evidence | Overall Grading |
|---|---|---|
| Any grade | Fail | Fail |
| Fail | Any grade | Fail |
| Pass | Pass | Pass |
| Pass | Distinction | Distinction |

**EPA degree apprenticeship aggregation**

The outcome of the EPA must be aggregated with the degree to enable the degree-apprenticeship to be awarded.

Once the overall EPA grade has been determined, aggregation can be achieved in a variety of ways. This will be determined during the creation of the degree-apprenticeship. Examples of how this aggregation can work include:

- each assessment method grade, and therefore the overall EPA grade, can be converted to marks or percentages however these must be an absolute figure and not a range
- alternatively, the overall EPA grade can be used directly

HEPs can explore other ways of aggregating the EPA with the degree outcomes in line with the latest IfATE degree-apprenticeship policy

**Re-sits and re-takes**

If the apprentice fails one assessment method or more, they can take a re-sit or a re-take at their employer's discretion. The apprentice's employer needs to agree that a re-sit or re-take is appropriate. A re-sit does not need further learning, whereas a re-take does. The apprentice should have a supportive action plan to prepare for a re-sit or a re-take.

The employer and the EPAO should agree the timescale for a re-sit or re-take. A re-sit is typically taken within 2 months of the EPA outcome notification. The timescale for a re-take is dependent on how much re-training is required and is typically taken within 4 months of the EPA outcome notification.

If the apprentice fails the project assessment method, they must amend the project output in line with the independent assessor's feedback. The apprentice will be given 8 weeks to rework and submit the amended report.

Failed assessment methods must be re-sat or re-taken within a 6-month period from the EPA outcome notification, otherwise the entire EPA will need to be re-sat or re-taken in full.

Re-sits and re-takes are not offered to an apprentice wishing to move from pass to a higher grade.

The apprentice will get a maximum EPA grade of pass if they need to re-sit or re-take one or more assessment methods, unless the EPAO determines there are exceptional circumstances.

**Roles and responsibilities**

| Roles | Responsibilities |
|---|---|
| Apprentice | As a minimum, the apprentice should:<br>• complete on-programme training to meet the KSBs as outlined in the apprenticeship standard for a minimum of 12 months |

| Roles | Responsibilities |
|---|---|
| | • complete the required amount of off-the-job training specified by the apprenticeship funding rules as arranged by the employer and training provider<br>• understand the purpose and importance of EPA<br>• prepare for and undertake the EPA including meeting all gateway requirements<br>• ensure that all supporting evidence required at the gateway is submitted in accordance with this EPA plan |
| Employer | As a minimum, the apprentice's employer must:<br>• select the HEP (and therefore the training provider and EPAO)<br>• work with the training provider (where applicable) to support the apprentice in the workplace and to provide the opportunities for the apprentice to develop the KSBs<br>• arrange and support off-the-job training to be undertaken by the apprentice<br>• decide when the apprentice is working at or above the apprenticeship standard and is ready for EPA<br>• ensure the apprentice is prepared for the EPA<br>• ensure that all supporting evidence required at the gateway is submitted in accordance with this EPA plan<br>• confirm arrangements with the EPAO for the EPA (who, when, where) in a timely manner<br>• provide access to any employer-specific documentation as required, for example company policies)<br>• ensure that the EPA is scheduled with the EPAO for a date and time which allows appropriate opportunity for the apprentice to meet the KSBs. |

