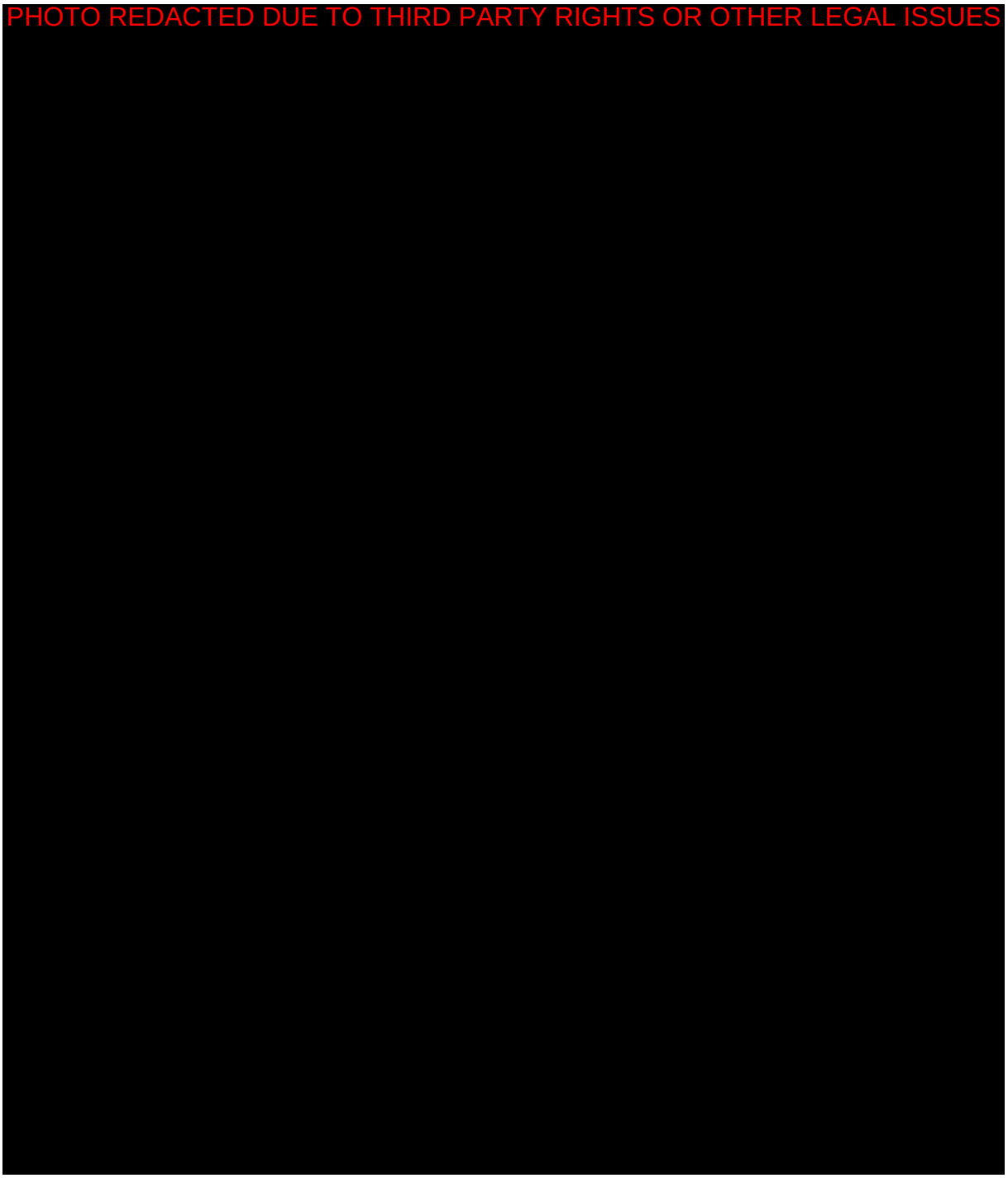
# Digital Engineering Technician
# Level 3 Apprenticeship
# End-Point Assessment Plan

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## FOREWORD

The Digital Engineering Technician occupation is transferable across all contexts within the Construction and Built Environment (CBE) Sector. Incumbents will develop in a variety of traditional and emerging Building Information Modelling (BIM) focused roles pairing digital capabilities with a strong foundation in the Construction Built Environment.

This apprenticeship standard is supported by six Professional Institutions who endorse the core competence as meeting the Technician or Associate level requirements across disciplines i.e. Civil Engineering, Architectural Technology, Quantity Surveying, Building Services Engineering, Construction Management and Engineering Technology.

In 2011 UK Government[1] set out plans to encourage the construction industry toward making greater use of BIM, particularly with a view to reduce cost, carbon foot-print and integration of modern methodology. This apprenticeship standard creates a new entry point into existing disciplines that are combined with a BIM focused curriculum, which aims to develop the skills and capability of talent at an earlier stage to meet the growing digital demands of the industry.

> *"BIM uses advanced computer systems to build 3D models of infrastructure and hold large amounts of information about its design, operation and current condition. At the planning stage it enables designers, owners and users to work together to produce the best possible designs and to test them in the computer before they are built. In construction it enables engineers, contractors and suppliers to integrate complex components cutting out waste and reducing the risk of errors. In operation it provides customers with real-time information about available services and maintainers with accurate assessments of the condition of assets."*[2]

> *"The construction industry is a major part of the UK economy. In 2014 construction output was £103 billion, 6.5% of GDP, and comprised 2.1 million jobs, 6.3% of the UK jobs total."*[3]

> *"BIM technology should be seen as a 'collaboration' between the construction sector and the software industries and creates an environment in which there are opportunities and synergies for both"* [4]

1 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/61152/Government-Construction-Strategy_0.pdf
2 http://digital-built-britain.com/DigitalBuiltBritainLevel3BuildingInformationModellingStrategicPlan.pdf
3 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/510354/Government_Construction_Strategy_2016-20.pdf
4 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/34710/12-1327-building-information-modelling.pdf

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## SUMMARY OF ASSESSMENT

The end–point assessment (EPA) will assess the individual against the knowledge, skills and behavioural competence to carry out the role of Digital Engineering Technician described by the *Digital Engineering Apprenticeship Standard*[5]. The EPA will consist of two main assessed elements that will comprise a holistic assessment of each candidate. These elements are summarised in the illustration below (Figure 1).

Candidates will have the opportunity to demonstrate competence through the following methods of assessment:

1. Synoptic Project:
   This extended task will simulate aspects of the Digital Engineering Technician role with scenarios and problems that require input and action from the candidate. The synoptic project will assess the candidate in context, testing application of knowledge and understanding. This will create an opportunity to observe the practical skills of the candidate in real-time.
2. Interview:
   The interview is the final stage of the EPA; this is competence-based, taking into account the results of the Synoptic Project stage. The assessor will determine and validate the evidence provided by the EPA portfolio. This summative assessment will involve reviewing the compilation of representative work-based outputs, which appropriately demonstrate how the candidate has learned and consistently applied the Digital Engineering Technician skills, knowledge and behaviours gathered toward the end of the apprenticeship. The assessor will probe areas such as behaviours and judgment.

