Rewarding Learning

General Certificate of Secondary Education
2015

Construction and the Built Environment

Assessment Unit 1

The Construction Industry for the 21st Century

[GCB11]

THURSDAY 11 JUNE, MORNING

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

AVAILABLE MARKS

1 **(a)** Natural stone [1]

Wet dash painted white [1]

(b) Any **one** of the following, [1] each up to a maximum of [7]

Security
Strength
Stability
Weather exclusion
Thermal Insulation
Sound Insulation
Durability
Fire resistance
Appearance
Privacy

Or any other suitable answer [7]

(c) Any **two** of the following, [1] each up to a maximum of [2]

Obtain maximum strength whilst distributing the loads carried by the walls.

Ensure lateral stability and resistance to side thrusts.

Create an acceptable appearance.

Reduce the number of cracks. [2] 11

2 **(a)** Candidates should relate the following responses to the pre-release materials.

AVAILABLE MARKS

Building Services Engineer
Any **three** from the following or other appropriate response:

- Health and Safety
- Outline plan for climate control or heating or lighting within the dwelling
- Design all internal layouts
- Prepare detailed working drawings for building services in the dwelling
- Calculate size of pipes for the dwelling
- Calculate size of generating plant for the dwelling
- Supervise the building services work on site
- Cost

[1] per main role up to a maximum of [3] [3]

(b) **Plumber**
Any **three** from the following or other appropriate response:

- Prepare a quotation for the cost of plumbing work
- First fix plumbing
- Second fix plumbing
- Cut and bend pipes for the dwelling
- Fit pipe work for waste system in the dwelling
- Solder copper pipe work
- Fix radiators to walls in the dwelling
- Commission system/test system
- Individual plumbing components to max. of 3

[1] per main role up to a maximum of [3] [3]

Electrician
Any **three** from the following or other appropriate response:

- Prepare a quotation for the cost of electrical work
- First fix electrical work
- Second fix electrical work
- Cut and bend ducting pipe for the dwelling
- Cut and fit electrical cables to the dwelling
- Fit face plates to all electrical points
- Fit consumer unit
- Test electrical installation of the dwelling
- Connect to national grid/meter
- Track walls
- Individual electrical components to max. of 3

[1] per main role up to a maximum of [3] [3] 9

			AVAILABLE MARKS
3	**(a)** For each of the following answers, the dimensions must be accurate and given in millimetres only to receive [2]. If a dimension is provided within tolerance or with an incorrect unit then only [1] will be given. Tolerance on scaled dimensions only ± 100 mm		
	(i) Length 7000 mm and Width 9500 mm **or** Length 9500 mm and Width 7000 mm	[4]	
	(ii) Length 22 700 mm	[2]	
	(iii) Length 7000 mm and Width 4000 mm or Width 4000 mm and Length 7000 mm	[4]	
	(iv) 1800 mm	[2]	
	(b) 9 (award [1] for ±1)	[2]	14

		AVAILABLE MARKS
4	Each of the following three points must be in the correct order. [1] for each. Step 1 Grip firmly using the whole hand and not just the fingertips while keeping your back straight. [1] Step 2 Lift the load using your legs not your back. [1] Step 3 Position the load in its new location. [1]	3

5 [1] for material
[1] for function

		AVAILABLE MARKS
1. Timber/wood	[1]	
Support the load of the roof, or bridges the space between the walls of the room. **Or** any other appropriate answer.	[1]	
2. Butyl Rubber	[1]	
Provide waterproof membrane or sheet.	[1]	
3. Plywood	[1]	
Provide the support for the Butyl rubber by spanning between the joists. **Or** any other appropriate answer.	[1]	
4. Timber/wood	[1]	
Provide the gradient which allows the water to run off.	[1]	
5. Lead	[1]	
Waterproofs the junction between the wall and the roof.	[1]	10

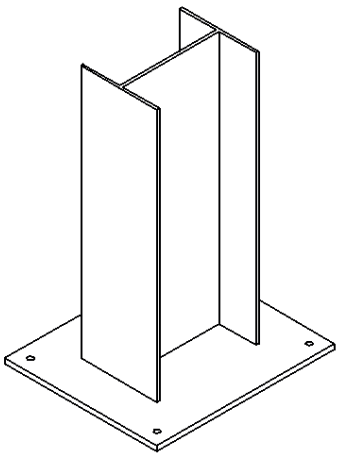
6 **(a)** Steel [1]
Reinforced concrete [1]

(b) Beam/s [1]
Column/s [1]

(c) Any **six** of the following advantages, [1] each up to a maximum of [6]
Or any other suitable answer.

