Sample Assessment Materials (SAMs)

CONSTRUCTION AND THE BUILT ENVIRONMENT

From September 2013

Pearson BTEC Level 1/Level 2 First Award in Construction and the Built Environment
Pearson BTEC Level 1/Level 2 First Certificate in Construction and the Built Environment
Pearson BTEC Level 1/Level 2 First Extended Certificate in Construction and the Built Environment
Pearson BTEC Level 1/Level 2 First Diploma in Construction and the Built Environment

ALWAYS LEARNING
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Introduction

Sample assessment materials (SAMs) provide learners and centres with specimen questions and mark schemes. These are used as the benchmark to develop the external assessment learners will take.

Unit 1: Construction Technology

The SAMs for this external unit have been provided for the following qualifications:

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As the Award is nested within the Certificate, Extended Certificate and Diploma, we have adopted the convention of titling external assessments for the smallest award for which they are available across the whole BTEC first suite. This is the same convention used for AS/GCSE which is also a nested qualification.
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The sample assessment test and mark scheme are for the following qualifications:

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Write your name here
Surname Other names

Total Marks

Paper Reference

You do not need any other materials.

Construction and the Built Environment

Unit 1: Construction Technology

Sample Assessment Material

Time: 1 hour

Instructions

• Use black ink or ball-point pen.
• Fill in the boxes at the top of this page with your name, centre number and learner registration number.
• Answer all questions.
• Answer the questions in the spaces provided – there may be more space than you need.

Information

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Advice

• Read each question carefully before you start to answer it.
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Unit 1: Construction Technology

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Answer ALL Questions

1. Many functional elements contribute to making a building safe, secure, sustainable and comfortable.

(a) Match the property to how it is achieved in a low-rise building.

Draw a line to match each property to how it is achieved.

<table>
<thead>
<tr>
<th>Property</th>
<th>How it is achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing a brownfield site</td>
<td>Stability</td>
</tr>
<tr>
<td>Provision of artificial light</td>
<td>Sustainability</td>
</tr>
<tr>
<td>Provision of ventilation</td>
<td>Construction of a suitable foundation</td>
</tr>
<tr>
<td>Developing a greenfield site</td>
<td></td>
</tr>
</tbody>
</table>

(b) Complete the sentence about U-values below.

A U-value is a measure of:

☐ A heat loss from a building
☐ B load transfer within a building
☐ C fire resistance in a building
☐ D sound resistance in a building.
(c) Outline two methods of making sure windows can resist the weather. (2)

1 ..................................................................................................................................

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2 ..................................................................................................................................

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..................................................................................................................................

(d) Identify **two** construction methods used to slow down the spread of fire in a building. (2)

- A Compartments
- B Wet Risers
- C Barriers
- D Smoke Detectors
- E Fire Alarms

(e) In the UK, which is the best direction for a building to face to make the most use of natural light? (1)

- A North
- B South
- C East
- D West

**(Total for Question 1 = 8 marks)**
2 A scaled site layout plan is used to plan the preparation required on site prior to work starting.

Name two welfare facilities that should be shown on the scaled site layout plan.

1 ........................................................................................................................................

........................................................................................................................................

2 ........................................................................................................................................

........................................................................................................................................

(Total for Question 2 = 2 marks)

3 A substructure design engineer needs to identify the component parts of a foundation drawing.

(a) Label the components of the foundation cross section shown in Diagram 1.

Diagram 1
(b) What is the name given to the foundation shown in the cross section in Diagram 1?

☐ A Deep strip
☐ B Mass fill
☐ C Strip
☐ D Raft

(Total for Question 3 = 5 marks)

4 Sketch a diagram of a cross section through an external masonry cavity wall.
You should annotate your diagram.

(Total for Question 4 = 4 marks)
5 Timber-framed construction uses a secondary finish which is applied to the outside of the panels.

Give one secondary finish which keeps out the weather.

