

# **T Level Technical Qualification in Building Services Engineering for Construction**

**Exam guide**

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# 1. Introduction

This exam guide for the T Level Technical Qualification in Building Services Engineering for Construction core exams (Paper 1 and Paper 2) provides general tips for candidates taking these assessments, along with examples of different types of questions that will appear.

Example candidate responses have also been provided along with examiner commentary and further hints and tips. The example candidate responses should not be considered as the only or best way to answer the question, their aim is to support transparency of the expectations when candidates are responding to different types of questions.

Marks, as indicated by “(1)”, highlighted in yellow have been added to show where marks have been awarded to support transparency of marking, they were not part of the candidate’s response.

## 2. General Tips

- Spelling, Punctuation and Grammar (SPaG) are not assessed within the core exam, no marks are awarded or deducted based on this. Examiners will make a judgement in relation to phonetic spelling to determine if the candidate has the required knowledge and/or understanding and where there is credit will award the mark(s).
- Handwriting quality, it is key that the candidates provide responses which are legible. Examination papers are scanned and marked onscreen therefore it is critical that candidates respond to questions using a ball-point pen and ensure their writing is legible. A recommendation would be to use block capitals if handwriting is poor.
- It is key candidates understand the paper is split into two sections (Section A and Section B) and they understand the type of questions they will find in each part of the paper. This can help them with time management ensuring they leave sufficient time to respond to the Extended Response Questions within Section B.
- The order of the paper is modelled in a way so that it gradually increases in level of difficulty. The paper starts with Section A with questions assessing knowledge, before moving onto understanding, then application. Section B then assesses application, analysis and evaluation.

### **3. AO1a – Demonstrate Knowledge**

#### **What this assessment objective means**

Recall or recognition of specific elements of knowledge which must be committed to long term memory in order to underpin success in the role.

All Assessment Objectives require the ability to recall knowledge. AO1a) refers to instances where the candidate is simply required to demonstrate basic recall. In the exam, this helps to give confidence in sufficiency of coverage of the content, and recognises that not all knowledge requires further understanding eg terminology, number facts etc.

#### **A candidate can**

- name or recognise technical terms, principles theories, based on a description/use or vice versa
- distinguish between correct and incorrect definitions/descriptions
- correctly use terminology/terms
- locate a part on a diagram.

#### **This is assessed within the examination by**

Simple questions that require knowledge that could be learned by rote (facts) no requirement to go beyond recall and statement of fact:

- Labelling a diagram with names/locations
- Definitions, facts, recall of purpose of something
- Description of physical appearance of something

### 3.1. Question and Mark Scheme

Q 3	List <b>three</b> forms of access equipment that are suitable for working in an open area to a height of 5 m.															
	Acceptable answer(s)	Guidance	Max marks	Test Spec ref & AO												
	Any <b>three</b> from: Scaffold towers (1) Boom (1) Scissor lifts (1) Lean to scaffolding/access platform (1)	Award <b>1 mark</b> for each up to a maximum of 3 marks  Descriptions must reflect the possible answers.  Do not accept ladders.	3	1.15 A01a												
KO ref	KO1 Health and safety															
	<p><b>1.15</b> Safe practices and procedures for the use of <b>access equipment and manual handling</b></p> <p><b>Range:</b></p> <p><b>Access equipment</b> - ladders, mobile scaffold towers, platforms, trestles, steps, podiums, staging, boom and scissor lifts.</p> <p><b>Manual handling</b> – single, two-person lift, mechanical lifting aids.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #fce4d6;"><b>What do learners need to learn?</b></td> <td style="background-color: #e0e0e0;"><b>Skills</b></td> </tr> <tr> <td style="background-color: #fce4d6;">The different types of access equipment and manual handling operations.</td> <td style="background-color: #e0e0e0;">MC4</td> </tr> <tr> <td style="background-color: #fce4d6;">The safety checks to be carried out on access equipment; visual, tagging, fit for purpose, secure level ground, operative's competency for use of equipment.</td> <td style="background-color: #e0e0e0;"></td> </tr> <tr> <td style="background-color: #fce4d6;">Safe erection methods for access equipment.</td> <td style="background-color: #e0e0e0;"></td> </tr> <tr> <td style="background-color: #fce4d6;">Factors that influence the choice of equipment for carrying out work at height based on the work being carried out; duration at work, action points for heights.</td> <td style="background-color: #e0e0e0;"></td> </tr> <tr> <td style="background-color: #fce4d6;">Ratios and advantage of pulleys and other lifting aids.</td> <td style="background-color: #e0e0e0;"></td> </tr> </table>				<b>What do learners need to learn?</b>	<b>Skills</b>	The different types of access equipment and manual handling operations.	MC4	The safety checks to be carried out on access equipment; visual, tagging, fit for purpose, secure level ground, operative's competency for use of equipment.		Safe erection methods for access equipment.		Factors that influence the choice of equipment for carrying out work at height based on the work being carried out; duration at work, action points for heights.		Ratios and advantage of pulleys and other lifting aids.	
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Factors that influence the choice of equipment for carrying out work at height based on the work being carried out; duration at work, action points for heights.																
Ratios and advantage of pulleys and other lifting aids.																