| Roles | Responsibilities |
|---|---|
| | • ensure the apprentice is given sufficient time away from regular duties to prepare for, and complete the EPA<br>• ensure that any required supervision during the EPA period, as stated within this EPA plan, is in place<br>• ensure the apprentice has access to the resources used to fulfil their role and carry out the EPA for workplace based assessments<br>• remain independent from the delivery of the EPA<br>• pass the certificate to the apprentice upon receipt from the EPAO |
| EPAO - HEP | As a minimum, the EPAO (HEP) must:<br>• conform to the requirements of the apprenticeship provider and assessment register<br>• conform to the requirements of this EPA plan and deliver its requirements in a timely manner<br>• conform to the requirements of the external quality assurance provider (EQAP)<br>• understand the degree-apprenticeship, including the apprenticeship standard, EPA plan and funding<br>• make all necessary contractual arrangements, including agreeing the price of the EPA<br>• develop and produce assessment materials including specifications and marking materials (for example mark schemes, practice materials, training material)<br>• maintain and apply a policy for the declaration and management of conflict of interests and independence which ensures, as a minimum, no personal benefit or detriment is received by those delivering the EPA or from the result of an assessment and covers:<br>  ○ apprentices<br>  ○ employers |

| Roles | Responsibilities |
| --- | --- |
| | ○ assessors<br>○ the HEP's role as a training provider<br>○ any other roles involved in delivery or grading of the EPA<br>• have quality assurance systems and procedures that ensure fair, reliable and consistent assessment and maintain records of IQA activity for external quality assurance (EQA) purposes<br>• appoint independent, competent and suitably qualified assessors in line with the requirements of this EPA plan<br>• where required to facilitate the EPA, appoint administrators, invigilators and any other roles<br>• deliver induction, initial and on-going training for all assessors, and if used administrators and invigilators and any other roles involved in delivery or grading of the EPA specified within this EPA plan. This should include how to record the rationale and evidence for grading decisions where required<br>• standardise all assessors, before allowing them to deliver EPAs and:<br>○ when the EPA is updated<br>○ at least once a year<br>○ moderate their decisions once EPAs have begun<br>• monitor the performance of all assessors and provide re-training where necessary<br>• develop and provide assessment recording documentation to ensure a clear and auditable process is in place for providing assessment decisions and feedback to all relevant stakeholders<br>• use language in the development and delivery of the EPA that is appropriate to the level of the degree-apprenticeship |

| Roles | Responsibilities |
|---|---|
| | • arrange for the EPA to take place in a timely manner, in consultation with the employer<br>• provide information, advice and guidance documentation to enable apprentices, employers and training providers to prepare for the EPA<br>• confirm all gateway requirements have been met<br>• host and facilitate the EPA or make suitable alternative arrangements<br>• maintain the security of the EPA including, but not limited to, verifying the identity of the apprentice, invigilation, security of materials<br>• where the EPA plan permits assessment away from the workplace, ensure that the apprentice has access to the required resources and liaise with the employer to agree this if necessary<br>• confirm the overall EPA grade<br>• arrange the certification of the degree-apprenticeship<br>• conduct appeals where required, according to the EPAO's appeals procedure |
| Training provider - HEP | As a minimum, the training provider (HEP) must:<br>• conform to the requirements of the apprenticeship provider and assessment register<br>• ensure procedures are in place to mitigate against any conflict of interest<br>• work with the employer and support the apprentice during the off-the-job training to provide the opportunities to develop the knowledge, skills and behaviours as outlined in the apprenticeship standard<br>• deliver training to apprentices as outlined in their learner agreement |

| Roles | Responsibilities |
|---|---|
| | • monitor the apprentice's progress during any training provider led on-programme learning<br>• ensure the apprentice is prepared for the EPA<br>• advise the employer, upon request, on the apprentice's readiness for EPA<br>• ensure that all supporting evidence required at the gateway is submitted in accordance with this EPA plan |
| Independent assessor | As a minimum, an independent assessor must:<br>• be independent, with no conflict of interest with the apprentice, their employer or training provider, specifically, they must not receive a personal benefit or detriment from the result of the assessment<br>• not be employed by the same organisation as the apprentice or employed by an organisation on IfATE's directory of professional and employer-led bodies (employer directory) that supports external quality assurance.<br>• be current and active in the occupation, for example be sourced from the industry or a professional body<br>• have, maintain and be able to evidence up-to-date knowledge and expertise of the occupation<br>• have authority to represent the professional body where the EPA is acting as the professional body's assessment process (if necessary and permitted in the EPA plan)<br>• have the competence to assess the EPA and meet the requirements of the IQA section of this EPA plan<br>• understand the degree-apprenticeship (occupational standard and EPA plan)<br>• attend induction and standardisation events before they conduct an EPA for the first time, when the EPA is updated, and at least once a year |