(Total for Question 5 = 1 mark)

6 An architect is designing a house and is considering two types of floor.

(a) Explain two advantages of using a beam and block floor instead of a solid floor.

1

2

(b) Explain how the installation of a damp-proof membrane prevents moisture transfer in solid floor construction.

(Total for Question 6 = 6 marks)
7  Give two functions of a foundation.

1 ..........................................................................................................................

2 ..........................................................................................................................

(Total for Question 7 = 2 marks)

8  The use of structural insulated panels (SIPs) is a modern method of construction.

   Explain two reasons why SIPs are more sustainable than cavity wall construction.

1 ..........................................................................................................................

2 ..........................................................................................................................

(Total for Question 8 = 4 marks)
9 The excavation of a substructure for a foundation has a number of hazards associated with it.

(a) Complete the table to show the missing hazard and the missing associated risk for this type of excavation.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Associated risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collapse of the sides of the excavation</td>
<td>Severe injury or fatality to workers</td>
</tr>
<tr>
<td>Flooding and potential drowning</td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td></td>
</tr>
</tbody>
</table>

(b) Explain two control measures used to prevent the collapse of the sides of the excavation.

1 ..........................................................................................................................
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..........................................................................................................................
..........................................................................................................................

2 ..........................................................................................................................
..........................................................................................................................
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..........................................................................................................................

(Total for Question 9 = 6 marks)
A client has commissioned an architect to design a house in a location with high rainfall and high wind speeds.

Explain **two** appropriate specifications for the external cavity wall.

1. ..........................................................................................................................
   ..........................................................................................................................
   ..........................................................................................................................
   ..........................................................................................................................

2. ..........................................................................................................................
   ..........................................................................................................................
   ..........................................................................................................................
   ..........................................................................................................................

(Total for Question 10 = 4 marks)
11 Evaluate whether a flat roof or a pitched roof would be more appropriate for an office scheme.

(Total for Question 11 = 8 marks)
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate’s response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the mark scheme to a candidate’s response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the candidate has replaced it with an alternative response.
<table>
<thead>
<tr>
<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(a)</td>
<td>1 mark for each of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stability – Construction of a suitable foundation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sustainability – Developing a brownfield site.</td>
<td>(2)</td>
</tr>
<tr>
<td>1(b)</td>
<td>A – heat loss from a building.</td>
<td>(1)</td>
</tr>
<tr>
<td>1(c)</td>
<td>1 mark for each method of achieving weather resistance identified:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• sealants (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• falls e.g. sloping windowsills (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• double glazing (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• draught strips/weather seals (1).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept any other appropriate answers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Up to a maximum of two marks.</td>
<td>(2)</td>
</tr>
<tr>
<td>1(d)</td>
<td>1 mark for each of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A – Compartments</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C – Barriers.</td>
<td></td>
</tr>
<tr>
<td>1(e)</td>
<td>B – South.</td>
<td>(1)</td>
</tr>
<tr>
<td>2</td>
<td>1 mark for each welfare facility identified:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• first aid point/provision (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• mess room/canteen (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• drying/changing room (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• toilets (1).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept any other appropriate answer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Up to a maximum of two marks.</td>
<td>(2)</td>
</tr>
<tr>
<td>Question Number</td>
<td>Answer</td>
<td>Mark</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>3(a)</td>
<td>One mark for each correct label: Label i) weak mix cavity fill Label ii) damp-proof membrane (dpm) Label iii) trench blocks/blockwork/concrete blocks Label iv) sand blinding/sand/blinding/sand bed.</td>
<td>(4)</td>
</tr>
<tr>
<td>3(b)</td>
<td>C – Strip</td>
<td>(1)</td>
</tr>
<tr>
<td>4</td>
<td>Accept fill patterns in place of annotation 1 mark for each label or fill pattern: 1 mark for brickwork labelled/fill pattern 1 mark for blockwork labelled/fill pattern 1 mark for cavity/insulation labelled/fill pattern 1 mark for wall tie labelled/fill pattern Example of an acceptable sketch with appropriate labelling and fill patterns.</td>
<td>(4)</td>
</tr>
</tbody>
</table>

Accept similar valid alternative sketches.
### Question 5

**Answer**

1 mark for each secondary finish:

- brickwork
- rendered blockwork
- insulated render
- cedar cladding
- tile hanging
- UPVC cladding
- Shingles.