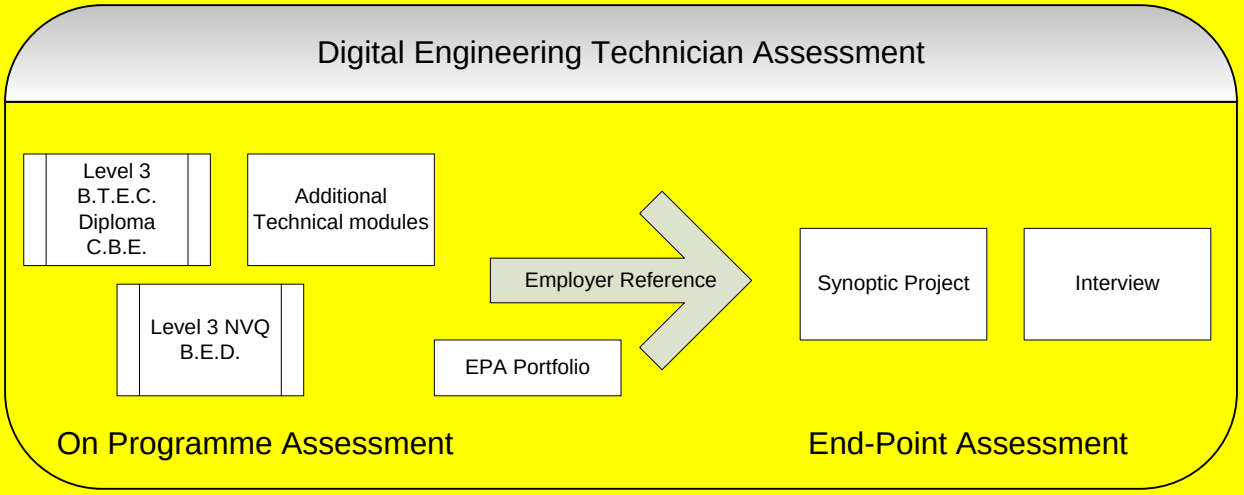


**Figure 1: Overview of the EPA process**

[5] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/478552/Trailblazer__DE_Apprentice.pdf

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## ASSESSMENT OVERVIEW

| Assessment Method | Area Assessed | Assessed By | Grading | Weighting |
|---|---|---|---|---|
| Synoptic Project Task | Knowledge, Skills and Behaviours: scenario-based demonstration. | Independent Assessment Organisation | Pass: 55-69%<br>Merit: 70-84%<br>Distinction: 85%+ | 40% |
| Interview | Knowledge, Skills and Behaviours: validate, assess performance and work-based experience across all areas. | | Pass: 55-69%<br>Merit: 70-84%<br>Distinction: 85%+ | 60% |

## PROFESSIONAL QUALIFICATIONS

The following qualifications must be completed successfully prior to the end of the apprenticeship and as a pre-requisite for the individual attending the EPA:

- Level 3 BTEC Diploma Construction and the Built Environment NVQ Level 3 Diploma in Built Environment Design.
- English Level 2 and Maths Level 2.

## ON-PROGRAMME ASSESSMENT

The mandatory qualifications maintain an established framework of examinations and formative assessment.

The employer and training provider (if applicable) should support the candidate to identify and build the appropriate evidence toward the EPA portfolio toward the end of the apprenticeship.

The skill and competence level defined by the *Digital Engineering Apprenticeship Standard* have been aligned to the technician level of Team Task roles defined by PAS1192-2:2013[6] Standards, specifically *Information Author* and *Interface Manager*. (**Annex D**: Aligned PAS roles and responsibility) It is highly recommended that employers provide candidates with opportunities to learn and practice the relevant aspects of these roles within the context of their unique working environment.

[6] http://www.bimtaskgroup.org/pas11922-overview/

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## ASSESSMENT GATEWAY

The employer will act as the gateway and will be responsible for the final judgment to endorse the individual to progress on to the EPA following satisfactory review of all the following essential outcomes:

Essential

- Appropriate pass marks for all relevant qualifications.
- Successful completion of the EPA portfolio providing evidence of the individual's competence over the final three months of the apprenticeship.
- Employer will write a reference to endorse the candidate as reaching the appropriate level of skill, knowledge and behavioural competence.

Desirable

- If the relevant professional institution has engaged the individual throughout their apprenticeship, the employer should review the individual's progress toward professional membership at the appropriate level.

Employer Reference

The employer will be the source of primary feedback on the candidate, their performance and quality of work. This account will add to the accumulated proof of work-place competence and professional behaviours. The employer perspective will be for the gateway stage to mark formal endorsement for EPA. The employer reference is not assessed or graded.

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## END POINT – ASSESSMENT

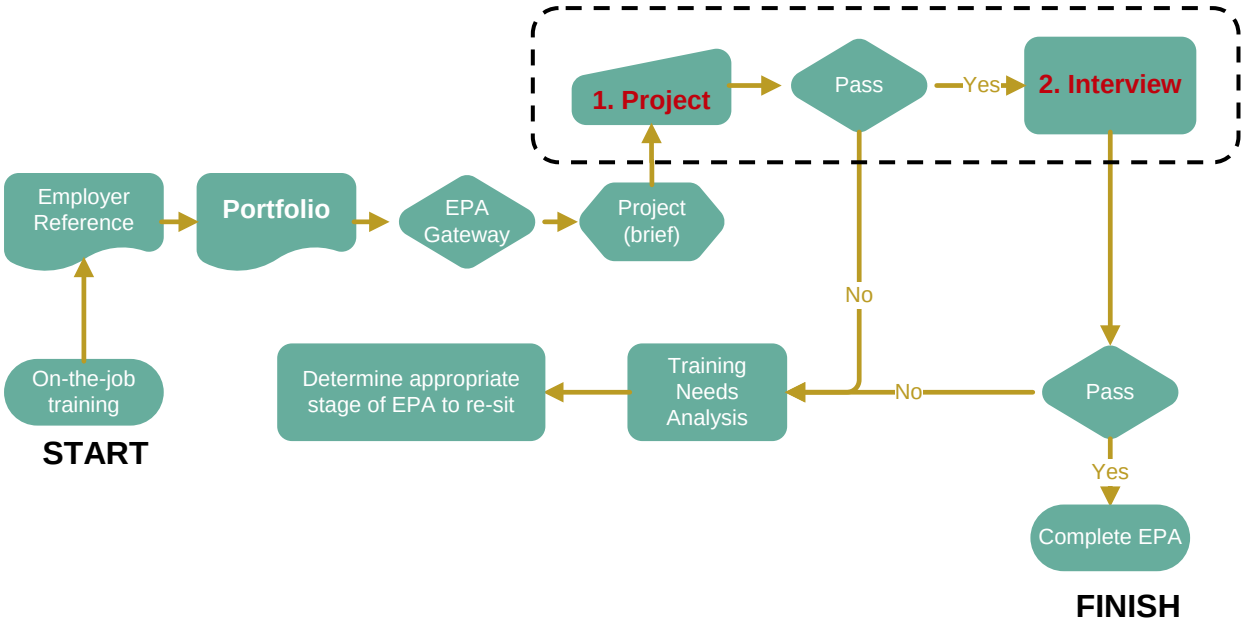


**Figure 2: Illustration of the EPA process**

The EPA will be conducted over two stages; the outcome of the stages combined will assess the holistic capability and competence of the candidates against the *Digital Engineering Technician Apprenticeship Standard.*
If successful at each stage, the candidate will be graded and progressed according to the grading system defined within the

**End-point** –Grading section of this document. The overall grade will be confirmed at the end of the EPA once all marks are moderated and verified by the Independent Assessment Organisation. If unsuccessful, the candidate will be provided with feedback and areas for improvement, a training needs analysis will determine whether additional training or further on-the-job experience is required.

### EPA PORTFOLIO

Overview

The EPA Portfolio will cover the competence requirements of the entire *Digital Engineering Apprenticeship Standard* (Annex B). The purpose of the EPA Portfolio will be to inform the final EPA interview. The individual will gather a collection of evidence of completed work that prove the level of competence achieved in all of these areas and align to the BIM learning outcomes framework[7]:

1. Understand what BIM is, the contextual requirement for BIM Level 2 and its connection to the Government Construction Strategy and Industries Strategy 2025.