| Roles | Responsibilities |
|---|---|
| | • use language in the delivery of the EPA that is appropriate to the level of the degree-apprenticeship<br>• work with other personnel, including additional assessors where used, in the preparation and delivery of assessment methods<br>• conduct the EPA to assess the apprentice against the KSBs and in accordance with the EPA plan<br>• make all final grading decisions on an apprentice's occupational competence in accordance with grading descriptors in this EPA plan<br>• if an assessor panel is used, the independent assessor must chair and make final grading decisions<br>• record and report all assessment outcome decisions for each apprentice<br>• comply with the IQA requirements of the EPAO<br>• comply with external quality assurance (EQA) requirements |
| External examiner | As a minimum, the external examiner must:<br>• confirm the EPA has been delivered in accordance with the EPA plan<br>• accept, and therefore not change, the EPA grading decisions made by the independent assessor<br>• comply with the requirements of the EPA plan and IfATE policies<br>• comply with the requirements, policies, and procedures of the EQA provider<br>• be independent of the apprentice, and the employing organisation who are involved in delivering the degree-apprenticeship<br>• be independent of the delivery and awarding of the EPA |

| Roles | Responsibilities |
| --- | --- |
| | • not have been involved in the teaching or on-programme assessment of the apprentice |

**Reasonable adjustments**

**Reasonable adjustments**

The EPAO must have reasonable adjustments arrangements for the EPA.

This should include:

- how an apprentice qualifies for a reasonable adjustment
- what reasonable adjustments may be made

Adjustments must maintain the validity, reliability and integrity of the EPA as outlined in this EPA plan.

**Special considerations**

The EPAO must have special consideration arrangements for the EPA.

This should include:

- how an apprentice qualifies for a special consideration
- what special considerations will be given

Special considerations must maintain the validity, reliability and integrity of the EPA as outlined in this EPA plan.

**Internal quality assurance**

They must also appoint independent assessors who:

- have recent relevant experience of the occupation or sector to at least occupational level 7 gained in the last 4 years or significant experience of the occupation or sector

**Value for money**

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

- utilising digital remote platforms to conduct applicable assessment methods
- conducting assessment methods on the same day

**Professional recognition**

This degree-apprenticeship aligns with:

- The Institution of Civil Engineers (ICE) for Chartered Engineer

This degree-apprenticeship aligns with:

- The Institute of Materials, Minerals and Mining (IOM3) for Chartered Engineer

**Mapping of KSBs to assessment methods**

| Knowledge | Assessment methods |
|---|---|
| **K1**<br><br>Ground investigation techniques and solutions to derive soil and rock parameters (geological, hydrogeological, stratigraphy) to inform tunnel and underground space engineering activities: intrusive and non-intrusive in situ techniques, laboratory tests, and instrumentation and monitoring techniques. | Professional discussion underpinned by a portfolio of evidence |
| **K2**<br><br>Tunnelling and underground construction methods, plant and equipment for temporary and permanent works, and for associated groundworks. | Professional discussion underpinned by a portfolio of evidence |
| **K3**<br><br>Tunnel lining and ground support systems. | Project with report, presentation and questioning |
| **K4**<br><br>Soil and rock behaviour (soil and rock mechanics): impact of excavation, changes in load and environmental conditions, and impact on the performance of tunnel and underground space assets. | Project with report, presentation and questioning |
| **K5**<br><br>Analysis techniques for the design and assessment of tunnel and underground space engineering problems: tunnel face stability, lining analysis, ground settlement, building damage assessment and soil-structure interaction. Awareness of the limitations of these techniques. | Project with report, presentation and questioning |