Accept any other appropriate answer.

### Question 6(a)

**Answer**

Any two from the following advantages of beam and block floors over solid floors:

- faster construction using beam and block floor than solid floors (1) because no hardcore/surface preparation/form work required (1)
- the use of a beam and block floor reduces the foundation load compared with a solid floor (1) so lighter weight (1)
- no curing period required for beam and block floors but solid floors require a curing period (1) so beam and block floors can be used straightaway (1)
- beam and block floors can be laid in bad weather but solid floors cannot (1) because for beam and block floors everything is pre-cast. (1)

1 mark per advantage identified, and 1 mark for explanation of that advantage.

Accept any other suitable answers.

Up to a maximum of four marks.

### Question 6(b)

**Answer**

2 marks for any of the following explanations of how the installation of damp-proof membrane prevents moisture transfer:

- lapping of the material (1) to prevent moisture gaining access via capillary traction in the lap between sheets (1)
- taping of joints (1) to prevent water penetrating membrane lap (1)
- linking to the DPC (1) to provide continuity of protection (1)
- installation of a specific thickness of damp-proof membrane (1) to resist perforation (1)

Accept any other appropriate answers.

Up to a maximum of two marks.
<table>
<thead>
<tr>
<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
</table>
| 7               | Any two from the following functions of a foundation:  
• to safely transmit the loads of the building to the subsoil (1)  
• to settle within acceptable limits for settlement (1)  
• to support the loads of the building for its lifespan. (1)  
Up to a maximum of two marks. | (2) |

<table>
<thead>
<tr>
<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
</table>
| 8               | Any two from the following reasons why SIPs are more sustainable than cavity walls:  
• SIPs are lighter than cavity walls (1) so less concrete for foundations needed (1)  
• SIPs are pre-insulated whereas cavity walls are not (1) so with SIPs don’t have to cut/fit insulation as a secondary process (1)  
• faster construction using SIPs than using traditional cavity wall construction (1) which reduces contract period (less on-site resources, saving energy and fuel) (1)  
• SIPs have a high strength to weight ratio than cavity wall (1) so shallower foundations/less materials required and to be disposed off (1)  
• OSB (oriented strand boards) used to face the SIPs panels boards (1) can be recycled more easily than the materials used for cavity walls. (1)  
Accept any other suitable answers.  
1 mark per reason identified and 1 mark for explanation of that reason.  
Up to a maximum of four marks | (4) |
<table>
<thead>
<tr>
<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>9(a)</td>
<td>Any two from the following specifications for the external cavity wall: (1) use a cement mortar because it is less porous; (1) use of a tooled or weathered joint because it sheds water better than other methods; (1) continuity of cavity because the air void prevents moisture transfer from the outside to the inside of the building; (1) avoidance of mortar bridges because mortar bridges provide a direct bridge to transfer moisture into the building; (1) use partial fill insulation because using full fill increases the chances of mortar bridges; (1) use of a drained cavity because water that enters the cavity to escape; (1) type of bricks (higher density) because it has a better surface finish and will shed water better/less water uptake/denser brick has fewer air voids. (1)</td>
<td>4</td>
</tr>
</tbody>
</table>
| 9(b)            | Any two from the following control measures:  
  - Physical barriers (1) stop machinery or people putting pressure on weak ground (1).  
  - Stops for excavation plant, eg sleepers (1) prevents moving machinery from going too close to excavation (1).  
  - Trench supports, eg timbering (1) holds sides of excavation back (1).  
  - Excavate and pour foundation immediately (mass trench fill) (1) no need for access to trench/less time for soil to loosen. (1)  