[7] http://bim-level2.org/globalassets/pdfs/learning-outcomes-framework.pdf

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2. Understand the implications and value proposition of BIM within their organisation.
3. Understand the requirement for the management and exchange of information between supply chain members and clients as described in the 1192 suite of standards and PAS55 / ISO 55000.

Details of EPA Portfolio

The structure recommended for the portfolio will shadow the format of the EPA interview. Portfolio evidence should be supplied according to project stage i.e. project brief, design, construction and asset management. The employer environment will determine whether the candidate can provide demonstrable or theoretical examples of understanding and competence. The Independent Assessment Organisation should provide a clear specification of target competence areas, directives on relevant evidence and supportive material to employers and training providers who will guide candidates to build the EPA portfolio.

The candidate is expected to produce a thorough representation of their achievements in meeting work objectives and fulfilling their professional duties. This will include client feedback, reflective accounts, samples of relevant documents, evidence of collaborative behaviours and information management within a BIM context. **Annex D**: Aligned PAS roles and responsibility gives some detail on the relevant PAS (Publicly Available Specification) roles and BIM learning outcomes framework, which are key industry standards for this role profile. Each submission that comprises the EPA portfolio should include a description and evidence of:

- 'What' – task/goal the candidate set out to complete/achieve.
- 'How' – details of the actions or methodology and rationale.
- 'Challenges' – specific limitations to each scenario, identify and specify how (if at all) these challenges were overcome.
- 'Outcome and Feedback' – specify the outcome, including an evaluation of feedback from all relevant stakeholders.
- 'Learning and CPD requirements' – personal reflective account from the candidate to include employer perspective with regard to ongoing CPD.

The EPA portfolio will be gathered toward the end of the apprenticeship, however, will inform the interview stage of the EPA. Once the employer determines the candidate ready for EPA, the completed portfolio will be submitted to the Independent Assessment Organisation.

An independent assessor will evaluate and assess the evidence provided to be of sufficient quality and depth. This judgment will be based on the extent to which the evidence is coherent, meets required technical standards and demonstrates reflective learning and improvement.

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## SYNOPTIC PROJECT

Overview

The synoptic project is based on real life project scenarios that the candidate is likely to be exposed to over the lifespan of a construction project. It will test the application of a selection of the knowledge, skills and behaviours defined in the *Digital Engineering Apprenticeship Standard.* (Annex B). The project will require candidates to work within a BIM environment to solve routine problems, providing an opportunity to demonstrate the core skills and related knowledge, and behaviours required by a BIM related job role.

The synoptic project will take place in an observed, controlled environment and will test the candidate's ability to work within a BIM environment and demonstrate:

- the application of knowledge and skills to meet the project outcomes, including demonstrating an understanding of current BIM practices (including PAS1192-2:2013)
- working knowledge of BIM tools
- practical problem solving within a BIM environment
- ability to review and interpret technical information in the form of an Employers Information Requirements (EIR) & BIM Execution Plan (BEP)
- ability to identify inaccuracies or discrepancies in the technical information received
- ability to validate information at key points during the BIM workflow
- an understanding of the enablers to collaborative team working
- an understanding of how BIM supports the efficient production of accurate and reliable information that builds over the lifespan of a project
- the application of the relevant behaviours

Details of Synoptic Project

The Independent Assessment Organisation will develop a project brief, supporting documentation and provide personnel and ICT resources to facilitate the running of the project. Each project will present BIM related scenarios that the candidate could be expected to be exposed to within the context of a BIM focused role, appropriate for an SME, or large corporate organisation. Five scenarios described in detail under the Synoptic Project overview (Steps 1-4); broadly will involve working on a BEP, authoring parts of the model, sharing information, design review and validation. The Independent Assessment Organisation will be required to develop a 'bank' of various scenarios that can align to the various disciplines and stages of the project cycle i.e. design; delivery and asset management.

Each scenario will be aligned to the current industry standards (such as PAS1192-2:2013) and the broader UK Government BIM Strategy. Projects will be comparable in terms of content and complexity; it is the context within which the skills and knowledge that must be demonstrated that will vary. Each project will require the

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use of Computer Aided Design (CAD)/BIM related tools. Independent Assessment Organisations will be required to incorporate the CAD/BIM tools within the project most relevant to the candidates undergoing the assessment as working knowledge of the tools is a pre-requisite of the project. Organisations with a number of candidates using different CAD/BIM tools will require multiple versions of the project to make allowances for the nuances between the different CAD/BIM tools. Independent Assessment Organisations will provide the employer (and or training provider where appropriate) with a choice to select the most appropriate project for each candidate, based on their current job role and software bias.

Each project will take three working days to complete. Candidates will complete their project off-the-job, so that they are away from the day to day pressures of work and in a ‘controlled' environment, which may be on the employer’s premises or the training provider’s premises. The requirements for the `controlled environment' will include a quiet room, away from the normal place of work, with a dedicated work-station, with access to all the required equipment and with someone responsible for the controlled environment to ensure it is their own work and to respond to any questions in a consistent way.

The synoptic project is assessed by an independent assessor who makes their own judgment on the quality of the work, based on the model answers provided by the Independent Assessment Organisation which are informed by the standard. The independent assessor may also note particular aspects of the work that they wish to discuss with the candidate during the interview.

Independent Assessment Organisations will test and trial the projects with small groups of candidates, employers and training providers. This will ensure they are valid, reliable and comparable to the other projects, before being implemented. Independent Assessment Organisations will monitor projects over time to ensure comparability and continuing relevance.

Over time, existing projects will be modified and new ones introduced. The projects will also be designed in such a way as to ensure there is no benefit for any candidate having prior knowledge of a project.

<u>Synoptic Project Overview/Summary</u>

Step 1 Preparation / Brief – A week before the synoptic project the candidate is given background information in the form of a fictitious project assignment including an EIR & BEP. This allows some preparation time and an opportunity to identify any flaws in the information. The candidate can bring notes to the assessment.

Step 2 BIM Execution Plan – Candidates are required to develop the partially complete BEP by completing any gaps in the information or raise any deficiencies.

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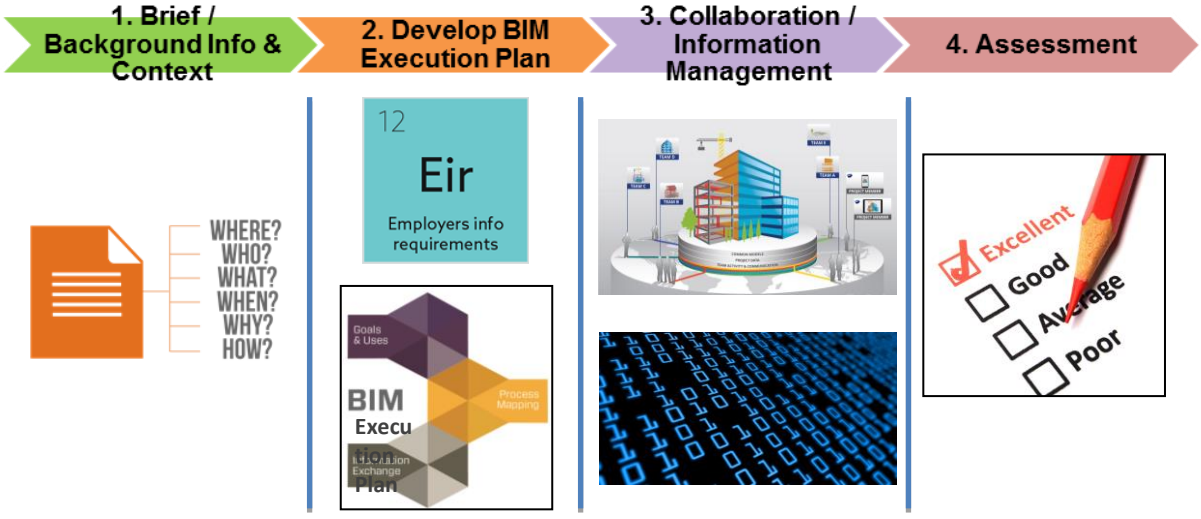
Step 3 Collaboration / Information Management / Authoring – Candidates are required to author part of a model in accordance with the BEP and share this information via a Common Data Environment (CDE) provided by the Independent Assessment Organisation. This is to be followed by a design review exercise whereby the candidates are required to work in accordance with the latest industry guidance to identify deficiencies in the graphical and non graphical information shared via the CDE and define solutions. This part of the project should also assess the candidate's ability to deal with a small-scale change. This should be achieved by running multiple design reviews incorporating updated information. Finally, the candidates will be required to validate the non graphical information extracted from the model.