| Knowledge | Assessment methods |
|---|---|
| **K6**<br><br>Techniques for developing suitable route alignments for tunnel projects, considering ground investigation data, existing built environmental constraints and project and stakeholder requirements. | Project with report, presentation and questioning |
| **K7**<br><br>Techniques for options appraisals using project-specific criteria. | Project with report, presentation and questioning |
| **K8**<br><br>Properties and uses of construction materials under working conditions (design and construction). | Project with report, presentation and questioning |
| **K9**<br><br>Construction logistics: on-site support for the construction process, site logistics, temporary works and resource management. | Professional discussion underpinned by a portfolio of evidence |
| **K10**<br><br>Design principles for tunnels and associated underground space structures, design codes, standards and best practice and their limitations. Industry developments and research of case studies. | Project with report, presentation and questioning |
| **K11**<br><br>Design principles for buildability, safe by design and consideration of long-term asset performance during the design stage. | Project with report, presentation and questioning |
| **K12**<br><br>Construction methods and management approaches used during construction and post-construction for the repair, maintenance and operation of tunnel and underground space assets. | Professional discussion underpinned by a portfolio of evidence |

| Knowledge | Assessment methods |
|---|---|
| **K13**<br><br>Project management, planning and commercial techniques for tunnel engineering activities: estimating, programming, cost and budget control and resource management. | Professional discussion underpinned by a portfolio of evidence |
| **K14**<br><br>Risks and risk management techniques: uncertainties inherent in tunnel and underground space engineering activities, controlling risks related to the environment, risks arising during construction (including for emergency situations), risks on the tunnel and associated assets, worker wellbeing, programme and budget risks, commercial and financial risks. | Professional discussion underpinned by a portfolio of evidence |
| **K15**<br><br>Legal requirements relating to Health and Safety at Work and the Construction Design Management (CDM) regulations | Professional discussion underpinned by a portfolio of evidence |
| **K16**<br><br>Ethical principles, social responsibilities, environmental protection and sustainability. | Professional discussion underpinned by a portfolio of evidence |
| **K17**<br><br>Commercial and contractual requirements: forms of contract, mechanisms of payment, specifications, and procurement, insurance, and third party undertakings. | Professional discussion underpinned by a portfolio of evidence |
| **K18**<br><br>Time management techniques. | Project with report, presentation and questioning |
| **K19**<br><br>Teamwork and leadership: negotiation techniques, conflict management, development techniques and, diversity, equality and inclusivity considerations. | Professional discussion underpinned by a portfolio of evidence |

| Knowledge | Assessment methods |
|---|---|
| **K20**<br>Communication techniques: oral, written, drawings and presentations. | Professional discussion underpinned by a portfolio of evidence |
| **K21**<br>Information technology: digital tools for research, analysis, and presentation of data, Building Information Modelling (BIM), digital communication and collaboration packages. | Professional discussion underpinned by a portfolio of evidence |
| **K22**<br>Daily review and assessment process during construction, and response to real-time information as excavation progresses to determine requirements on monitoring and construction activities going forward. | Professional discussion underpinned by a portfolio of evidence |
| **K23**<br>Research techniques: desk study, geotechnical data sources, access to Standards, industry publications. Importance of critical review of published sources. | Project with report, presentation and questioning |
| **Skill** | **Assessment methods** |
| **S1**<br>Specify ground investigations to obtain geotechnical data, including in situ techniques, laboratory tests and instrumentation and monitoring techniques. | Professional discussion underpinned by a portfolio of evidence |
| **S2**<br>Interpret, analyse and critically evaluate the ground investigation, geological, hydrogeological, stratigraphy and existing built environment data. | Project with report, presentation and questioning |
| **S3**<br>Develop feasibility plans and alignments for tunnel projects that consider data, project requirements and constraints. | Project with report, presentation and questioning |