Accept any other suitable answer.  
1 mark for selected method and 1 mark for explanation of how it prevents collapse. | 4   |
<table>
<thead>
<tr>
<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Any two from the following specifications for the external cavity wall:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• use a cement mortar (1) because it is less porous (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• use of a tooled or weathered joint (1) because it sheds water better than other methods (1)</td>
<td></td>
</tr>
<tr>
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<td>• continuity of cavity (1) because the air void prevents moisture transfer from the outside to the inside of the building (1)</td>
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<td>• use partial fill insulation (1) because using full fill increases the chances of mortar bridges (1)</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• type of bricks (higher density) (1) because it has a better surface finish and will shed water better/less water uptake/denser brick has fewer air voids so reduces chances of passing moisture. (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>accept any other appropriate answers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>up to a maximum of four marks.</td>
<td>(4)</td>
</tr>
</tbody>
</table>
Question Number | Answer | Mark
---|---|---
11 | **Indicative content**
Advantages of a flat roof:
- aesthetics
- enables parapet feature to be provided within the building
- ease of maintenance
- forms entertainment/recreational area for staff/visitors
- economical commercial alternative.

Disadvantages of a flat roof:
- water run-off and ponding
- whole-life costs of a flat roof installation including periodic maintenance
- solar reflective paint required which needs to be maintained
- additional hardwearing surfaces required where trafficked.

Advantages of a pitched roof:
- aesthetics
- creates more floor space or storage space
- better water run off
- less maintenance required.

Disadvantages of a pitched roof:
- initial cost more expensive
- takes longer to build
- traditionally difficult to access for maintenance.

(8)

<table>
<thead>
<tr>
<th>Level</th>
<th>Mark</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>No material deserving of reward.</td>
</tr>
<tr>
<td>1</td>
<td>1–3</td>
<td>Basic argument for both types of roof identified, or only one roof type considered in more depth. The answer is likely to be in the form of a list. Points will be superficial/generic and not applied/directly linked to the office development in the question. No conclusion produced or conclusion a consequence of only one side of the argument being considered.</td>
</tr>
<tr>
<td>2</td>
<td>4–6</td>
<td>Arguments for and against each roof type are given, but there will be more emphasis on one roof type for the high-class office context. The answer will be unbalanced. A conclusion is present, but is either implicit or as a result of unbalanced consideration of the arguments. There is a little or unfocused justification of the question, but the link will not always be clear.</td>
</tr>
<tr>
<td>3</td>
<td>7–8</td>
<td>Balanced explanation of both roof types, for and against. A conclusion is produced which is justified and linked clearly to the consideration of arguments for and against, and their relative importance to the situation. The majority of points will be relevant and there will be a clear link to the office development in the question.</td>
</tr>
</tbody>
</table>
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Construction and the Built Environment

Unit 11: Sustainability in Construction

Sample Assessment Material

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Section A

1 Which two of these features are used to reduce air leakage from a building?

☐ A Automatic external door closers
☐ B Interlocking concrete roof tiles
☐ C Triple glazing
☐ D Draught sealing
☐ E Cavity wall insulation

(Total for Question 1 = 2 marks)

2 Give one way of reducing the impact of dust produced during excavation and building demolition on the surrounding environment.

..........................................................................................................................
..........................................................................................................................
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(Total for Question 2 = 1 mark)
Sustainable technologies can be used to meet building requirements.

Match the building requirements to the appropriate sustainable technologies that can be used.

Draw a line to match each building requirement to the correct sustainable technology.

<table>
<thead>
<tr>
<th>Building requirement</th>
<th>Sustainable technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>Passive stack ventilation</td>
</tr>
<tr>
<td></td>
<td>Ground source heat recovery</td>
</tr>
<tr>
<td>Air circulation</td>
<td>Solar hot water panel</td>
</tr>
<tr>
<td></td>
<td>Large areas of planting</td>
</tr>
<tr>
<td></td>
<td>Photovoltaic panels</td>
</tr>
</tbody>
</table>

(Total for Question 3 = 2 marks)
4 Carbon emissions occur during the construction phase of a development, for example, when materials are transported to construction sites.

