



Rewarding Learning

General Certificate of Secondary Education
2016

Construction and the Built Environment

Assessment Unit 1

The Construction Industry for the 21st Century

[GCB11]

MONDAY 13 JUNE, AFTERNOON

MARK SCHEME

General Marking Instructions

Introduction

Mark schemes are intended to ensure that the GCSE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these general marking instructions.

Assessment Objectives

Below are the assessment objectives for Construction and the Built Environment.

Candidates must:

- recall, select and communicate their knowledge of construction and the built environment and understanding of a range of contexts (AO1);
- apply skills, knowledge and understanding in a variety of contexts and in planning and carrying out investigations and tasks (AO2); and
- analyse and evaluate evidence, make reasoned judgements and present conclusions (AO3).

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Types of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response

Tasks and questions requiring candidates to respond in extended writing are marked in terms of levels of response. In deciding which level of response to award, examiners should look for the “best fit” bearing in mind that weakness in one area may be compensated for by strength in another. In deciding which mark within a particular level to award to any response, examiners are expected to use their professional judgement. The following guidance is provided to assist examiners.

- **Threshold performance:** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.
- **Intermediate performance:** Response which clearly merits inclusion in the level and should be awarded a mark at or near the middle of the range.
- **High performance:** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Marking calculations

In marking answers involving calculations, examiners should apply the “own figure rule” so that candidates are not penalised more than once for a computational error.

Quality of written communication

Quality of written communication is taken into account in assessing candidates’ response to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of levels of response. The description for each level of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within levels of response as follows:

Level 1: Quality of written communication is limited.

Level 2: Quality of written communication is satisfactory.

Level 3: Quality of written communication is excellent.

In interpreting these level descriptions, examiners should refer to the more detailed guidance provided below:

Level 1 (Limited): The level of accuracy of candidates’ presentation, spelling, punctuation and grammar is limited. The candidate makes a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary.

Level 2 (Satisfactory): The level of accuracy of candidates’ presentation, spelling, punctuation and grammar is satisfactory. The candidate makes a satisfactory selection and use of an appropriate form and style of writing supported with appropriate use of diagrams as required. Relevant material is organised with some clarity and coherence. There is some use of specialist vocabulary.

Level 3 (Excellent): The level of accuracy of candidates’ presentation, spelling, punctuation and grammar is excellent. The candidate successfully selects and uses the most appropriate form and style of writing, supported with precise and accurate use of diagrams where appropriate. Organisation of relevant material is excellent. There is excellent use of appropriate specialist vocabulary.

Section A

Answer **all** questionsAVAILABLE
MARKS

Use the Pre-Release Material to assist with answering questions 1, 2, 3, and 9.

- 1 (a) Cavity wall (construction) or Cavity [1]
- (b) Constructed from a series of small rooms or cells
Create a strong structure
Constructed from a number of short walls joined at right angles
Residential structure
Any two of the above [2]
Or any other appropriate answer up to a maximum of [2].
- (c) Main functional requirements of walls
- Strength
Stability
Weather Exclusion
Thermal Insulation
Sound Insulation
Durability
Fire Resistance
Appearance
Privacy
Security
Separate rooms/cells
Support load
Support roof
[1] per function up to a maximum of [8] or any other appropriate answer [8] 11
- 2 (a) **Architect**
- Any of the following or other appropriate response:
- Design the dwelling shown in the pre-release materials
 - Supervise the work on site
 - Apply for planning permission
 - Apply for Building Control approval
 - Prepare the working drawing or drawings
 - Prepare the site plan
 - Appoint a design team
 - Approve interim valuations
 - Tender process
 - Specification of materials
- [1] per response up to a maximum of [3] [3]
- (b) **Bricklayer**
- Any of the following or other appropriate response:
- Build bricks
 - Build blocks
 - Position and secure window sills
 - Position and secure heads or lintels
 - Build in DPC
 - Place concrete
 - Bed timber wall plates

5 (a) Hipped or hipped roof [1]

(b) Any of the following or other appropriate response:

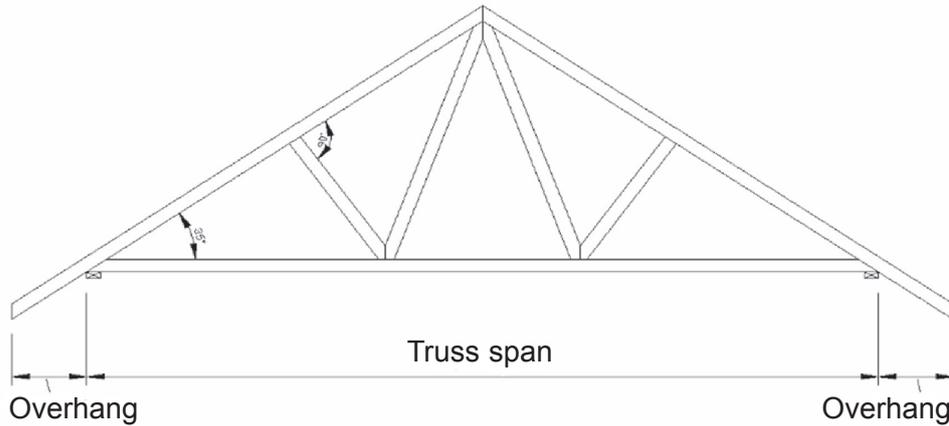
- Slates
- Natural slates
- Concrete interlocking roof tiles or roof tiles
- Clay tiles
- Felt membrane