- Framed structures are easily erected from pre-fabricated members.
- These members are easily connected together in the correct sequence to form the structural framework.
- Standard components can be easily tailored for the needs of each project.
- Allows the building to have fairly large open spaces.
- Creates a strong structure.
- The structural frame carries the total load of the building and transfers it to the foundation.
- Cladding is fixed over the framework, or infill panels are placed between its members, to totally enclose the space within the building.
- Not weather dependent for erection. [6]

(d)



Correct position of one bolt hole = [1] two bolt holes = [2]
Base plate drawn correctly = [1]
Column left side correct = [1]
Column right side = [1]
Web = [1]
Quality of sketch high = [2] medium = 1 Maximum marks awarded = [5]

(e) Welding [1]
Bolts [1]

17

AVAILABLE MARKS

			AVAILABLE MARKS
7	**(a)**	Any **two** of the following materials [1] each up to a maximum of [2] or any other suitable answer. • Timber • UPVC • Galvanized metal • Plastic • Aluminium • Glass [2]	
	(b)	Any **four** of the following performance requirements relating to a sliding sash window [1] each up to a maximum of [4]. Weather Exclusion Security Provide resistance to air penetration in the form of drafts Thermal and Sound Insulation Privacy (bathroom) Durability Opening sash slides up and down easily Ventilation Let light in Ability to look out Fire escape **Or** any other suitable answer. [4]	6
		Section A	**70**

Section B

AVAILABLE MARKS

8 The following points should be considered in relation to the Planning Service in Northern Ireland.

Location of dwelling is close to a scenic mountain range.

Importance of dwelling blending in with surrounding area hence the natural stone cladding to the front elevation.

Dwelling constructed close to a small village hence visual integration.

Site has been excavated to a reduced level thus lowering the ridge line.

Long narrow windows of vertical emphasis to match the size of traditional sliding sash windows.

Traditional pitched roof construction

Level 1 ([1]–[4]) (2 points as shown above)

Candidate analyses the reasons why the Architect in consultation with the Client has chosen to comply with Planning Service guidelines for the construction of a dwelling in close proximity to a scenic mountain area. Candidate will show an understanding of the difference between different planning issues. Their level of accuracy for spelling, punctuation and grammar is limited. They analyse the planning issues in a limited form and style of writing. The presentation of the analysed findings is not fully coherent or organised and there is little use of specialised terms.

Level 2 ([5]–[7]) (4 points as shown above)

Candidate analyses the reasons why the Architect in consultation with the Client has chosen to comply with Planning Service guidelines for the construction of a dwelling in close proximity to a scenic mountain area. Candidate will show a satisfactory understanding of the difference between different planning issues. Their level of accuracy for spelling, punctuation and grammar is satisfactory. They analyse the planning issues in a satisfactory style and form of writing. The presentation of the analysed findings is coherent and organised in most cases and they use a range of specialised terms.

Level 3 ([8]–[10]) (5 points as shown above)

Candidate analyses the reasons why the Architect in consultation with the Client has chosen to comply with Planning Service guidelines for the construction of a dwelling in close proximity to a scenic mountain area. Candidate will clearly show a very good understanding of the difference between different planning issues. Their level of accuracy for spelling, punctuation and grammar is excellent. They analyse the planning issues in an excellent style and form of writing. The presentation of the analysed findings is coherent and very well organised in most cases and they use a very good range of specialised terms. [10]