(a) Give **two** other ways that carbon emissions are generated on site **during** the construction of a building.

(b) Explain **one** way a contractor could reduce carbon emissions from transportation when ordering materials for a construction site.

(Total for Question 4 = 4 marks)

5 A construction company is planning a construction project.

Give **two** ways in which the construction company can involve the local community when planning the project.

(Total for Question 5 = 2 marks)
6 Explain how **two** sustainable techniques reduce the costs for occupants of a building.

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(Total for Question 6 = 4 marks)
7 Construction developments can cause damage to the physical environment.

One example of damage is the clearing of natural habitats which affects biodiversity.

(a) Explain one other way that damage to the physical environment can occur. 

(b) Give one way that may reduce the impact on biodiversity.

(c) Explain two disadvantages of using a brownfield site for a construction project developer.

(Total for Question 7 = 7 marks)
8 Which **two** of these use 'low energy embodied' materials?

- [ ] A  A timber frame
- [ ] B  A steel frame
- [ ] C  A straw bale wall
- [ ] D  A brick wall
- [ ] E  A concrete frame

(Total for Question 8 = 2 marks)

9 The proposed development of a residential area may contain design features that would be beneficial to the local community.

Explain how **two** design features of a development can benefit the community.

1

2

(Total for Question 9 = 4 marks)

**TOTAL FOR SECTION A = 28 MARKS**
Section B: Construction of office buildings

Read the source material below and then answer the questions.

(Source: © Stephen Richards, www.geographic.org.uk)

Building 1: 1962 Office Block

Building 1 shows an office development constructed in 1962.

It is constructed using a concrete frame with concrete panels below the single-glazed metal windows. The remaining walls are constructed using brick cladding. The roof is a flat roof design using felt roofing bonded with bitumen to the roof deck. The main entrance of the building faces south west.

The wall areas around the stairs are in-filled with traditional brickwork. There is very little insulation built into the outer walls. Artificial lighting is provided by the use of strip lighting to the offices and low-energy halogen light bulbs to the stairwells and reception areas. The building is heated by a gas-fired boiler that was installed 20 years ago. There are no air-conditioning facilities in the building and the windows open to provide ventilation.

The building is in an inner-city location, with built-up areas surrounding it and hard standing and pavements at ground level.
Building 2: 2012 Office Block

Building 2 shows an office development constructed in 2012 built on a brownfield site. It is constructed from a steel frame and clad in glass and terracotta tiles with some brickwork panelling. The building is orientated towards the south. It has aluminium sun screens attached to the aluminium-framed double-glazed windows. These windows do not open. One staircase and two lifts serving all floors are placed near the centre of the building, with a second staircase towards the rear entrance of the building.

The building has thermal insulation within the walls, floor and roof. The flat roof area contains a green sedum roof with a recreational terrace. The eaves detailing around the roof edges are in zinc panelling and rainwater falling on the roof area is harvested.

Demolition waste was used for filling materials. Cooling and heating requirements for the building are provided by ground-source heat pumps and natural stack ventilation.
10 Both buildings have sustainable features.

(a) Outline two sustainable features of Building 1.

1

2

(b) Explain how aluminium sun screens in Building 2 contribute to sustainability.

(Total for Question 10 = 6 marks)

11 An office block like Building 1 is being demolished.

State how each of the materials can be disposed of sustainably.

Bricks

Glass

(Total for Question 11 = 2 marks)
12 Give **two** reasons why the collection of rainwater in Building 2 improves sustainability.

1 ...........................................................................................................................................

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...........................................................................................................................................

2 ...........................................................................................................................................

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(Total for Question 12 = 2 marks)

13 Explain **two** disadvantages of using a green roof for an office building.

1 ...........................................................................................................................................

...........................................................................................................................................

...........................................................................................................................................

2 ...........................................................................................................................................