Step 4 Assessment – Grading takes place at the end of the exercise against model answers developed by the Independent Assessment Organisation.




**Purpose:**
- *Provides details of the project brief / and the context of the project.*
- *Outlines expectations and areas for assessment.*
- *Outlines roles of simulated parties e.g. Client.*

**Purpose:**
- *To simulate a project scenario and test the apprentices knowledge of the core principles of PAS1192-2:2013.*

**Purpose:**
- *To simulate a BIM orientated iterative design process with a focus on collaboration, information management and model authoring.*

**Purpose:**
- *Provide evidence of knowledge, competencies and behaviours.*

**Figure 3: Synoptic Project Overview**

## INTERVIEW

Overview

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The interview is the final EPA stage that will consolidate the results of each stage of the EPA and form an overall impression of the level of competence demonstrated by the candidate. The assessor will consider the range of evidence provided by the candidate in response to interview questions as well as from the EPA Portfolio, and Synoptic Project. The focus will be to probe for further detail and evidence of understanding against a range of criteria based on the competence defined by the

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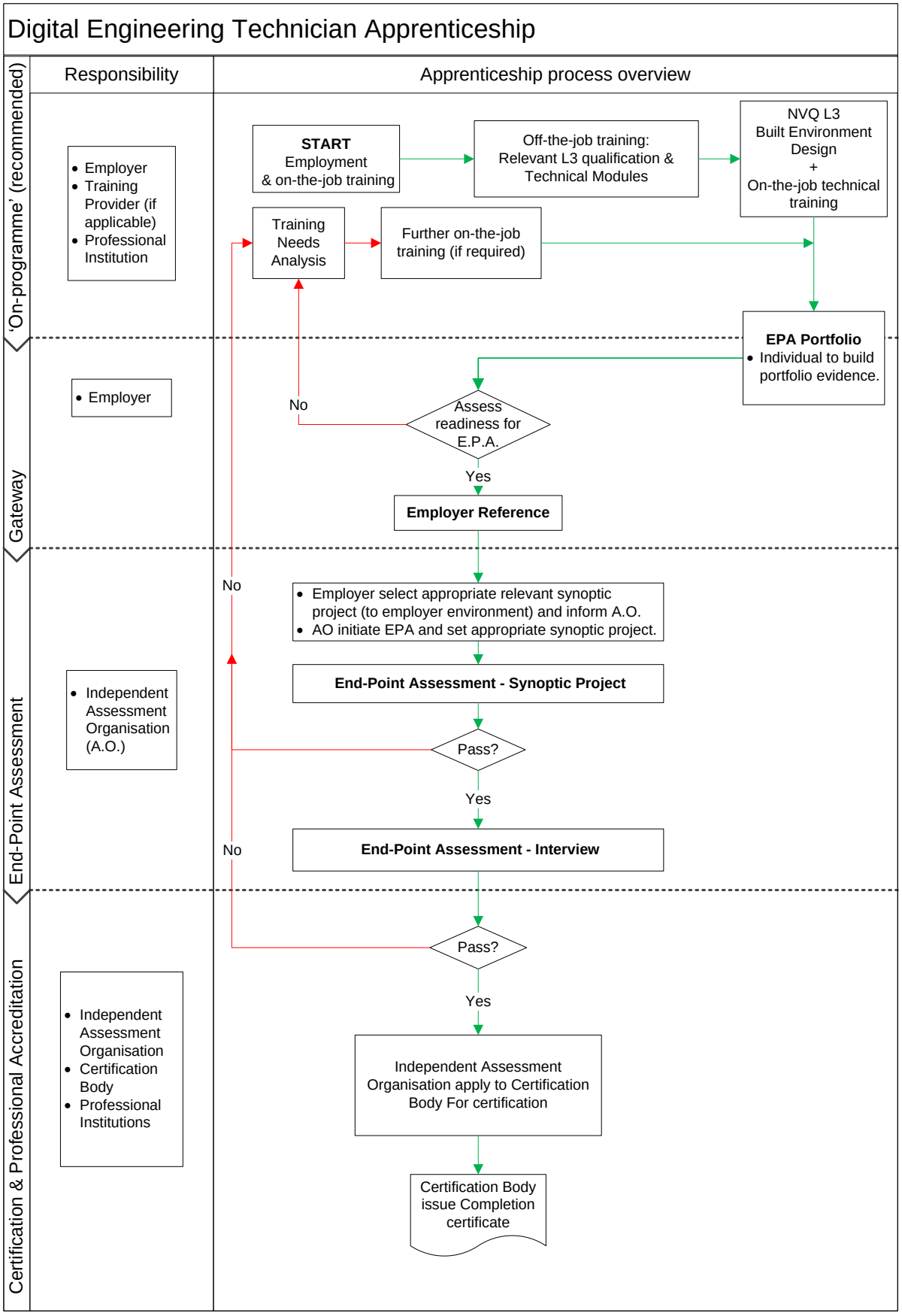
*Digital Engineering Apprenticeship Standard* (Annex B

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Annex B).

Details of the Interview

This will be a competence based interview with structured questions to determine the candidate's level of competence at the end of their apprenticeship. It can take place at training provider or employer premises, appropriate assessment conditions will be set by the Independent Assessment Organisation. The interview will take three and a half hours in order to ensure sufficient time is attributed to cover the evidence provided and final deliberation. The assessor will receive a pack prior to the interview that will consist of:

- Candidate EPA Portfolio
- Submitted Synoptic Project
- Assessor notes and suggested areas for further questioning (Synoptic Project)Structured Interview questions and guidance
- Assessment criteria

The Independent Assessment Organisation will be responsible for setting out the assessment criteria and structured questions. Ranges and indicators will be set to