| Knowledge | Assessment methods |
|---|---|
| **S4**<br><br>Analyse and interpret project and desk study data to develop an engineering understanding of the tunnel and associated underground structures and the ground and how this will impact upon design solutions, including in the short- and long-term. | Project with report, presentation and questioning |
| **S5**<br><br>Interpret the client's operational requirements from the project brief. Translate these requirements to actions in the design, construction or maintenance approach of the structure. | Project with report, presentation and questioning |
| **S6**<br><br>Compare different options on their relative merit, and select most suitable to meet client and stakeholder needs, technical requirements and other project brief-specific criteria. | Project with report, presentation and questioning |
| **S7**<br><br>Undertake research to support the selection of engineering solutions, materials and methodologies in the design, construction and maintenance of tunnel and underground space works. | Project with report, presentation and questioning |
| **S8**<br><br>Develop tunnel engineering solutions and evaluate the potential impacts of these, including economic sustainability, ethical, societal and environmental and sustainability perspectives and practical considerations such as buildability and long-term asset management. | Professional discussion underpinned by a portfolio of evidence |
| **S9**<br><br>Produce designs for tunnel linings and other underground structures in accordance with engineering design principles, methods and codes, using information such as site | Project with report, presentation and questioning |

| Knowledge | Assessment methods |
|---|---|
| investigation data, evaluation of construction methodology, and appropriate material performance. | |
| **S10**<br>Interpret engineering drawings. | Professional discussion underpinned by a portfolio of evidence |
| **S11**<br>Interpret materials specifications for the construction, repair and maintenance of tunnels and associated underground space structures. | Professional discussion underpinned by a portfolio of evidence |
| **S12**<br>Interpret work method statements for the construction, repair and maintenance of tunnels and associated underground space structures. | Professional discussion underpinned by a portfolio of evidence |
| **S13**<br>Communicate with colleagues and stakeholders, using a range of different methods and techniques, both verbal and written, including the production of reports. | Professional discussion underpinned by a portfolio of evidence |
| **S14**<br>Assess onsite logistics to support proposed construction methodology, for example site layouts, spoil management, impacts on the local population and local area as part of an Environmental Impact Assessment, reduction of noise or vibration. | Professional discussion underpinned by a portfolio of evidence |
| **S15**<br>Use project management and planning techniques. For example, estimating, programming, cost and budget control, resource management and handover to follow-on projects and programmes. | Professional discussion underpinned by a portfolio of evidence |

| Knowledge | Assessment methods |
|---|---|
| **S16**<br><br>Identify and comply with legal and statutory requirements, including Health and Safety, environmental protection and sustainability. | Professional discussion underpinned by a portfolio of evidence |
| **S17**<br><br>Use risk management techniques to identify, quantify, assess, mitigate and manage risks associated with tunnel engineering activities, including for emergency situations. | Professional discussion underpinned by a portfolio of evidence |
| **S18**<br><br>Plan and manage own time. | Project with report, presentation and questioning |
| **S19**<br><br>Work with and lead others, for example negotiating with, influencing, and developing others, taking account of diversity, equality and inclusivity requirements. | Professional discussion underpinned by a portfolio of evidence |
| **S20**<br><br>Use information technology: for example digital tools for research, analysis, and presentation of data, Building Information Modelling (BIM), digital communication and collaboration packages. | Professional discussion underpinned by a portfolio of evidence |
| **S21**<br><br>Produce as-built records to facilitate handover of assets. | Professional discussion underpinned by a portfolio of evidence |
| **Behaviour** | **Assessment methods** |
| **B1**<br><br>Prioritise and promote ethical, sustainable and socially responsible practices. | Professional discussion underpinned by a portfolio of evidence |

| Behaviour | Assessment methods |
|---|---|
| **B2**<br>Be adaptable, flexible and resilient in challenging and changing environments. | Professional discussion underpinned by a portfolio of evidence |
| **B3**<br>Work with autonomy. Take responsibility for decisions, designs and procedures, while recognising the limits of own capabilities. | Project with report, presentation and questioning |
| **B4**<br>Develop, promote and support a risk-aware culture. | Professional discussion underpinned by a portfolio of evidence |
| **B5**<br>Take a whole lifecycle view of the tunnel or other underground structure at any stage of involvement in the project. | Project with report, presentation and questioning |
| **B6**<br>Remain committed to continued professional development of self and others, and be open to innovation. | Professional discussion underpinned by a portfolio of evidence |
| **B7**<br>Collaborate and promote teamwork across diverse internal and external teams. | Professional discussion underpinned by a portfolio of evidence |