...........................................................................................................................................

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(Total for Question 13 = 4 marks)
14 Compare the carbon footprint of the two buildings during the operational phase of their lifecycles.

(Total for Question 14 = 8 marks)

TOTAL FOR SECTION B = 22 MARKS
TOTAL FOR PAPER = 50 MARKS
General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate’s response is not worthy of credit according to the mark scheme.
- Where some judgment is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the application of the mark scheme to a candidate’s response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
<table>
<thead>
<tr>
<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 mark for <strong>each</strong> correct answer:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) automatic external door closures</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) draught sealing</td>
<td>(2)</td>
</tr>
<tr>
<td>2</td>
<td>1 mark for giving an example of reducing dust.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Any one from:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• wheel washing (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• road sweeping (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• damping down (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• dust suppression equipment (1).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept any other appropriate answers.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1 mark for <strong>each</strong> correct building requirement matched to the correct sustainable technology.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electricity to photovoltaic panel (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air circulation to passive stack ventilation (1).</td>
<td>(2)</td>
</tr>
<tr>
<td>4 (a)</td>
<td>1 mark for <strong>each</strong> way identified.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Any two from:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• plant and machinery use on site (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• the lighting of the site (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• the heating of social areas (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• provision of hot water for sanitary facilities (1).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Accept any other appropriate answers that relate to emissions generated during construction. Do not award credit for two answers that refer to plant/machinery.</td>
<td>(2)</td>
</tr>
<tr>
<td>Question Number</td>
<td>Answer</td>
<td>Mark</td>
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<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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</tbody>
</table>
| 4 (b)           | A linked response that makes reference to any one of the following points. Up to 2 marks for an explanation. Any one from:  
- use of locally-sourced materials (1) so travel distances to site reduced (1)  
- use of more fuel-efficient modern vehicles (1) so less fuel used per mile travelled (1)  
- buying materials in bulk (1) to reduce the number of vehicles/journeys by vehicles to site (1)  
- ordering a variety of materials from one supplier for delivery to site together (1) reducing the number of vehicle journeys to site (1).  
Accept any other appropriate answers.                                                                                           | (2)  |
| 5               | 1 mark for each way of involving the community when planning the development. Any two from:  
- local committees and/or a local representative (1)  
- community liaison officers (1)  
- setting up community consultation event(s) (1)  
Accept any other appropriate answers.                                                                                         | (2)  |
| 6               | A linked response that makes reference to the following points. Up to 2 marks for each explanation.  
- long-term cost savings (1) due to reduced energy usage for heating and lighting (1)  
- reduced maintenance costs for occupant (1), due to use of sustainable durable materials (1)  
Accept any other appropriate answers.                                                                                         | (4)  |
<table>
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</thead>
</table>
| 7 (a)           | A linked response that makes reference to any one of the following points. Up to 2 marks for an explanation. Any one from:  
- waste materials produced during demolition and construction (1) can cause damage to land through pollution if not disposed of correctly/ can lead to loss of land through using for waste disposal (1)  
- air pollution (1) resulting from site emissions (1)  
- ground water contamination (1) resulting from chemical spillage (1)  

Accept any other appropriate answers.                                                                 | (2)  |
| 7 (b)           | 1 mark for giving a measure used to minimise the impact on biodiversity. Any one from:  
- need to plan areas for relocating wildlife/plant life during the construction stage (1).  
- when using land containing important wildlife/plant life, incorporate this into the construction scheme (1).  
- during the buildings life, minimize the detrimental effect on wildlife/plant life by sectioning off of areas for wildlife and planting use. (1)  

Accept any other appropriate answers.                                                                 | (1)  |
| 7 (c)           | A linked response that makes reference to the following disadvantages. Up to 2 marks for each explanation.  
- Brownfield sites usually require the demolition of structures (1) so there is increased initial development costs through the demolition cost/the disposal of waste materials (1)  
- Old industrial brownfield sites may be contaminated with chemicals (1) so there is the cost of decontaminating the site and disposal of hazardous waste by specialists (1)  