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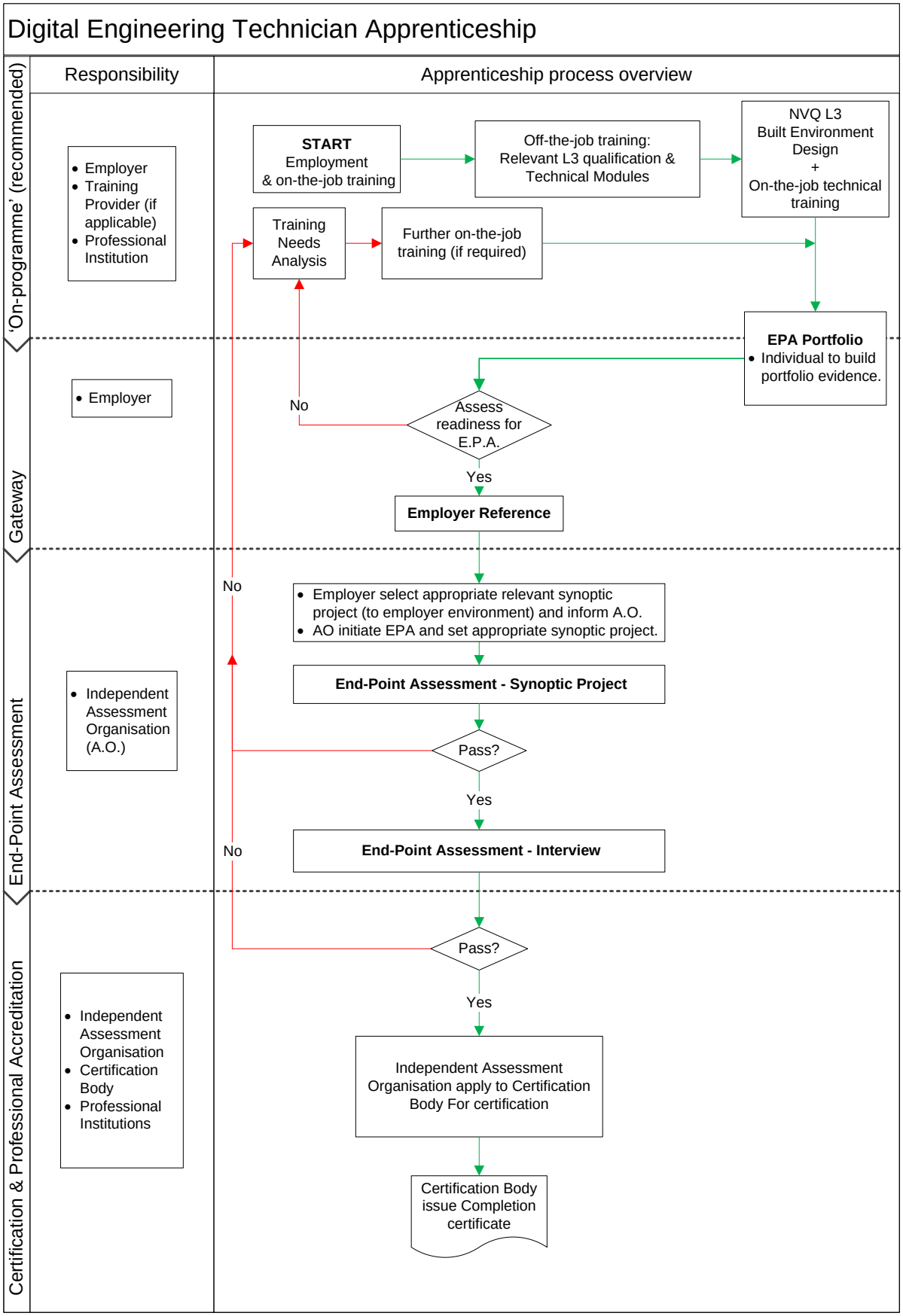
assess each area of competence (Annex B

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Annex B), providing a sound basis for judgment covering a diverse range of possible responses and evidence. The candidate will be required to present a summary of the work within their portfolio, to provide first-hand interpretation and create a comfortable dialogue between the candidate and assessor.

The aim for the assessor will be to probe and evaluate the candidate's level of behavioural competence, technical skill set, knowledge and understanding with the evidence provided.

The interview will be conducted by a qualified assessor employed by the Independent Assessment Organisation (EPA Assessor criteria). The assessor for this stage of the EPA will need to have sufficient professional experience; industry knowledge and technical competence to cover a broad range of the expected standard and make credible overall judgments. The assessor will score the candidate on their performance against the interview criteria first and determine the final grade awarded for the entire EPA.

## EPA Assessor criteria

The synoptic EPA will be coordinated by the Independent Assessment Organisation. Liaison with the professional institutions (i.e. ICE, CIBSE, RICS, CIAT, CIOB and IET) is highly recommended for access to technically competent assessors. Assessors will need to meet at least two of the criteria points detailed below.

Assessor qualification requirements:

- Current Industry knowledge (experience within the profession within at least 3 years).
- Current professional qualification at (or above) the *Technician* level of professional membership with one of the relevant professional institutions listed on the *Digital Engineering Technician Apprenticeship Standard*.
- Evidence at least 3 years effective experience applying CAD/BIM related tools and standards.
- Hold Construction and Built Environment related discipline (or equivalent) qualification, minimum HNC.
- Employed on a permanent or associate basis by an Assessment Organisation approved to appear on the Register of Apprentice Assessment Organisations (R.o.A.A.O.).

## End Point – final judgement

The results of each stage of the EPA test require independent invigilation and moderation by a qualified assessor employed by the Independent Assessment Organisation. The Independent Assessment Organisation Assessor playing the role

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of ‘chair’ for the final (interview) EPA stage will be responsible for the final judgment of the overall grade.

## INDEPENDENCE

The approved Independent Assessment Organisation will be responsible for the final judgement and moderation of the EPA. To ensure independence:

- Meet the requirements detailed above.
- Approved and listed on the Register of Apprentice Assessment Organisations (R.o.A.A.O).
- Ensure the assessor is entirely independent of and not involved with the delivery of training and assessment during the on-programme element of the apprenticeship.
- Ensure the assessor is entirely independent of employer.

## END-POINT –SUMMARY OF ROLES AND RESPONSIBILITIES

| **Assessor** | **Role** |
|---|---|
| Employer | Will establish candidate readiness for EPA with information and provide the candidate with suitable opportunities to obtain the evidence required for the EPA portfolio. |
| Independent Assessment Organisation | Responsible for assessment and coordination of the entire EPA and final judgement plus informing the relevant Professional Institution of the outcome (if applicable). |

## QUALITY ASSURANCE – INTERNAL

To meet the expected internal quality assurances for Independent Assessment Organisations must have in place the following procedures and guidance:

- Demonstrable and on-going consultation with current industry professionals and occupational experts in ‘live’ project/site environments. Propose a strategy to maintain this engagement and cascade through standardisation meetings for the network of appointed assessors.
- Run standardisation events for assessors at least every six months to ensure consistent application of the guidance and consistency in marking the assessment methods, also to ensure assessors are trained in the relevant assessment and moderation processes and undertake regular continued professional development.
- Maintenance procedures for the EPA model (materials) to reflect/ reference current, software updates, legislation, safety, techniques, codes of practice and specific industry/project requirements.

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- Demonstrable process to account for and track the progress of each learner through the EPA cycle, the 'learner assessment journey' must be the principle consideration of these procedures.
- Traceable network of communication and a viable proposal to manage the communication between the lead training provider, employer, individual (attempting the assessment), professional institution (where applicable to the EPA) and Certification Body. If absent, a suitable implementation strategy should be proposed along with benchmarked accepted standards and timeframes through a service level agreement system.
- Propose a suitable mechanism to manage the output, within realistic timeframes of all dependencies to the certification of each individual attempting the EPA i.e. relevant Awarding Organisations for each of the mandatory qualifications, lead training provider (for verifying Gateway requirements have been achieved), end-point assessors, Certification Body. If absent, a suitable implementation strategy should be proposed along with a flag or service level agreement system of accepted standards and timeframes.
- Reference the *Construction Consolidated Assessment Strategy for the Built Environment*[8] to appoint occupationally competent, professional assessors.
- Policies and procedures to manage escalated appeals/disputes.
- Establish policies and procedures for the approval and where necessary disqualification of assessment venues.
- Establish policies and procedures for standardisation of assessment specification/criteria.
- Capacity to establish procedures to liaise with the proposed external quality assurance process.

## QUALITY ASSURANCE – EXTERNAL

The external quality assurance (EQA) of the Digital Engineering Technician apprenticeship EPA will combine information gathering and audit processes under the direction and accountability of a representative non-profit subject matter expert employer panel. The Construction Industry Training Board (CITB) has proposed to provide a '*Quality Code'* statement within the Construction Industry for this purpose. The role CITB have proposed is to provide a service that will administer and coordinate the EQA process and draw technical context and expertise support from employer experts and relevant organisations such as The Building Research Establishment (B.R.E.).