## 3.2. Candidate Responses

### Example 1 (3 marks)

*Scissor lift, scaffolding, boom.*

#### Examiner Commentary on application of mark scheme

Candidate recalls the correct access equipment that can be used for the specific scenario as outlined in the mark scheme.

### Example 2 (1 mark)

*Cherry picker, ladder, lift.*

#### Examiner Commentary on application of mark scheme

Candidate has only identified one correct piece of access equipment to use for the specific scenario. Only “cherry picker” has gained a mark, as a cherry picker is also known as a boom. The others are not appropriate for a high open area. The term ‘lift’ is too generic as could be referring to numerous items. If ‘scissor lift’ was provided, this would have gained a mark.

## 3.3. Examiner Hints and Tips

- Often candidates struggle to achieve marks in relation to AO1a as they don’t have the breadth of knowledge across the syllabus. Candidates may either leave the question blank or will recall an incorrect fact, acronym or name.
- When asked to recall legislation or regulations, examiners will accept industry recognised abbreviations and acronyms, as shown in the marking scheme.
- Examiners will also accept alternative answers, if acceptable. For example, terms that are sometimes used on a construction site.

## 4. AO1b – Demonstrate Understanding

### **What this assessment objective means**

The ability to explain principles and concepts beyond recall of definitions in order to be able to transfer these principles and concepts between contexts. Candidates have built connections between related pieces of knowledge.

AO1b) focuses on the ability of the candidates to show understanding by summarising or explaining concepts in their own words, exemplifying or comparing and making inferences in general terms that show eg cause and effect.

### **A candidate can**

- explain a concept in their own words
- explain what it means in practice
- give relevant examples
- say what the impact/implication may be in general terms

### **This is assessed within the examination by**

Straightforward questions requiring demonstration, beyond recall, of understanding about something. Response is in general terms, or a concrete exemplification.

- Why is..
- What does ... mean?
- Explain the use of...
- Explanation of how something works
- Explanation of the benefits/weaknesses of...



## 4.1. Question and Mark Scheme

Q 9	Explain how locally recycled bricks are classed as sustainable when used for a new building.			
	Acceptable answer(s)	Guidance	Max marks	Test Spec ref & AO
	<p>Example of new use for recycled bricks (1)</p> <p>Reducing production (1)</p> <p>Effect of reducing production (1)</p> <p>Reduction in raw material quarrying/mining (1)</p> <p>Reduction in waste products (1)</p> <p>Not needing to transport bricks (1)</p>	<p>Award <b>1 mark</b> for each point raised up to a maximum of 5 marks</p> <p>Accept any other answer that shows an understanding but where wording differs</p>	5	5.2 A01b
KO ref	K0 5 Construction sustainability principles			
	<p><b>5.2 Types of sustainable solutions</b></p> <p><b>Range:</b>  <b>Sustainable solutions</b> - social, environmental, economic, human (habitability).</p> <p><b>What do learners need to learn?</b></p> <p>The use of sustainable solutions including prefab construction, self-heal concrete, energy efficiency systems, insulation, green roofs, greywater harvesting systems, use of soakaways, sustainable drainage, and smart glass/electrochromic glass.</p> <p>How sustainable materials are used including recycled bricks and tiles/slates and timber products in construction of building and roofs/locally sourced (reducing carbon footprint).</p>			<p><b>Skills</b> CSB</p>

## 4.2. Candidate Responses

### Example 1 (5 marks)

*Locally recycled bricks are sustainable because they are being reused (1) of being disposed of and potentially harming the environment (1). When they are locally sourced (1), there is very little transportation (1), meaning there is less CO<sub>2</sub> emissions (1) (petrol). It means the bricks are possibly doubling their useful life.*

### Examiner Commentary on application of mark scheme

Candidate has identified items mentioned in the mark scheme, as highlighting with a mark being assigned. Hence, the candidate has managed to obtain full marks for their response.

### Example 2 (4 marks)

*Locally recycled bricks are classed as sustainable as they are not being re-made, resulting in saved materials (no waste) (1). They reduce carbon emissions (1) as they are being recycled. As local (1), not as much transport (1). More buildings are able to be built, resulting in a sustainable source of materials. Sustainable source of income for the local community, more jobs.*

### Examiner Commentary on application of mark scheme

Candidate has identified items mentioned in the mark scheme, as highlighting with a mark being assigned. Hence, the candidate has managed to gain most (4) marks for their response.