**Mapping of KSBs to grade themes**

**Project with report, presentation and questioning**

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| Analysis and feasibility<br>K4 K6<br>S2 S3 S4 | Soil and rock behaviour (soil and rock mechanics): impact of excavation, changes in load and environmental | Interpret, analyse and critically evaluate the ground investigation, geological, hydrogeological, | None |

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| | conditions, and impact on the performance of tunnel and underground space assets. (K4)<br><br>Techniques for developing suitable route alignments for tunnel projects, considering ground investigation data, existing built environmental constraints and project and stakeholder requirements. (K6) | stratigraphy and existing built environment data. (S2)<br><br>Develop feasibility plans and alignments for tunnel projects that consider data, project requirements and constraints. (S3)<br><br>Analyse and interpret project and desk study data to develop an engineering understanding of the tunnel and associated underground structures and the ground and how this will impact upon design solutions, including in the short- and long-term. (S4) | |
| Design for construction and operation of tunnels and associated underground structures<br>K3 K5 K7 K8 K10 K11<br>S5 S6 S9<br>B3 B5 | Tunnel lining and ground support systems. (K3)<br><br>Analysis techniques for the design and assessment of tunnel and underground space engineering problems: tunnel face stability, lining analysis, ground settlement, building damage assessment and soil-structure | Interpret the client's operational requirements from the project brief. Translate these requirements to actions in the design, construction or maintenance approach of the structure. (S5)<br><br>Compare different options on their relative merit, and select most suitable to meet client | Work with autonomy. Take responsibility for decisions, designs and procedures, while recognising the limits of own capabilities. (B3)<br><br>Take a whole lifecycle view of the tunnel or other |

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| | interaction. Awareness of the limitations of these techniques. (K5)<br><br>Techniques for options appraisals using project-specific criteria. (K7)<br><br>Properties and uses of construction materials under working conditions (design and construction). (K8)<br><br>Design principles for tunnels and associated underground space structures, design codes, standards and best practice and their limitations. Industry developments and research of case studies. (K10)<br><br>Design principles for buildability, safe by design and consideration of long-term asset performance during the design stage. (K11) | and stakeholder needs, technical requirements and other project brief-specific criteria. (S6)<br><br>Produce designs for tunnel linings and other underground structures in accordance with engineering design principles, methods and codes, using information such as site investigation data, evaluation of construction methodology, and appropriate material performance. (S9) | underground structure at any stage of involvement in the project. (B5) |
| Professional conduct<br>K18 K23<br>S7 S18 | Time management techniques. (K18)<br><br>Research techniques: desk study, | Undertake research to support the selection of engineering solutions, materials and methodologies in the | None |

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| | geotechnical data sources, access to Standards, industry publications. Importance of critical review of published sources. (K23) | design, construction and maintenance of tunnel and underground space works. (S7)<br><br>Plan and manage own time. (S18) | |

**Professional discussion underpinned by a portfolio of evidence**

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| Project and risk management<br>K13 K14 K15 K17<br>S15 S16 S17<br>B4 | Project management, planning and commercial techniques for tunnel engineering activities: estimating, programming, cost and budget control and resource management. (K13)<br><br>Risks and risk management techniques: uncertainties inherent in tunnel and underground space engineering activities, controlling risks related to the environment, risks arising during construction (including for emergency situations), risks on the tunnel and associated | Use project management and planning techniques. For example, estimating, programming, cost and budget control, resource management and handover to follow-on projects and programmes. (S15)<br><br>Identify and comply with legal and statutory requirements, including Health and Safety, environmental protection and sustainability. (S16)<br><br>Use risk management techniques to identify, quantify, assess, mitigate and manage risks associated with | Develop, promote and support a risk-aware culture. (B4) |