CITB will convene a representative (non-profit) panel to direct the technical requirements and take overall accountability for the decisions and advisory statements required for effective EQA of the Digital Engineering Apprenticeship EPA. The recommended composition of the panel will include representation from a wide

[8] https://www.citb.co.uk/documents/awards/centres/con-sector_skills_council_consolidated_assessment_strategy.pdf

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selection of employers (i.e. size - minimum of 25% SME employers, sector interest), all employers will be afforded equal influence as part of this entity. It would be good practice to ensure employer membership of this panel is accessible across the industry and should be rotated at fixed intervals over an appropriate cycle (i.e. 2-3 years). The panel should meet bi-annually as a minimum initially; the frequency of events will be proportional to demand for Digital Engineering Technician EPA.

The primary function of this panel will be to review the assessment specification(s) devised by all (R.o.A.A.O.) approved Digital Engineering apprenticeship EPA Independent Assessment Organisations against the criteria of the apprenticeship assessment plan and consistent approach to:

- Technical complexity
- Benchmarked of standard of competence
- Quality of EPA against the benchmark (set by the panel)
- Range of methods and techniques

The scope of activity for the panel will cover:

- Reviewing all EPA delivery as consistent and up-to-date and contextualised against rapid advancements in industry, legislative and technological practice;
- Recommendations for standard question banks and templates for each of the EPA methods;
- Consistent review of the competence standards and benchmark criteria;
- Review appeals and resolve disputes or challenges against assessment outcome decisions and issue recommendations for change where applicable;
- Set up performance indicators to measure the effectiveness of approved digital engineering technician apprenticeship assessment organisations (AAOs);
- Inspection of the operations and processes adopted by the approved digital engineering technician apprenticeship assessment organisations (AAOs);
- Standardisation and consistency panels invested in the decisions and outcomes of assessments across Independent Assessment Organisations;
- External ‘spot’ checks of results and comparative exercises to ensure results are consistent across sectors and geographic locations.

The output of the Quality Code process detailed below will be provided to the EQA employer panel for consideration and direction. This activity will be organised under four headings: *Informing*, *Assessing*, *Monitoring* and *Reporting*.

- *Informing* will involve:
    - Standardisation meetings with all Independent Assessment Organisations (AO)
    - Briefing on best practice to fulfill full requirements of the approved assessment plan to AOs.

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  - Consideration of the EPA pass/fail rate and any amendments to the EPA that have been identified.
  - Recommend approval processes for EPA assessors aligned to the Consolidated Assessment Strategy.

- *Assessing* will involve:
  - Recommend areas of CPD for EPA assessors across AOs.
  - Desk top evaluation of demand for EPA against AO provision.
  - Verifying adherence of EPA delivery to requirements of the assessment plan.
  - Review capability of AOs with regard to EPA materials, equipment and facilities.

- *Monitoring* will involve:
  - Provide a monitoring service for EPA delivery.
  - Evaluation of procedures and process to ensure standardisation across the AO network.
  - Checking the provision of candidate learning support resources and facilities for EPA.
  - Ensure fairness and transparency across EPA decision-making and methodology.

- *Reporting* will involve:
  - Provide reports on levels of compliance against the full requirements of the assessment plan.
  - Collate data and report findings of non-conformance and best practice.
  - Inform the industry and IfA of Non-compliance, volumes, success rates, availability of provision and put forward recommendations for cessation of approved status of underperforming AOs.
  - Report to stakeholders on completions, pass/fail rates, grading, provision and review requirements.

## END-POINT –GRADING

The overall EPA will be graded Pass, Merit, and Distinction, this will be determined by the results of each area of assessment, refer to Figure 4 below. The individual should achieve at least 55% of the marks available at each stage of the EPA. As a minimum, the candidate must pass each assessed stage (Synoptic Project and Interview) to be considered for an overall pass mark. Each mark will be consolidated against the relevant weighting to determine the overall outcome. As stated, the Independent Assessment Organisation will provide marking criteria and guidance for the Interview and model answers for the Synoptic project, **Annex C**: Digital Engineering Technician EPA grading descriptors provides further guidance on grading descriptors.

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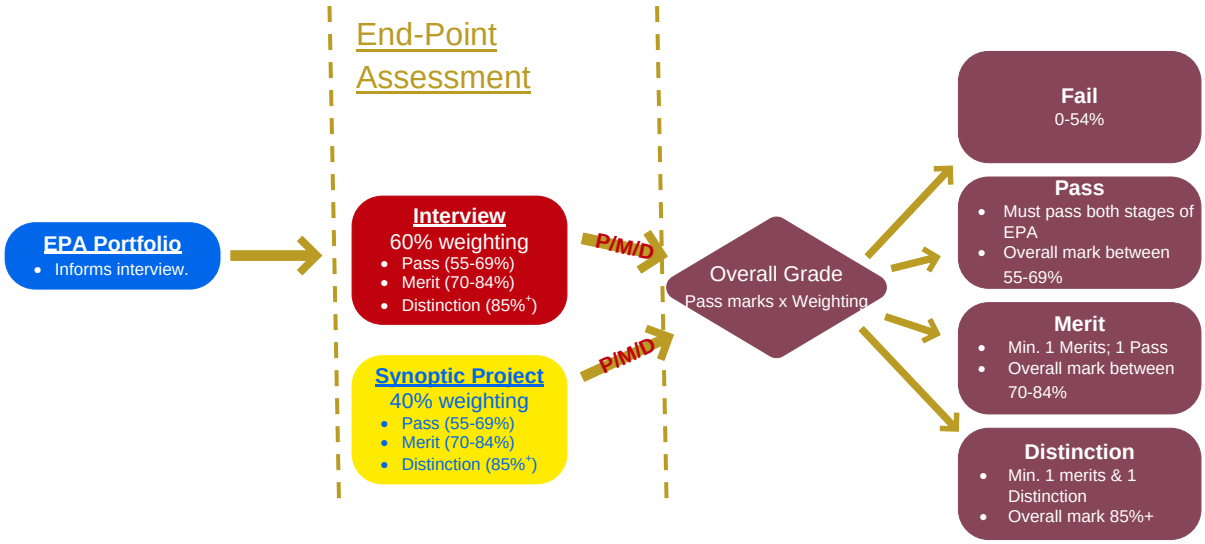


**Figure 4: Overall grading structure**

## IMPLEMENTATION

Consistent End Point –Assessments

The Independent Assessment Organisation will produce clear specifications and guidance for each stage of the EPA. This will ensure the appropriate level of checks and balances in order to promote standardised, equal and fair judgments. Clear limitations will be set with regard to the control conditions for each assessed stage of the EPA.

Affordability

It is estimated the end-point assessment will cost Independent Assessment Organisations approximately 15% of the total cost of the apprenticeship. The end-point assessment is portable and may be delivered at a range of sites including employer and training provider premises or dedicated assessment centres. The independent assessment organisation will liaise with the training provider and employer to establish the most cost-effective location. A knowledgeable invigilator will be required for each Synoptic Project assessment and therefore a minimum cohort for each assessment would be recommended. The expected volumes enrolled on this apprenticeship are expected to increase once it is established and as such this demand will further benefit affordability.

Professional Body recognition

Student membership is free for some but not all of the professional institutions and it will be for the individual in consultation with their employer to decide which route is best suited. Successful candidates following the EPA will be eligible to opt for submitting their application for professional registration with the relevant institution.