## 4.3. Examiner Hints and Tips

- In questions such as this, candidates should take the approach of explaining why recycling bricks is classed as sustainable. Then expanding on why this is helpful/important in the context of the question posed.
- Candidates must ensure they have also considered the context given within the question. Candidates will only achieve marks when they identify reasons relevant to the context given. Likewise, their consideration of the impact of recycling bricks must be applicable to the context of the question.
- By just listing out reasons for being sustainable with no further explanation, candidates will not be able to achieve full marks as they have not demonstrated they understand the impact of recycling bricks to support sustainability.
- Examiners will also accept alternative answers, if acceptable and is contextualised in relation to the question.

## 5. AO2 – Apply Knowledge and Understanding to Different Situations and Contexts

### What this assessment objective means

Using and applying knowledge and understanding, of processes, procedures, generalisations principles and theories to specified, concrete situations. AO2 is about being able to take the understanding of generalities (AO1b) and apply them to specific novel situations. It is more granular than the more extended synthesis/creation that may respond to an analysis (AO3a) of a more holistic complex situation/brief.

### A candidate can

- differentiate relevant from irrelevant information in a given, new situation,
- select appropriate procedures/principles from memory and
- implement these procedures and principles appropriately for the given situation.

### This is assessed within the examination by

Given a clear, straightforward/narrow situation, the question requires selection and application of relevant principles and procedures in a way that is specific to the situation (rather than in general terms).

- What is the best approach to... in this situation?
- Explain the process/ procedure to take when...
- What are the implications of ...(specific rather than general situation)

## 5.1. Question and Mark Scheme (Maths)

<p><b>Q17</b></p>	<p>A pallet containing material needs to be lifted using a lever where the fulcrum is placed 1.5 m from the load. The pallet has a mass of 800 kg and a mechanical aid is able to exert a force of 5000 N on the other side of the fulcrum. Assume gravity to have an acceleration of 9.81 m/s.</p> <p>Calculate the distance needed between the mechanical aid and the fulcrum to lift this load. Show your workings.</p>			
	<p><b>Acceptable answer(s)</b></p>	<p><b>Guidance</b></p>	<p><b>Max marks</b></p>	<p><b>Test Spec ref &amp; AO</b></p>
	<p style="text-align: center;"><math>f = m \times a</math></p> <p>So</p> <p style="text-align: center;"><math>f = 800 \times 9.81(1) = 7848 \text{ N}(1)</math></p> <p>and</p> <p style="text-align: center;"><math>f \times d = f \times d</math></p> <p>So</p> <p style="text-align: center;"><math>5000 \times d = 7848 \times 1.5(1)</math></p> <p>So</p> <p style="text-align: center;"><math>d = \frac{7848 \times 1.5}{5000}(1) = 2.35 \text{ m}(1)</math></p>	<p>Marks awarded for:</p> <ul style="list-style-type: none"> <li>• Force formula</li> <li>• Force answer</li> <li>• Using lever principle and transposing it</li> <li>• Applying transposed formula</li> <li>• Final distance (including correct unit)</li> </ul> <p>If alternative demonstration of understanding is given, for example in a diagram, award full marks.</p> <p>If correct answer is given without showing workings, award a maximum of 3 marks.</p> <p>If 800kg is used without applying gravity, 2 marks maximum.</p> <p>Accept answers within 0.1 m</p>	<p><b>5</b></p>	<p><b>2.4</b></p> <p><b>AO2</b></p> <p><b>MC4</b></p>

KO	2. Construction science principles		
	<p><b>2.4 Mechanical science principles</b></p> <p><b>Range:</b>  <b>Mechanical science principles</b> - force, work, energy, power, levers, simple mechanics, basic mechanics.</p> <table border="1" data-bbox="268 551 1442 860"> <tr> <td data-bbox="268 551 1326 860"> <p><b>What do learners need to learn?</b></p> <p>Key principles of mechanical science and how they are used to inform construction methods and the relationship between force, work, energy, power and efficiency.</p> <p>Calculations for all mechanical principles in range.</p> <p>Basic mechanics: theory of moments, action and reaction, centre of gravity, equilibrium, velocity and ratio, mechanical advantage.</p> <p>Simple mechanics: levers, pulleys, Archimedes, screw.</p> </td> <td data-bbox="1326 551 1442 860"> <p><b>Skills</b></p> <p>MC4</p> </td> </tr> </table>	<p><b>What do learners need to learn?</b></p> <p>Key principles of mechanical science and how they are used to inform construction methods and the relationship between force, work, energy, power and efficiency.</p> <p>Calculations for all mechanical principles in range.</p> <p>Basic mechanics: theory of moments, action and reaction, centre of gravity, equilibrium, velocity and ratio, mechanical advantage.</p> <p>Simple mechanics: levers, pulleys, Archimedes, screw.</p>	<p><b>Skills</b></p> <p>MC4</p>
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## 5.2. Candidate Responses

