



*Rewarding Learning*

General Certificate of Secondary Education  
2012

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**Construction and the Built Environment**

**Assessment Unit 1**

*assessing*

The Construction Industry for the 21st Century

**[GCB11]**

**MONDAY 14 MAY, AFTERNOON**

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**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** questions

Use the pre-release material to assist with answering questions 1, 2, 3 and 4.

- 1 (a) The following symbols have been used on the Site Plan and Ground Floor Plan contained within the pre-release material.

Identify what each of these BS1192 symbols or building elements represents:

- |  |     |
|--|-----|
| 1. North point                         | [1] |
| 2. Tree                                | [1] |
| 3. Sill detail/Cavity wall/Window sill | [1] |
| 4. W.C. or toilet                      | [1] |
| 5. Kitchen sink/Double drainer         | [1] |

- (b) The following building elements are found in the pre-release material. Name **one** material that can be used to manufacture each element.

- |   |     |
|---|-----|
| 1. PVC plastic (Brown)/Glass                  | [1] |
| 2. Visqueen 1200 grade or plastic or Visqueen | [1] |
| 3. Bangor blue natural slate/Slate            | [1] |
| 4. Stainless steel                            | [1] |
| 5. Timber or softwood/Wood                    | [1] |
| 6. PVC plastic or white plastic               | [1] |

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The following professionals and craft operatives are employed during the design and construction stages of the house shown in the pre-release material.

- 2 (a) Identify **three** of the main roles that a Site Engineer would have in relation to this project.

Site Engineer

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

- Survey site
- Take site levels
- Mark out building on site
- Supervise work on site

[1] per main role up to a maximum of [3] or any other appropriate response. [3]

- (b) Identify **three** of the main roles that the following craft operatives would have for the project shown in the pre-release material.

Bricklayer

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

- Prepare a quotation for the cost of brick work.
- Building substructure.
- Build walls to first floor level
- Build walls to roof level
- Build internal walls
- Build fire place
- Put in concrete floors

[1] per main role up to a maximum of [3] or any other appropriate response. [3]

Joiner

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

- Prepare a quotation for the cost of joinery work
- Position floor joists
- Put on roof
- Make and fit door frames
- Hang doors
- All other first and second fix joinery
- Make and fit stairs
- Nail down timber floors

[1] per main role up to a maximum of [3] or any other appropriate response. [3]

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- 3 Using the attached pre-release material, give the following dimensions in millimetres. Some dimensions may need to be scaled.

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 but with an incorrect unit then only [1] will be given.

**Tolerance on scaled dimension only  $\pm 100$  mm**

- (a) The length and width of the dining room.

Length 4800 mm                  Width 3800 mm                  [4]

- (b) The overall width of the conservatory from the outside of the walls at first floor level.

Width 4100 mm                  [2]

- (c) The width and height of the family room window at the front of the house. Take this height at the highest point of the window.

Width 1000 mm                  Height 1500 mm                  [4]

- (d) The total number of toilets within the complete building.

Total number of toilets 4                  [2]

**Tolerance  $\pm 1$  for half marks**

- (e) The gradient of the ramp into the entrance hall.

Gradient 1 : 12                  [2]

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4 The drawing shown below is of a foundation detail which will be used in the dwelling shown in the pre-release material.

(a) Name the type of foundation shown in **Fig. 2**.

Strip Foundation or strip [2]

[2] for strip foundation or [1] for concrete foundation. [2]

(b) Give **two** functions of the foundation shown above.

1. Distribute load from building to the surrounding earth.
2. Help to prevent walls from cracking.
3. Help to prevent building from sinking.

[1] per appropriate response up to a maximum of [2] or any other appropriate response. [2]

(c) Name the type of wall construction shown in **Fig. 2**.

Wall type: Cavity wall construction or cavity [1]

[1] for block wall construction  
[2] for cavity wall or cavity wall construction [2]

(d) List **two** functions of the wall construction shown in **Fig. 2**.

- Strength
- Stability
- Weather exclusion
- Thermal insulation
- Sound insulation
- Durability
- Fire resistance
- Appearance

[1] per appropriate response up to a maximum of [2] or any other appropriate response. [2]

(e) What is the full name of the material represented by the letters DPM?  
Damp Proof Membrane

[1] for damp sheet or plastic sheet  
[2] for damp proof membrane [2]

(f) State **one** function of a DPM:

- Prevent the passage of moisture from the substrata into the floor
- Prevent cement grout from escaping from the concrete floor when it has been poured.