Accept any other appropriate answers.                                                                 | (4)  |
<table>
<thead>
<tr>
<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
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<tbody>
<tr>
<td>8</td>
<td>1 mark for <strong>each</strong> correct answer:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- A) a timber frame (1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- C) a straw bale wall (1)</td>
<td></td>
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<tr>
<td></td>
<td>(2)</td>
<td></td>
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<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
</table>
| 9               | A linked response that makes reference to any **two** of the following design features used to benefit the community. Up to 2 marks for **each** explanation.  
|                 | Any two from the following:                                                                                       |      |
|                 |   - including internal communal areas (1) so occupants are encouraged to engage with others and enjoy their environment (1)           |      |
|                 |   - creating cycle lanes so that people cycle (1) which reduces traffic congestion which improves safety and cuts pollution (1)   |      |
|                 |   - creating community gardens/green spaces (1) so people have social outdoor space/ leisure areas (1)                      |      |
|                 | Accept any other appropriate answers.                                                                               | (4)  |


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<tr>
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<th>Mark</th>
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</thead>
</table>
| 10 (a)          | 1 mark for **each** sustainable feature. Any two from:  
- opening windows for ventilation  
- south west orientation  
- low energy halogen lights  
Accept any other appropriate answers. Do not accept feature e.g. lights without reference to what it is that makes them sustainable e.g. low energy halogen. | (2) |
| 10 (b)          | A linked response that makes reference to the following points. Up to 4 marks for an explanation.  
- aluminium sun screens reduce the need for air conditioning (1) because when sun is high in the sky in summer it provides screening/shade from too much heat gain through the glass (1). In winter when the sun is lower in the sky sunscreens allow solar gain to contribute to the heating of the building (1) which reduces heating costs (1).  
Accept any other appropriate answers. | (4) |
| 11              | 1 mark for how **each** material can be disposed of sustainably.  
- Bricks - cleaning off and re-use/ crush for use as fill (1)  
- Glass – sort for recycling into new glass (1)  
Do not accept answers that simply refer to ‘recycling bricks’ or ‘recycle glass’. | (2) |
<table>
<thead>
<tr>
<th>Question Number</th>
<th>Answer</th>
<th>Mark</th>
</tr>
</thead>
</table>
| 12              | 1 mark for **each** reason why rainwater collection improves the sustainability of Building 2.  
Any two from:  
- less mains water required (1)  
- less drainage capacity required (1)  
- less water run off (1)  
- can be used for watering the green roof (1)  
Accept any other appropriate answers.                                                                                                                                       | (2)  |
| 13              | A linked response that makes reference to any **two** of the following disadvantages. Up to 2 marks for **each** explanation.  
Any two from the following disadvantages:  
- green roofs permanently contain moisture (1) requiring the installation of a long lasting and fit-for-purpose roof waterproofing system which requires expertise (1)  
- natural rainfall may be insufficient to meet plant needs all year (1) so higher initial and ongoing costs than a traditional roof because need for the installation of an irrigation system (1)  
- weight of the soil and planting increases the structural support required for roof area (1) so higher initial construction costs than traditional roofing (1)  
- occupants using the roof must be kept safe (1) so requires the installation of safety barriers which adds to the initial construction costs/ ongoing maintenance (1)  
Accept any other appropriate answers.  
Do not award credit for mention of initial construction costs/need for ongoing maintenance in both answers.                                                                 | (4)  |
**Question Number** | **Indicative content** | **Mark**
---|---|---
14 | **Comparison of the carbon footprint of the two buildings during the operational phase of their life cycle:**
- Building 2 has large areas of glass which are thicker than the glazing of Building 1 and are also double glazed which will result in a higher embodied energy content for the glazing than Building 1
- The aluminum sun screens of Building 2 assist to keep the building cool but are made from a material with a high embodied energy. However, Building 1 is cooled via natural ventilation (opening windows) which results in zero emissions
- Building 2 has high standards of insulation to the walls/ground floor/windows/roof, while Building 1 will have minimal insulation incorporated in the external envelope and no insulation to the ground floor. Building 1 will, therefore, consume more energy to heat the building and this will increase the carbon footprint during the operational phase
- For Building 2, the heating and ventilation is provided by ground source heat pumps and natural stack ventilation so minimal energy is consumed, whereas Building 1 has gas fired central heating using a 20-year-old inefficient boiler, so the emissions from heating Building 1 and subsequent carbon footprint are much higher
- The large glazed areas and sun screens of Building 2 maximize the use of heat and light from the sun in winter and this reduces emissions from both heating and lighting. Building 1 has a greater dependence on artificial lighting via strip lighting and low-energy halogen lights