### Example 1 (worth 5 marks)

$$800 \times 9.81 \text{ (1)} = 7,848 \text{ N (1)}$$

$$\text{Moment} = 7,848 \times 1.5 \text{ (1)} = 11,772$$

*Anti-clockwise moment > Clockwise moment to lift the load*

$$11,773 > 11,772$$

$$\frac{11,773}{5,000}$$

$$2.35 \text{ (1)} = 2.35$$

$$2.35 \text{ m (1)}$$

### Examiner Commentary on application of mark scheme

Candidate has calculated items correctly, as mentioned in the mark scheme. These have been highlighted with a mark being assigned. Hence, the candidate has managed to obtain full marks for their response calculations, showing formula and units.

Mark 1: The candidate demonstrated they were able to apply their understanding by identifying the appropriate formula.

Mark 2: The candidate had the knowledge to calculate the correct force answer.

Mark 3: Candidate was able to correctly calculate, using the lever principle and transposing to suit.

Mark 4: Candidate was able to correctly apply their knowledge and understanding with the transposition of formula.

Mark 5: The candidate was able to present their final answer in the correct SI unit (metres).

### Example 2 (worth 3 marks)

$$800 \times 9.81 \text{ (1)} = 7,848 \text{ N (1)}$$

$$\text{Moment} = 7,848 \times 1.5 \text{ (1)} = 11,772$$

*Anti-clockwise moment > Clockwise moment to lift the load*

$$11,773 > 11,772$$

$$11,733 \times 5,000 \text{ (0)} = 58,865 \text{ (0)}$$

### Examiner Commentary on application of mark scheme

Candidate has calculated some items correctly, as mentioned in the mark scheme. These have been highlighted with a mark being assigned. Hence, the candidate has managed to obtain most of marks (3) for their responses. The candidate has not fully accessed all marks for this question, due to some incorrect transposition calculations and final answers.

Mark 1: The candidate demonstrated they were able to apply their understanding by identifying the appropriate formula.

Mark 2: The candidate had the knowledge to calculate the correct force answer.

Mark 3: Candidate was able to mostly calculate, using the lever principle and transposing to suit.

Mark 0: Candidate was unable to correctly fully apply, their knowledge and understanding with the transposition of formulas.

Mark 0: The candidate was unable to present their final answer in the correct SI unit (metres).

## 5.3. Examiner Hints and Tips

- Encourage candidates to always show their working on mathematics questions, they may be able to pick up marks for following the correct method, even when calculations have gone wrong.
- Candidates should note the SI unit/unit of measure that their answer needs to be presented using.
- Candidate should note the number of decimal places or significant figures they are asked to give their answer too.
- Examiners will also accept alternative answers, if acceptable and is contextualised in relation to the question.

## 5.4. Question and Mark Scheme (non-Maths)

<p>8710-032 Q15</p>	<p>The managing director of your organisation has asked you to take a SMART approach to the next main contract which is in the planning stage. Previous contract projects have not been successful for the business due to labour, materials and resource availability which have led to penalties due to late project delivery.</p> <p>Explain how SMART objectives can be applied.</p>								
	<table border="1"> <thead> <tr> <th data-bbox="244 566 815 790">Acceptable answer(s)</th> <th data-bbox="823 566 1206 790">Guidance</th> <th data-bbox="1214 566 1334 790">Max marks</th> <th data-bbox="1342 566 1460 790">Test Spec ref &amp; AO</th> </tr> </thead> <tbody> <tr> <td data-bbox="244 801 815 1865"> <p>SMART objectives with explanations linked back to the scenario, for example:</p> <ul style="list-style-type: none"> <li>• <b>Specific</b> areas of improvement such as labour and material availability which need improving</li> <li>• <b>Measurable</b> setting an indicator for success such as completing the project on time</li> <li>• <b>Assign</b> who is responsible for carrying out the task of managing the resources such as project manager</li> <li>• <b>Realistic</b> rather than simply flooding the site with labour and resources which will be costly, what is the realistic approach to achieve the goals of the project OR is it realistic to find the skilled persons needed or should contract times be extended due to impossible completion dates due to restrictions</li> <li>• <b>Timely</b> when these results should be achieved such as materials available just in time or labour available at phases of the work</li> </ul> </td> <td data-bbox="823 801 1206 1865"> <p>Accept only relevant examples of management to achieve these objectives. As variations of SMART exist, mark according to objectives given eg specific could be strategic or realistic could be relevant.</p> <p>1 mark for each letter of the acronym <b>explained</b> with three added marks for strength of explanation given and understanding shown.</p> <p>Award no marks for just recalling acronym or not mentioning at least one aspect of SMART.</p> <p>If SMART is explained but not linked to the scenario award a maximum of 3 marks.</p> </td> <td data-bbox="1214 801 1334 1865"> <p>8</p> </td> <td data-bbox="1342 801 1460 1865"> <p>11.7 AO2</p> </td> </tr> </tbody> </table>	Acceptable answer(s)	Guidance	Max marks	Test Spec ref & AO	<p>SMART objectives with explanations linked back to the scenario, for example:</p> <ul style="list-style-type: none"> <li>• <b>Specific</b> areas of improvement such as labour and material availability which need improving</li> <li>• <b>Measurable</b> setting an indicator for success such as completing the project on time</li> <li>• <b>Assign</b> who is responsible for carrying out the task of managing the resources such as project manager</li> <li>• <b>Realistic</b> rather than simply flooding the site with labour and resources which will be costly, what is the realistic approach to achieve the goals of the project OR is it realistic to find the skilled persons needed or should contract times be extended due to impossible completion dates due to restrictions</li> <li>• <b>Timely</b> when these results should be achieved such as materials available just in time or labour available at phases of the work</li> </ul>	<p>Accept only relevant examples of management to achieve these objectives. As variations of SMART exist, mark according to objectives given eg specific could be strategic or realistic could be relevant.</p> <p>1 mark for each letter of the acronym <b>explained</b> with three added marks for strength of explanation given and understanding shown.</p> <p>Award no marks for just recalling acronym or not mentioning at least one aspect of SMART.</p> <p>If SMART is explained but not linked to the scenario award a maximum of 3 marks.</p>	<p>8</p>	<p>11.7 AO2</p>
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<p>KO</p>	<p>11 Construction commercial/business principles</p>								