[1] per response up to a maximum of [3] [3]

(c) 400 mm or 600 mm

[1] for either 400 mm or 600 mm [1]

(d)



[1] per component correctly drawn up to a maximum of [8]

Rafter × 2

Strut × 1

Tie × 1

Overhang × 2

Wall plates × 2

Overall span × 1

Ceiling joist × 1

Quality of completed drawing [1]

[8]

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6 (a) Main performance requirements of windows

- Weather Exclusion
- Security
- Provide resistance to air penetration in the form of drafts
- Thermal and Sound Insulation
- Privacy (bathroom)
- Durability
- Light in
- View/visual
- Appearance
- Ventilation

[1] per performance requirement up to a maximum of [6], or any other appropriate answer.

[6]

(b) **Head**

The horizontal top member of the window/PVC or concrete.

Sill

The horizontal base of the window/PVC or concrete.

Stile

The vertical members of the window.

Transom

The horizontal member in a window frame.

Mullion

The vertical member in a window frame.

Fixed Light

A fixed component in a window. It will not open.

Opening casement An opening component in a window.

[1] per definition requirement up to a maximum of [7], or any other appropriate answer.

[7]

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Section A**70**AVAILABLE
MARKS

Section B

Answer all questions

AVAILABLE
MARKS**7 Economic benefits of Sustainable Construction**

- Consume minimum energy over its life cycle reducing running costs including heating and lighting
- Generate minimum waste over its life cycle reducing running costs
- Reduces the cost of landfill
- Integrate with the natural environment is a positive outcome but may have little or no economic benefits other than at the point of sale.
- Use renewable sources where possible to generate fuel from the Earth's natural resources having the economic benefit of reducing running costs.
- Enhance living, working and leisure environments for individuals and communities thus reducing the social burden of people becoming depressed/unwell.
- Reduces the demand for water in the community thus reducing costs
- Since the owners will have lower operating costs, more disposable income should be available to the owner therefore hopefully reducing the risk to lending institutions.
- Lower material costs with careful purchase of resources and materials
- Potential earnings from sales of reusable items removed during the demolition of old buildings.

Level 1 ([1]–[4]) (2 Economic benefits included)

Candidate discusses the economic benefits of Sustainable Construction for a new primary school. Candidates will show why sustainability reduces costs including full life cycle costs. Candidates will discuss the use of renewable energies and the subsequent reduction in the reliance on fossil fuels. Their level of accuracy for spelling, punctuation and grammar is limited. They discuss the economic benefits of Sustainable Construction in a limited form and style of writing. The presentation of the discussion is not fully coherent or organised and there is little use of specialised terms.

Level 2 ([5]–[7]) (3 Economic benefits included)

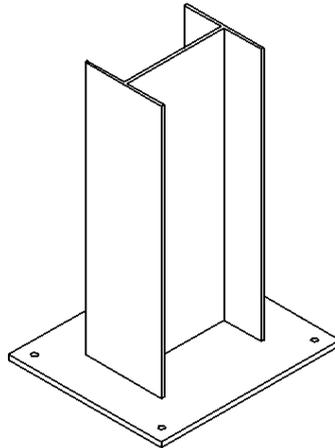
Candidate discusses the economic benefits of Sustainable Construction for a new primary school. Candidate will show why sustainability reduces costs including full life cycle costs. Candidate will discuss the use of renewable energies and the subsequent reduction in the reliance on fossil fuels. Candidate will also consider the positive impact on living standards and the reduced use of water. Candidate will show a satisfactory understanding of the difference between different sustainable economic issues. Their level of accuracy for spelling, punctuation and grammar is satisfactory. They discuss the economic benefits of Sustainable Construction in a satisfactory style and form of writing. The presentation of the discussion is coherent or organised in most cases and they use a range of specialised terms.

Level 3 ([8]–[10]) (4 points as shown above)

Candidate discusses the economic benefits of Sustainable Construction for a new primary school. Candidate will show why sustainability reduces costs including full life cycle costs. Candidate will discuss the use of renewable energies and the subsequent reduction in the reliance on fossil fuels. Candidate will also consider the positive impact on living standards and the reduced use of water. Candidate will show a satisfactory understanding of the difference between different sustainable economic issues. Their level of accuracy for spelling, punctuation and grammar is excellent. Candidate will show a satisfactory understanding of the difference between different sustainable economic issues. The presentation of the discussion is coherent and very well organised in most cases and they use a wide range of specialised terms. [10]