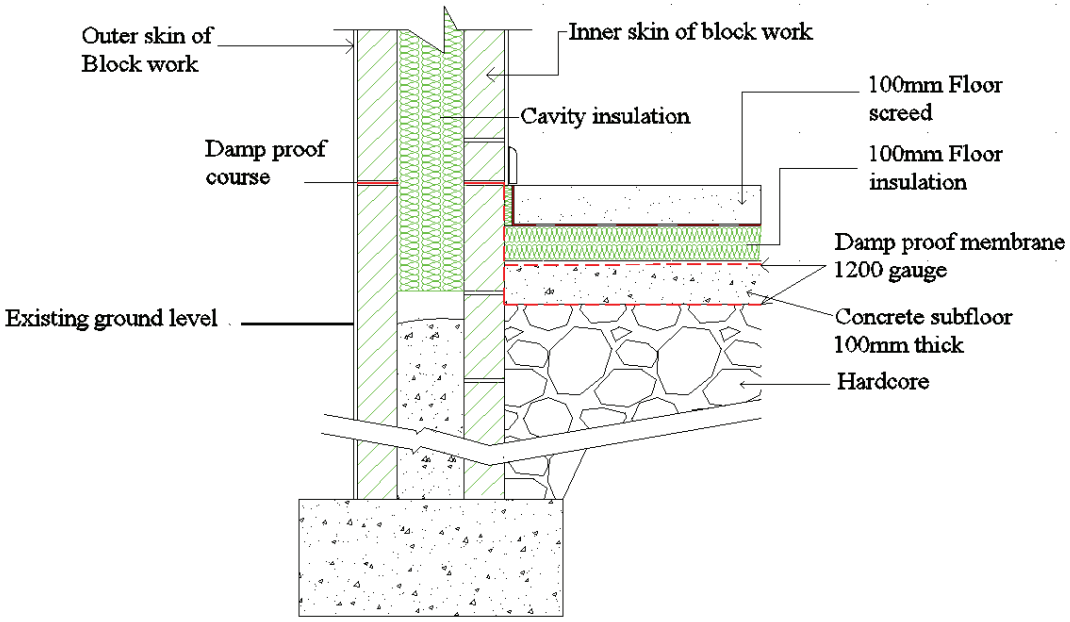
10

9 **(a)** [1] per element up a maximum of [7] + quality of drawing maximum [3]

AVAILABLE MARKS

- External skin of block work
- Inner skin of block work
- Cavity Insulation
- Floor insulation
- 100 mm floor screed
- D.P.M.
- Hardcore
- D.P.C.
- 100 mm concrete subfloor
- Wet dash
- Inner skin of plaster
- Concrete to foundation
- Concrete cavity fill [10]

(b) Labelled correctly [1] per element up a maximum of [10].



[10] 20

10 The following points should be considered in relation to **Embodied energy** as it **relates to copper**, which is **mined in Brazil**, and used for **pipes** in a new **hospital in Belfast**.

AVAILABLE MARKS

Energy used in the extraction of copper from the ground in Brazil.

Transport the short distance from the mine to the smelting/pipe manufacturing factory.

Energy used to manufacture the pipes.

Fuel/energy burned in transporting pipes to the harbour for export.

Energy used is transporting the copper pipe in containers across the seas.

Energy used to transport the pipes across land to a new hospital in Belfast.

Energy used in installing the copper pipe including heating the joints to solder the pipe.

Energy used to maintain the pipe.

Energy used to remove the pipe from the building after its useful life cycle.

Energy used to recycle the copper into a new product.

Or any other suitable answer.

Level 1 ([1]–[4]) (2 points as shown above)

Candidate will discuss the term Embodied Energy and how it relates to the sum of all the energy used in extracting copper from a mine, through the complete life cycle of the pipes being used in a Belfast hospital. Candidates will also discuss demolition and recycling of the copper into new products. Their level of accuracy for spelling, punctuation and grammar is limited. The candidate discusses Embodied energy in a limited form and style of writing. The presentation of the discussion findings is not fully coherent or organised and there is little use of specialised terms.

Level 2 ([5]–[7]) (4 points as shown above)

Candidate will discuss the term Embodied Energy and how it relates to the sum of all the energy used in extracting copper from a mine, through the complete life cycle of the pipes being used in a Belfast hospital. Candidates will also discuss demolition and recycling of the copper into new products. Their level of accuracy for spelling, punctuation and grammar is satisfactory. The candidate discusses Embodied energy in a satisfactory form and style of writing. The presentation of the discussion findings is coherent and organised in most cases and they use a range of specialised terms.

Level 3 ([8]–[10]) (6 points as shown above)

	AVAILABLE MARKS
Candidate will discuss the term Embodied Energy and how it relates to the sum of all the energy used in extracting copper from a mine, through the complete life cycle of the pipes being used in a Belfast hospital. Candidates will also discuss demolition and recycling of the copper into new products. Their level of accuracy for spelling, punctuation and grammar is excellent. The candidate discusses Embodied energy in a very good form and style of writing. The presentation of the discussion findings is coherent and very well organised in most cases and they use a very good range of specialised terms. [10]	10

			AVAILABLE MARKS
11	**(a)**	A strip foundation is so called as it is a long strip of concrete laid in the ground to carry the load of the building. The strip effect is achieved by the excavation of the trench in the ground. [1] for strip effect + [1] for concrete as the material. [2]	
	(b)	Dead loads:- are the loads created by the building structure such as the floors and walls of the multi-storey hospital building. [1] for loads created by the building structure + [1] one example of a dead load from a multi-storey hospital building. [2]	
	(c)	Imposed Loads:- are the loads of the library building's occupants and contents. [1] for imposed loads created by the contents of a building + [1] one example of imposed loads for a three storey library building such as books. [2]	
	(d)	Bearing Capacity:- maximum load that the reclaimed ground can safely carry. [1] for Bearing Capacity stating that it is the ability of the substrata to support the load of the building:- + [1] for an example relating it to a steel framed factory building constructed on reclaimed land. [2]	
	(e)	[1] for stating that a profile board is used to mark the location of the foundations and walls + [1] for stating that it is made from timber. [2]	10
		Section B	**50**
		Total	**120**