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| | assets, worker wellbeing, programme and budget risks, commercial and financial risks. (K14)<br><br>Legal requirements relating to Health and Safety at Work and the Construction Design Management (CDM) regulations (K15)<br><br>Commercial and contractual requirements: forms of contract, mechanisms of payment, specifications, and procurement, insurance, and third party undertakings. (K17) | tunnel engineering activities, including for emergency situations. (S17) | |
| Professional conduct<br>K16<br>S8<br>B1 B6 | Ethical principles, social responsibilities, environmental protection and sustainability. (K16) | Develop tunnel engineering solutions and evaluate the potential impacts of these, including economic sustainability, ethical, societal and environmental and sustainability perspectives and practical considerations such as buildability and long-term asset management. (S8) | Prioritise and promote ethical, sustainable and socially responsible practices. (B1)<br><br>Remain committed to continued professional development of self and others, and be open to innovation. (B6) |

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| Communication<br>K19 K20<br>S13 S19<br>B2 B7 | Teamwork and leadership: negotiation techniques, conflict management, development techniques and, diversity, equality and inclusivity considerations. (K19)<br><br>Communication techniques: oral, written, drawings and presentations. (K20) | Communicate with colleagues and stakeholders, using a range of different methods and techniques, both verbal and written, including the production of reports. (S13)<br><br>Work with and lead others, for example negotiating with, influencing, and developing others, taking account of diversity, equality and inclusivity requirements. (S19) | Be adaptable, flexible and resilient in challenging and changing environments. (B2)<br><br>Collaborate and promote teamwork across diverse internal and external teams. (B7) |
| Construction<br>K2 K9 K12 K22<br>S10 S11 S12 S14 | Tunnelling and underground construction methods, plant and equipment for temporary and permanent works, and for associated groundworks. (K2)<br><br>Construction logistics: on-site support for the construction process, site logistics, temporary works and resource management. (K9)<br><br>Construction methods and management | Interpret engineering drawings. (S10)<br><br>Interpret materials specifications for the construction, repair and maintenance of tunnels and associated underground space structures. (S11)<br><br>Interpret work method statements for the construction, repair and maintenance of tunnels and associated underground space structures. (S12) | None |

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| | approaches used during construction and post-construction for the repair, maintenance and operation of tunnel and underground space assets. (K12)<br><br>Daily review and assessment process during construction, and response to real-time information as excavation progresses to determine requirements on monitoring and construction activities going forward. (K22) | Assess onsite logistics to support proposed construction methodology, for example site layouts, spoil management, impacts on the local population and local area as part of an Environmental Impact Assessment, reduction of noise or vibration. (S14) | |
| Ground investigation<br>K1<br>S1 | Ground investigation techniques and solutions to derive soil and rock parameters (geological, hydrogeological, stratigraphy) to inform tunnel and underground space engineering activities: intrusive and non-intrusive in situ techniques, laboratory tests, and instrumentation and monitoring techniques. (K1) | Specify ground investigations to obtain geotechnical data, including in situ techniques, laboratory tests and instrumentation and monitoring techniques. (S1) | None |

| KSBS GROUPED BY THEME | Knowledge | Skills | Behaviour |
|---|---|---|---|
| Digital<br>K21<br>S20 S21 | Information technology: digital tools for research, analysis, and presentation of data, Building Information Modelling (BIM), digital communication and collaboration packages. (K21) | Use information technology: for example digital tools for research, analysis, and presentation of data, Building Information Modelling (BIM), digital communication and collaboration packages. (S20)<br><br>Produce as-built records to facilitate handover of assets. (S21) | None |

**Supporting information**

**External quality assurance**

**Option selected:** Office for Students (OfS)

**Involved employers**

COWI UK, London Bridge Associates, HS2, CMR, Ramboll, Bechtel, Arup, Dr. Sauer & Partners, Strabag, NDA, CECL Global, Hyperbaric & Tunnel Safety Ltd, Jacobs, Morgan Sindall, Murphy, Hewson Consulting Engineers, Bemo Tunnelling



**EPA menu**