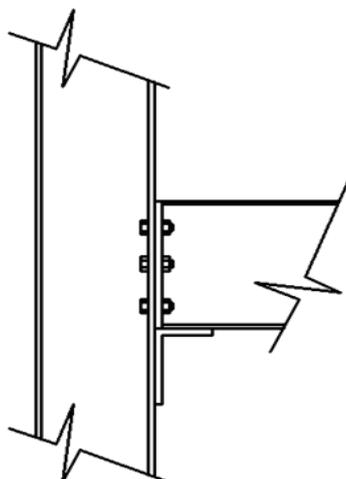
10

- 8 (a) Rectangular steel framed structure [2] or part answer [1] [2]
- (b) Beams [1] [1]
- (c) Columns/stanchion [1] [1]
- (d) Welding [1] [1]
- (e) Bolts [1] [1]
- (f) Concrete/reinforced concrete [2] [2]



- (g) [3] for a complete base including holes
 [2] for a base with no holes
 [1] for a limited base
 [3] for a complete column
 [2] for an almost completed column
 [1] for a limited column [6]

- (h) [3] for a complete beam including bolts
 [2] for a beam with no bolts
 [1] for a limited beam
 [3] for a complete column including bolts
 [2] for a completed column with no bolts
 [1] for a limited column
 [1] bolts



Any of the above to a maximum of [6] [6]

AVAILABLE MARKS

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9 Advantages and disadvantages of using renewable energy

AVAILABLE
MARKS

Advantages

- Minimal carbon footprint
- Reduced or no use of fossil fuels
- Energy source will always be available
- Sustainable construction enhances living, working and leisure environments for individuals and families as energy source is always available.
- Consume minimum energy over its life cycle
- Generate minimum waste over its life cycle
- Integrate with the natural environment in most cases other than wind turbines.
- Use renewable sources where possible

Disadvantages

- Initial set-up cost can be higher
- Wind turbines can be unsightly
- Takes additional space to accommodate solar panels in close proximity to the dwelling.

Improvements to structure of house

- Increased insulation to the roof
- Increase the cavity from 100 mm to 150 mm and add more insulation
- Install double glazing or triple glazing in all rooms with K glass or other equal or approved glass.
- Increased floor insulation
- Change the type of blocks used for the walls from concrete to a thermal block.

Level 1 ([1]–[4]) (2 advantages or disadvantages or improvement to the structure of the house.)

Candidate discusses the advantages or disadvantages of sustainable construction to generate energy for the house in the pre-release materials. Candidate will suggest ways to improve the fabric of the building structure as set out in the pre-release materials. Their level of accuracy for spelling, punctuation and grammar is limited. They discuss the advantages or disadvantages of sustainable construction in a limited form and style of writing. The presentation of the discussion is not fully coherent or organised and there is little use of specialised terms.

Level 2 ([5]–[7]) (3 advantages or disadvantages or improvement to the structure of the house.)

Candidate discusses the advantages or disadvantages of sustainable construction to generate energy for the house in the pre-release materials. Candidate will suggest ways to improve the fabric of the building structure as set out in the pre-release materials. Their level of accuracy for spelling, punctuation and grammar is satisfactory. They discuss the advantages or disadvantages of sustainable construction in a satisfactory style and form of writing. The presentation of the discussion is coherent or organised in most cases and they use a range of specialised terms.

Level 3 ([8]–[10]) (5 advantages or disadvantages or improvements to the structure of the house.)

Candidate discusses the advantages or disadvantages of sustainable construction to generate energy for the house in the pre-release materials. Candidate will suggest ways to improve the fabric of the building structure as set out in the pre-release materials. Their level of accuracy for spelling, punctuation and grammar is excellent. They discuss the advantages or disadvantages of sustainable construction demonstrating a satisfactory understanding. The presentation of the discussion is coherent and very well organised in most cases and they use a wide range of specialised terms. [10]

AVAILABLE
MARKS

10

- 10** Discuss the principal activities of the Construction Industry under the following headings.

Building

Building involves many aspects of construction including: commercial, residential, educational and health properties. It is an extremely large industry that provides jobs across the UK and beyond. The vast majority of building construction projects are small renovations, such as addition of a room, or renovation of a bathroom or kitchen. Large projects can take years to complete and cost millions of pounds.

Civil Engineering

Civil Engineers turn complex ideas into reality. They help make some of the most innovative structures in the world. Civil engineering activities in the construction industry deals with the design, construction, and maintenance of bridges, roads, tunnels, airports, dams, harbours, and wind farms. Civil Engineers must consider many factors in their designs, from the costs to making sure the structure will stay intact during inclement weather. Much of the national expenditure on civil engineering projects is much less visible as these are the utilities which are buried in our roads such as the water supply and sewage systems.

Building Services

Take away the heating, lighting, and ventilation, the lifts and escalators, acoustics, plumbing, the security and safety systems, power supply and energy management systems. You are left with a cold, dark, uninhabitable shell. Everything inside a building which makes it safe and comfortable comes under the title of 'Building Services'. A building must do what it was designed to do not just provide shelter but also be an environment where people can live, work and achieve. Building services are a large component of the overall cost of any building. [10]

10

Section B

50

Total

120