Any other appropriate answers.

<table>
<thead>
<tr>
<th>Level</th>
<th>Mark</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>No rewardable material.</td>
</tr>
<tr>
<td>1</td>
<td>1-3</td>
<td>Basic similarities and differences between Building 1 and Building 2 identified, or only similarities or differences considered. The answer is likely to be in the form of a list, and statements may be incomplete. Statements made will be superficial/generic and not applied to the context in the question. Statements will not contrast/link elements of Building 1 and Building 2 directly to each other.</td>
</tr>
<tr>
<td>2</td>
<td>4-6</td>
<td>Some similarities and differences between Building 1 and Building 2 identified, or a few key similarities and differences described, but this will include statements that do not contrast/link elements of Building 1 and Building 2 directly to each other. Consideration of both similarities and differences but there will be an inappropriate emphasis on one of them. The answer is unbalanced. Most points made will be relevant to the context in the question.</td>
</tr>
<tr>
<td>3</td>
<td>7-8</td>
<td>Range of similarities and differences described, or a few key similarities and differences explained in depth. Balanced consideration of both similarities and differences, with all statements contrasting/linking elements of Building 1 and Building 2 directly to each other. The majority of observations made will be relevant in terms of the context in the question.</td>
</tr>
</tbody>
</table>
Comparison of the carbon footprint of the two buildings during the operational phase of their life cycle:

Building 2 has large areas of glass which are thicker than the glazing of Building 1 and are also double glazed which will result in a higher embodied energy content for the glazing than Building 1. The aluminum sun screens of Building 2 assist to keep the building cool but are made from a material with a high embodied energy. However, Building 1 is cooled via natural ventilation (opening windows) which results in zero emissions. Building 2 has high standards of insulation to the walls/ground floor/roof, while Building 1 will have minimal insulation incorporated in the external envelope and no insulation to the ground floor. Building 1 will, therefore, consume more energy to heat the building and this will increase the carbon footprint during the operational phase.

For Building 2, the heating and ventilation is provided by ground source heat pumps and natural stack ventilation so minimal energy is consumed, whereas Building 1 has gas fired central heating using a 20-year-old inefficient boiler, so the emissions from heating Building 1 and subsequent carbon footprint are much higher.

The large glazed areas and sun screens of Building 2 maximize the use of heat and light from the sun in winter and this reduces emissions from both heating and lighting. Building 1 has a greater dependence on artificial lighting via strip lighting and low-energy halogen lights.

Any other appropriate answers.

Mark: 14

Descriptor: 0-3 basic similarities and differences between Building 1 and Building 2 identified, or only similarities or differences considered. The answer is likely to be in the form of a list, and statements may be incomplete. Statements made will be superficial/generic and not applied to the context in the question. Statements will not contrast/link elements of Building 1 and Building 2 directly to each other.

Level: 1-3

Mark: 4-6

Descriptor: Some similarities and differences between Building 1 and Building 2 identified, or a few key similarities and differences described, but this will include statements that do not contrast/link elements of Building 1 and Building 2 directly to each other. Consideration of both similarities and differences but there will be an inappropriate emphasis on one of them. The answer is unbalanced. Most points made will be relevant to the context in the question.