## 11.7 Project management

### What do learners need to learn?

The principles of project management, including effective planning, setting clear goals and objectives, defining roles and responsibilities, setting realistic milestones, and constraints on cost and time. Ensuring all objectives are measurable and achievable, including SMART technique.

### Skills

CSC

## 5.5. Candidate Response

### Example (7 marks)

*Specific, Measurable, Attainable, Relevant, Time-bound*

*Because it's in the planning stage (1), this is important as construction has not yet started and you can look what you are dealing with, with time. You can evaluate what needs improving for example what's relevant (1), which is labourers and more workers as that's what failed last time (1). You can also look at time bound and see how long you have as its only in the planning stages. Also be specific (1) in what tasks need carrying out for the correct materials / people to employ and if they attainable (1) to receive. Also look at being measurable (1) for the contract and the time bound (1), and be time bound and time wise and order things before construction to avoid it being delayed / late and so you don't get penalised like previous contracts.*

### Examiner Commentary on application of mark scheme

Candidate has responded with most of the items correctly identified, as mentioned in the mark scheme, and relating to the context of the question. These have been highlighted with a mark being assigned. Hence, the candidate has managed to obtain most of marks (7) for their responses. The candidate has not fully accessed all marks for this question, due to not fully linking their response to all question elements and context. eg resource availability, needed more expansion.

## 5.6. Examiner Hints and Tips

- Candidate should be encouraged to highlight or underline the context given within the question. They should consider how this context impacts on the question they are being asked. They will only be given context and information which is relevant and needed for them to answer the question.
- Candidate should link their responses against the question context and requirements specifically, trying not to respond randomly in their own words.



## 6. Section B – Extended Response and AO3 (Analysis and Evaluation)

### AO3a Analysis

#### What this assessment objective means

Complex thinking that distinguishes patterns and relationships, breaking material into constituent parts, and determining how the parts are related to one another and holistically, inferring underlying assumptions / conditions / relevance / causation.

It can be seen as an extension of understanding (AO1b), or a prelude to evaluation (AO3b) and to the creation of a response to, for example, a complex brief or situation (more fully assessed in the project).

#### A candidate can

- break down a complex problem into parts
- consider the relationships between the parts
- manipulate knowledge and experience to determine a range of solutions/proposals
- balance competing priorities to suggest the best outcome.

#### This is assessed within the examination by

Given a relatively complex, realistic occupationally relevant scenario, stating a situation that implies (but does not directly state) the need for application of a number of different (possibly competing) principles / approaches / procedures; a requirement to respond / propose solutions

- Analyse the situation recommending an approach to be taken to...
- Analyse how the situation can be managed in order to...
- Analyse the consequences of...

### AO3b Evaluation

#### What this assessment objective means

Ability to make judgements about the value, for some purpose, of own or other's work / ideas / solutions / methods using internal or external criteria or standards relevant for the occupational area. These criteria may include eg quality, accuracy, effectiveness, efficiency, coherence, consistency, and may be quantitative or qualitative.

#### A candidate can

- judge the quality of actions proposals, outcomes
- using their own internal quality standards
- using external standards / criteria
- can justify their judgements of quality.

#### This is assessed within the examination by

Must have something either given or supplied by the candidate to be evaluated; often following / as part of analysis and the proposal of eg an approach, (AO3a above).