Volumes

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The Digital Engineering Technician standard is a new apprenticeship and so it is expected that the employer consortium will commit to recruiting a discrete cohort of technicians to pilot the scheme in the first year. The expected growth is reflected in the numbers below:

- 2017/18 – minimum 15 apprentices (1 cohort)
- 2018/19 – anticipate 45 apprentices (3 cohorts)
- 2020/21 – expected 135 apprentices (9 cohorts)

Once the programme is established the demand is expected to increase as employers increase their capacity to commit to the government B.I.M. industrial strategy referred to by the Industrial Strategy for Construction 2025.[9]

[9] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/210099/bis-13-955-construction-2025-industrial-strategy.pdf

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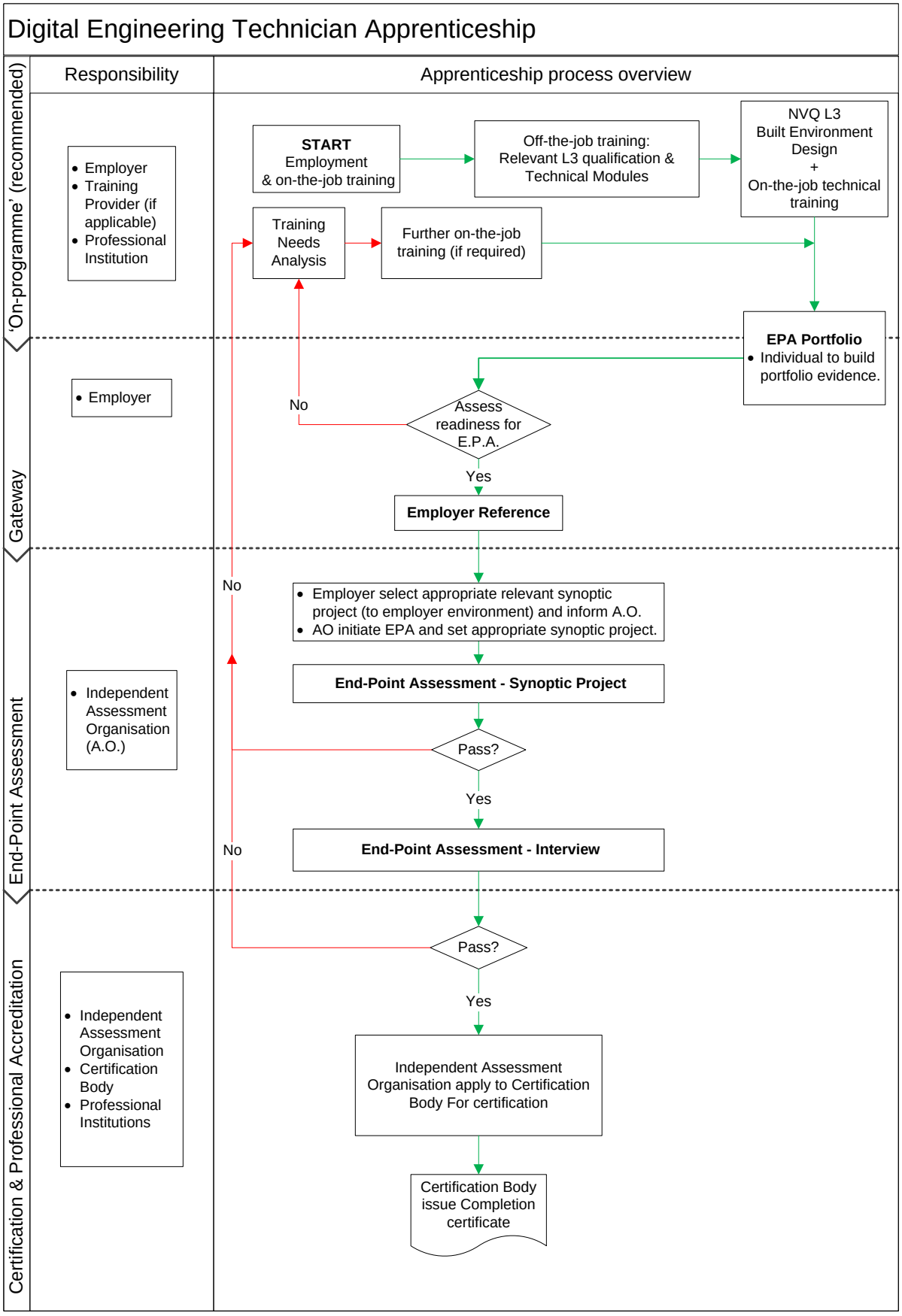
# ANNEX A: DIGITAL ENGINEERING TECHNICIAN APPRENTICESHIP OVERVIEW

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## ANNEX B: DIGITAL ENGINEERING TECHNICIAN EPA COMPETENCIES

| **Competence Area**<br>Overview of assessment criteria | **Synoptic Project** | **Interview** |
|---|---|---|
| **Knowledge and Skills** | | |
| **Information Modelling**<br>Demonstrate a high level of competence in the application of common authoring tools in response to a specific brief. | ✓ | ✓ |
| **Collaboration and Coordination**<br>Thorough theoretical and practical understanding of the primary collaborative B.I.M. processes and procedures including:<br>• Establishing a Common Data Environment (CDE).<br>• Production and sharing of design information, design review and clash detection practices. | ✓ | ✓ |
| **Information Management**<br>• Thorough understanding of BIM processes, procedures, information models, management and collaboration.<br>• Understanding of the Government's approach to BIM and how the benefits of BIM can enable a step change across the construction industry. | ✓ | ✓ |
| **Customer Care**<br>• Understanding of customer focused business development and delivery.<br>• Be aware of relationship management and its application in construction. | ✓ | ✓ |
| **Quality Management**<br>Candidates should be able to produce a *Quality Management Plan*.<br>• Have an understanding of quality management systems.<br>• Be able to suggest digital quality management solutions. | | ✓ |
| **Planning**<br>• Understand *Planning*, *Logistics* and *Construction Simulations.*<br>• Ability to utilise digital technologies to structure and plan projects | | ✓ |

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| | | |
|---|---|---|
| through visualisation tools. | | |
| **Design**<br>• Understand the design process in its entirety and how it applies to each discipline.<br>• Capable in utilisation of digital tools to assist in the development of project design.<br>• Manage a design process in a digital and non-digital environment. | ✓ | ✓ |
| **Maintain and Operate**<br>• An understanding of Asset Management Engineering.<br>• Ability to utilise digital technologies to structure and plan maintenance in line with asset requirements. | ✓ | ✓ |
| **Engineering**<br>• Understand domain specific engineering principles in a digital setting.<br>• Develop a solution for a specific engineering application. | | ✓ |
| **Commercial Management**<br>• Broad understanding of commercial processes from bid stage through to handover and asset management throughout a facility lifecycle.<br>• Capable of creating a 5D model by applying cost information to models using industry standard rules of measurement, and analyse the impacts of change using digital tools.<br>• Broad understanding of contract administration and the impact BIM processes have on this. | | ✓ |
| **Health & Safety**<br>• Broad understanding of industry standards related to Health & Safety and how specific issues can be communicated and managed through a digital platform.<br>• Candidates should understand the roles and responsibilities of Health & Safety professionals in construction such as the Health & Safety Officer and Construction Design Management Coordinator (CDMC) and specific procedures related to each.<br>• Furthermore a thorough understanding of managing Health & Safety on site through the creation of daily activity briefings, methods statements and task sheets should be acquired with the ability to contribute to these through the use of digital models. | | ✓ |
| **Technology & Innovation**<br>• Understanding of how technology and innovation can be implemented. | | ✓ |