- ...justify your decisions/approach
- Evaluate how well ... meets ...standards
- Evaluate how effective/efficient...

## 6.1. Question and Mark Scheme

<p><b>Q20</b></p>	<p>You are part of a team who are responsible for the design and build of a public sector construction project. This is a complex, multi trade project that is to be designed and built within strict time and financial limits.</p> <p>Analyse the uses and purpose of Building Information Modelling (BIM) in relation to collaboration between designers and trades for this project, discussing the government levels of BIM that are to be applied.</p>			
	<p><b>Indicative content</b></p>	<p><b>Guidance</b></p>	<p><b>Max marks</b></p>	<p><b>Test Spec ref &amp; AO</b></p>
	<p>Building Information Modelling (BIM) is a collaborative way of working, underpinned by the digital technologies which unlock more efficient methods of designing, creating and maintaining assets. BIM embeds key product and asset data and a 3-dimensional computer model that can be used for effective management of information throughout a project lifecycle – from earliest concept through to operation. It has been described as a game-changing ICT and cultural process for the BSE sector.</p> <p>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.</p> <p>There are currently three levels of BIM under which Building Information Modelling can be classified. At Level 1 there is either a lack of BIM or an over-reliance on different systems of data. The UK Government has</p>	<p><b>For no awardable content, award 0 marks.</b></p> <p><b>Band 1 1-3 marks</b></p> <p>Analysis of BIM modelling is basic. Some applications identified but with little application to the context of the project. Basic understanding and application of government BIM levels and not clearly linked to the project.</p> <p><b>Band 2 4-6 marks</b></p> <p>Analysis of BIM modelling is good Some applications identified but with little application to the context of the project. Good understanding and application of government BIM levels, but this does not always clearly link to the project.</p>	<p><b>12</b></p>	<p><b>4.8</b></p> <p><b>AO2 4</b></p> <p><b>AO3a 4</b></p> <p><b>AO3b 4</b></p>

<p>mandated compliance with BIM Level 2 in order to fund any public sector construction project. At Level 2 there is a structure to the data for a built asset which requires collaboration across the supply chain. BIM Level 3 will be defined and targeted once the construction industry has achieved compliance with Level 2.</p> <p><b>Levels of BIM</b></p> <p><b>BIM Level 1</b> has been reached when it is implied that the data has assumed a form of structure. The CAD is now either 3D or 2D with some commonality in the data environment. However, there is still some distance to collaboration between different parties being achieved.</p> <p><b>BIM Level 2</b> is required by the Government on all public sector construction projects. Therefore, organisations in the construction industry must demonstrate compliance before the Treasury will release funding. At Level 2, collaboration has been introduced between teams and the process of BIM is being followed. There is still a lack of a single source of data, but crucially any data collected about a built asset is now shared. There is commonality in the data structure which enables a federated BIM model to be produced.</p> <p>Once the construction industry has achieved compliance to BIM Level 2, the Government will begin to define and set targets for the achievement</p>	<p><b>Band 3 7-9 marks</b></p> <p>Analysis of BIM modelling is thorough. Applications identified which have mostly been applied to the context of the project Thorough understanding and application of government BIM levels for this project is demonstrated.</p> <p><b>Band 4 10-12 marks</b></p> <p>Analysis of BIM modelling is comprehensive Applications identified and all applied to the context of the project Comprehensive understanding and application of government BIM levels for this project is demonstrated.</p>		
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	<p>of <b>BIM Level 3</b>. At Level 3, there is complete and total collaboration in the planning, construction and operational life cycle of any built asset. The data is shared, collected and stored using a single source of data.</p> <p>This universal approach to built asset data is known as 'Open BIM' – this is the construction industry's ultimate goal.</p>					
<b>KO</b>	KO 7 Building technology systems					
	<p><b>4.8</b> Building information modelling (BIM)</p> <table border="1" data-bbox="252 954 1437 1346"> <tr> <td data-bbox="252 954 1318 1346"> <p><b>What do learners need to learn?</b></p> <p>The aspects of BIM and the effect it has on real time project delivery in a collaborative way and BIM government levels 1-3.</p> <p>Building passporting and Data warehouse</p> <p>The collaborative role of BIM in delivering real time projects:</p> <ul style="list-style-type: none"> <li>• Digital Plan of Works (DPoW)</li> <li>• Employer's Information Requirements (EIR)</li> <li>• Common Data Environment (CDE)</li> </ul> </td> <td data-bbox="1318 954 1437 1346"> <p><b>Skills</b></p> <p>CSD</p> </td> </tr> </table>				<p><b>What do learners need to learn?</b></p> <p>The aspects of BIM and the effect it has on real time project delivery in a collaborative way and BIM government levels 1-3.</p> <p>Building passporting and Data warehouse</p> <p>The collaborative role of BIM in delivering real time projects:</p> <ul style="list-style-type: none"> <li>• Digital Plan of Works (DPoW)</li> <li>• Employer's Information Requirements (EIR)</li> <li>• Common Data Environment (CDE)</li> </ul>	<p><b>Skills</b></p> <p>CSD</p>
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**What do we mean by:**

	<b>AO2</b> Application	<b>AO3a</b> Analysis	<b>AO3b</b> Evaluation
<b>Basic</b>	Limited understanding that is relevant to the context or question. Limited accuracy in interpretation through lack of application of relevant knowledge and understanding.	Limited accuracy in analysis through lack of application of relevant knowledge and understanding.	Un-supported evaluation through lack of application of knowledge and understanding. Un-supported judgement through lack of application of knowledge and understanding.
<b>Good</b>	Some understanding that is relevant to the context or question. Some accuracy in interpretation through the application of some relevant knowledge and understanding.	Some accuracy in analysis through the application of some relevant knowledge and understanding.	Partially supported evaluation through the application of some relevant knowledge and understanding. Partially supported judgement through the application of some relevant knowledge and understanding.
<b>Thorough</b>	A range of accurate understanding that is relevant to the context or question. Accurate interpretation through the application of relevant knowledge and understanding.	Accurate analysis through the application of relevant knowledge and understanding.	Supported evaluation through the application of relevant knowledge and understanding. Supported judgement through the application of relevant knowledge and understanding.
<b>Comprehensive</b>	A range of detailed and accurate understanding that is fully relevant to the context or question. Detailed and accurate interpretation through the application of relevant knowledge and understanding.	Detailed and accurate analysis through the application of relevant knowledge and understanding.	Detailed and substantiated evaluation through the application of relevant knowledge and understanding. Detailed and substantiated judgement through the application of relevant knowledge and understanding.

## 6.2. Candidate Responses

### 6.2.1. Band 1

#### Top of band 1 response, 3 marks

*Building Information Modelling (BIM) could be used in meetings between the trades and designers for this project (1). This is for many reasons such as BIM being familiar to all the people involved as it is used by most trades and designers. BIM could also be used in meetings to showcase the progress of the project, how long it will take to complete and the costs (1).*

*As this project is complex, BIM can help people to understand it better. As this is a public sector construction project, BIM can be used to showcase information to the public such as what it will look like and when the building will be ready (1).*

#### Examiner Commentary on application of mark scheme

Candidate has responded with limited understanding and knowledge of the government BIM levels, as mentioned in the mark scheme, and relating to the context of the question. These have been highlighted with marks being assigned. Hence, the candidate has only managed to obtain (3) marks (Band1) for their responses. The candidate has not fully accessed all marks for this question, due to not fully linking their response to all question elements and context. For example, the candidate has not elaborated or mentioned anything, regarding the BIM different levels etc. The candidate response is really mentioning the collaborative purpose of BIM.

The candidate needs to expand their responses with more detail and relevant context to access the higher band marks.

### 6.2.2. Band 2

#### Middle of band 2 response, 5 marks

*BIM is a computer aided design tool which helps create an easily accessible plan of a project (1). The minimum level of BIM required is level 2 (1) as all companies have this. It's a standard set by the government. In the design phase this is particularly important as it can provide accurate measurements (1), locate trades people and provide materials are to be used where.*

*Collaboration between designers and trades is especially important as they'll work hand-in-hand to ensure everyone is working efficiently.*

*Advantages of trades working collaboratively is; good communication, increased work rate, and creating a sustainable environment (1).*

*Having trades people following ACOPs will also give the designer confidence in collaborating with trades. To get this project done within a strict time frame we want to include the use of JiT (Just-in-Time), this will allow the delivery of materials to be efficient and reduce the waste meaning less time is used disposing of material. In using JiT, this promotes the site as heading towards lean construction.*

*The use of BIM level 2 allows any trades person to have access (1) to the plans and schedule although COBIE can play a part in distributing plans also.*

## Examiner Commentary on application of mark scheme

Candidate has responded with some understanding and knowledge of the government BIM levels, as mentioned in the mark scheme, and relating to the context of the question. These have been highlighted with marks being assigned. Hence, the candidate has only managed to obtain (5) marks (Band 2) for their responses. The candidate has not fully accessed all marks for this question, due to not fully linking their response to all question elements and context. eg The candidate has not fully elaborated or mentioned anything, only briefly BIM level 2. More information required for the BIM different levels etc.

The candidate needs to expand their responses with more detail and relevant context to access the higher band marks.