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| | | |
|---|---|---|
| • Be able to articulate problem solving in a lean framework. | | |
| **Sustainability**<br>• Understanding of Sustainability in CBE.<br>• Be able to introduce digital techniques to identify, measure, record and communicate sustainable built environment outcomes. | | ✓ |
| **Construction Industry and Sectors**<br>• Be able to identify where the current role ties in to the construction industry. Articulate the respective position in the construction sector and highlight how it integrates with other sectors/disciplines.<br>• Demonstrate awareness of the information interdependencies of delivering information throughout a product / asset lifecycle.<br>• Show understanding the purpose of information standards and regulation. | | ✓ |
| **Knowledge Sharing**<br>• Be able to shoe awareness of social networking and appropriate sources of information / knowledge sharing.<br>• Demonstrate understanding of basic research techniques to ensure integrity of knowledge discovery. | | ✓ |
| **Behaviours** | | |
| **Professional Judgment**<br>Be able to work within own level of competence and know when to seek advice from others and work on own initiative | ✓ | ✓ |
| **Commitment to code of ethics**<br>Work within rules and regulations of professional competence and conduct. Gain the trust of both team members and the management team. | ✓ | ✓ |
| **Personal and Continuing Professional Development**<br>Identify own development needs and take action to meet those needs. Use own knowledge and expertise to help others when requested. Understands role in the team, constantly seek opportunities to improve own work and maximize efficiency. | | ✓ |
| **Commitment to Equality and Diversity**<br>Understand the importance of equality and diversity and demonstrate these attributes so as to meet the requirements of fairness at work. | | ✓ |
| **Effective Communication**<br>Contribute to effective meetings and present information in a variety of ways including oral and written. Adaptable with the confidence to facilitate meetings with stakeholders. | ✓ | ✓ |
| **Work in Teams**<br>Work with others and demonstrating collaborative behaviours. | ✓ | ✓ |

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| | | |
|---|---|---|
| **Innovation and commitment**<br>Focus on areas for process improvement and learn from innovative solutions. Challenge current practice and be open minded about how to improve and implement a new way of working. | ✓ | ✓ |
| **Collaboration**<br>Understand the existence of team dynamics and application of personal strengths and weaknesses in group situations. Awareness of collaborative frameworks and contract / organisational level of collaboration. | ✓ | ✓ |
| **Personal Effectiveness**<br>Understand personal strengths and weaknesses and show CPD. | | ✓ |

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## ANNEX C: DIGITAL ENGINEERING TECHNICIAN EPA GRADING DESCRIPTORS

| | Fail (≤54%) | Pass (55-69%) | Merit (70-84%) | Distinction (85%+) |
|---|---|---|---|---|
| Interview<br><br>(Weight 60%) | • Fails to provide evidence to meet all knowledge, skill and behavioural requirements for a *Pass* grade.<br>• Incomplete responses to interview questions lacking depth of experience qualified by the Standard and PAS 1192. | • Evidence of understanding and appropriate application (meeting the requirements of PAS1192) relative to environment and project stage.<br>• Evidence of understanding and demonstrating Digital Engineering Technician Apprenticeship Standard behaviours with some examples.<br>• Show ability to present and communicate (written, visual and oral) material in a literate, articulate and appropriate way.<br>• Evidence of commitment to CPD. | Meets all the requirements for a pass plus:<br><br>• Evidence of their critical/analytical and evaluative capability in each of these areas.<br>• Understanding and examples of demonstrating behaviors.<br>• Consistent evidence of understanding and demonstrating behaviours.<br>• Evidence of commitment to CPD and is informed by research and relevant developments that draw on a range of sources and resources that goes beyond the minimum required. | Meets all the requirements for a merit plus:<br><br>• Evidence of independent working and synthesis/production of substantial piece of work independently.<br>• Consistent evidence of understanding and demonstrating behaviours.<br>• Some evidence of innovation and exploration/recommendations to technologies/initiatives that support improved outcomes/performance. |
| Synoptic Project<br><br>(Weight 40%) | • Failure to meet all knowledge, skill and behavioural requirements for a *Pass* grade. | • Capable working within CDE, work meets requirements of PAS 1192, accurate information provided at each stage. Evidence of appropriate behaviours (ref DET Apprenticeship Standard, PAS 1192).<br>• Applies the appropriate tools, techniques and/or methods accurately, as set out by PAS 1192.<br>• Evidence of validation skills accurate to within 80%, with the ability to derive facts and execute judgment on results. | Meets all the requirements for a pass plus:<br><br>• Applies tools and techniques to the fullest of their capability to execute project deliverables in the most efficient manner possible.<br>• Evidence of validation skills accurate to within 90% Demonstration of analysis and insights developed the ability to derive facts from data. | Meets all the requirements for a merit plus:<br><br>• Uses innovative tools and techniques competently to execute project deliverables, improving the efficiency of process by doing so.<br>• Evidence of validation skills accurate to 100%. Demonstrating the ability to evaluate data in its entirety, and the project dependencies forming deeper levels of insight and concepts. |

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## ANNEX D: ALIGNED PAS ROLES AND RESPONSIBILITY

These roles and responsibilities defined by the PAS 1192-2:2013 are listed below:

Information Author:

- Creating files and ensuring the appropriate file attributes are captured correctly
- Producing and/or amending information in accordance with the Project Standards Methods and Procedures (SMP)
- Ensuring graphical models (they produce) are spatially coordinated and escalating interface issues to the Interface Manager
- Ensuring all elements of the Information Model are fully coordinated with other disciplines
- Submitting information for approval in accordance with the TIDP

Interface Manager

- Resolving spatial coordination issues with other Task Team Interface Managers
- Escalating unresolved coordination issues to the Design/Construction Lead
- Keeping the Task Team updated with agreed resolutions and progress of ongoing resolutions

The responsibilities outlined will be covered by the EPA Portfolio and should be verified by the EPA Interview.

The knowledge requirements as defined by the BIM Task Group BIM Level 2 Learning Outcomes Framework should include:

1. Understand what BIM is, the contextual requirement for BIM Level 2 and its connection to the Government Construction Strategy and Industries Strategy 2025.
    - Background and the need for collaborative working (removing waste, errors and poor quality/incomplete information).
    - The value of whole life and whole estate approach rather than capital-led and single asset.
    - Roles and responsibilities of the supply chain members and clients as part of BIM Level 2 delivery (cultural / behavioural).
    - External context for BIM, global, national standards and support communities.
    - Core and extended suite of standards, documents and deliverables describing BIM Level 2.
    - The value of high quality data and the principles of data management.
2. Understand the implications and value proposition of BIM within their organisation.

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- Technical, technology and interoperability requirements of Level 2 BIM (information management / CDE, model based design and analysis).
- How BIM supports the relationship between Design and Construction and Facilities and Asset Management.

3. Understand the requirement for the management and exchange of information between supply chain members and clients as described in the 1192 suite of standards and PAS55 / ISO 55000.
    - Requirements for the exchange of information between supply chain members in a collaborative manner as described in PAS1192-2: 2013 and PAS1192.3: 2014, and provided in conjunction with BS1192:2007.
    - Roles and responsibilities of the supply chain members and clients of BIM Level 2 and the implications on Scopes of Services.
    - BIM Execution Plan (BEP) in context of PAS1192.2:2013 – the related concepts, purpose and implementation principles.
    - Digital delivery of information between supply chain members and with clients in context of BS1192-4:2014 (COBie), Digital Plan of Work (DPoW) and classification system.
    - The concept, purpose and implementation principles of Project Information Models (PIM) and Asset Information Models (AIM) and the relationship and interchange between them.
    - A common Data Environment (CDE) as described in the 1192 suite of standards.
    - The implications of Level 2 BIM in relation to the project team working methods as described in BS1192:2007.
    - The way in which Level 2 BIM can be adopted to benefit decision-making for design management.

Technologies and methods for creating, using and maintaining structured information.

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