### 6.2.3. Band 3

#### Bottom of band 3, 7 marks

*BIM is a vital tool to help meet the strict time and financial limits (1). BIM allows clear communication between the different trades that are going to be in this project (1). The government level of BIM are going to be applied which is BIM level two (1). This is a mandatory requirement for all government funded construction projects. BIM level two is where there is one common data environment where all the data is kept and can be accessed and altered by anyone (1). BIM level two allows more collaborative working on site. The use of BIM level two helps with collaboration between designers and trades people in many ways (1). One way is that everyone can access the design of the building such as 3D models and many more. They can be accessed by everyone so they can see what goes where. This helps to reduce mistakes and waste, this is because everything will be on the plans. Also, in BIM level two, all the plans that are being shared on the common data environment are all up-to-date so the newest version of the model will always be shown (1). This helps to reduce mistakes (1) of people using older plans because everyone has an up-to-date one.*

*You could also see who and when a job is being done in BIM level two. This helps with collaboration because everyone knows what they are doing and when its being done. Another way BIM level two helps with collaborative working is that trades people can input into the plan to make it better. So BIM allows everyone to have an input in the design and make the design buildable and look nice.*

*So overall, BIM will help to reduce waste and mistakes helping to meet the strict time and financial limits and also helping with collaboration between designers and trades.*

## Examiner Commentary on application of mark scheme

Candidate has responded with an accurate range of understanding and knowledge of the government BIM levels, as mentioned in the mark scheme, and relating to the context of the question. These have been highlighted with a mark being assigned. Hence, the candidate has managed to obtain (7) marks (Band 3) for their responses. The candidate has not fully accessed all marks for this question, due to not fully linking their response to all question elements and context. For example, the candidate has not fully elaborated on the BIM different levels etc. More information required for the BIM different levels etc.

The candidate needs to expand their responses with more detail and relevant context to access the higher band marks.

## Examiner Commentary on application of mark scheme

<b><u>Band 3 7-9 marks</u></b>	Analysis of BIM modelling is <b>thorough</b> . Applications identified which have mostly been applied to the context of the project <b>Thorough</b> understanding and application of government BIM levels for this project is demonstrated.
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	<b>AO2</b> Application	<b>AO3a</b> Analysis	<b>AO3b</b> Evaluation
<b>Thorough</b>	A range of accurate understanding that is relevant to the context or question. Accurate interpretation through the application of relevant knowledge and understanding.	Accurate analysis through the application of relevant knowledge and understanding.	Supported evaluation through the application of relevant knowledge and understanding. Supported judgement through the application of relevant knowledge and understanding.

### 6.2.4. Band 4

#### Bottom of Band 4, 10 marks

*The purpose of BIM is to help and allow for multiple (if not all) designers and trades to understand and calculate accurately the needs for the project at hand (1). The government levels are (1): level 0 (paper and pencil), level 1 (detailed blueprints), level 2 (CAD – Computer Aided Design, 3D modelling), level 3 (VR – Virtual Reality, AR – Augmented Reality). The minimum required BIM for any construction project is level 2 (1).*

*By using BIM it allows us to advance throughout the project so much better. This is because, with the use of COBIE and IoT (1), it allows us to show all trades and designers to plan to build the project step-by-step (1). Allow the multi-trade project to have this and allows all trades to work cooperatively (1) with each other without getting in each other's way. To help prevent this we use Gantt charts.*

*Using BIM also prevents (1) the designers from clashing with their blueprints. This is because, they would all be able to see where the problems (1) are before any delays occur from the problems.*

*BIM also allows to use other things such as JIT (Just-In-Time) (1) delivery and allows us to get a much more accurate pricing on materials needed (1). On this project this benefits us tremendously due to the lack of time and financial limits we have.*



### **Examiner Commentary on application of mark scheme**

Candidate has responded with a detailed and accurate understanding and knowledge of the government BIM levels, as mentioned in the mark scheme, and relating to the context of the question. These have been highlighted with a mark being assigned. Hence, the candidate has managed to obtain (10) marks (Band 4) for their responses. The candidate has not fully accessed all marks for this question, due to not fully linking their response to all question elements and context. For example, the candidate has not fully elaborated on the BIM different levels etc.

The candidate needs to expand their responses with a little more detail and relevant context to access the top marks.

### **6.3. Examiner Hints and Tips**

- Candidates should be encouraged to highlight or underline the context given within the question. They should consider how this context impacts on the question they are being asked. They will only be given context and information which is relevant and needed for them to answer the question.
- Candidates should link their responses against the question context and requirements specifically, trying not to respond randomly in their own words.
- Candidates should re-read the question after completing their initial response to ensure all aspects of the question have been responded to.

## Get in touch

The City & Guilds Quality team are here to answer any queries you may have regarding your T Level Technical Qualification delivery.

Should you require assistance, please contact us using the details below:

Monday - Friday | 08:30 - 17:00 GMT

T: 0300 303 53 52

E: [technicals.quality@cityandguilds.com](mailto:technicals.quality@cityandguilds.com)

W: <http://www.cityandguilds.com/tlevels>

Web chat available [here](#).

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