[1] per appropriate response up to a maximum of [1] or any other appropriate response. [1]

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- 5 List different examples of work which could commonly be carried out under each of the following headings:

**Building, Civil Engineering and Building Services**

**(a) Building**

List **five** different examples of work:

1. Houses
2. Hospitals
3. Community buildings
4. Flats or apartments
5. Farm buildings
6. Hotels
7. Shops
8. Bungalow
9. Building maintenance

[1] per activity as shown above up to a maximum of [5] or any other appropriate response. [5]

**(b) Civil Engineering**

List **three** different examples of work:

1. Building roads
2. Building bridges
3. Building sewage treatment works
4. Large dams or other structural projects
5. Airports
6. Drainage
7. Foundations

[1] per activity as shown above up to a maximum of [3] or any other appropriate response. [3]

**(c) Building Services**

List **three** different examples of work:

1. Heating within a building
2. Lighting within a building
3. Computer cabling
4. Computer infrastructure
5. E&M control

[1] per activity as shown above up to a maximum of [3] or any other appropriate response. [3]

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6 A requirement of all modern construction is to incorporate services into a building.

- (a) Clearly state how you would incorporate electrical services into a timber stud wall and secure a socket box in place. In your answer indicate what stage plastering should take place in this process.

Any **four** of the following:

1. Drill holes in timber studs so that cables can pass through them
2. Position timber bridging (noggins) pieces to support sockets
3. Secure socket boxes in place so that they are just under the surface of the finished plaster
4. Feed cables through holes in timber studs and into socket boxes.
5. Secure plasterboard
6. Plaster wall must be included to get full marks
7. Connect face plate to socket
8. Test wiring system
9. Connect to mains supply

[1] per activity as shown above up to a maximum of [4] or any other appropriate response. [4]

- (b) Clearly state how you would incorporate electrical services into the inner leaf of a concrete block cavity wall and secure a socket box in place. In your answer indicate what stage plastering should take place in this process.

Any **four** of the following:

1. Cut tracks in wall for plastic or metal ducting
2. Securely fix ducting pipe
3. Secure socket boxes in place so that they are just under the surface of the finished plaster
4. Feed cables through ducting into socket boxes
5. Plaster wall must be included to get full marks
6. Connect face plate to socket
7. Test wiring system
8. Connect to mains supply

[1] per activity as shown above up to a maximum of [4] or any other appropriate response. [4]

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7 State the main reason for having the following elements in a typical domestic house.

(a) The building element shown in **Fig. 3** is a foundation trench.

What is the main reason for excavating the foundation trench?

1. Provide a trench in which to pour the foundation concrete
2. Takes the foundation deep enough within the ground so that it is not affected by frost heave
3. The excavation will take the trench down to ground of good bearing capacity

[1] per reason for having a foundation trench from the list above up to a maximum of [2] or any other appropriate response. [2]

(b) The building elements shown in **Fig. 4** are floor joists.

What are the **two** main reasons for having floor joists in a domestic house?

1. Provide support for flooring
2. Provide support for ceilings
3. Transfer the load of the floor and any content onto the walls

[1] per reason for having a floor joist from the list above up to a maximum of [2] or any other appropriate response. [2]

(c) The building element shown in **Fig. 5** is a window.

What are the **two** main reasons for having a window within a domestic house?

1. Weather Exclusion
2. Security
3. Provide resistance to air penetration in the form of drafts
4. Thermal and Sound Insulation
5. Durability
6. Let light in
7. Fire escape window
8. Provide vision

[1] per reason for having a window from the list above up to a maximum of [2] or any other appropriate response [2]

**Section A**

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6

**70**

## Section B

Answer **all** questionsAVAILABLE  
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- 8 Compare how a solid stone wall in traditional domestic construction is different from a modern cavity wall constructed from brick or block.

The following points should be considered in relation to wall construction.

**Stone wall construction**

Traditional walls of dwellings and industrial buildings were constructed from stone which was found locally. The walls were usually very thick at about 400 mm to 700 mm in width. Most had no damp proof course included. Lime mortar was used to bind these stones together.

**Cavity wall construction**

The first brick walls were one brick solid construction. This then progressed to cavity wall construction. This was the first development to prevent the spread of damp into the inside of the building. These walls were constructed from two skins of brick or block joined together by twisted stainless steel wall ties. The twist was constructed into the wall ties so that any moisture which tried to move across the cavity would drop off. Insulation is placed within the cavity.

(Or any other suitable suggestion)

**Level 1 ([1]–[4])**

Candidates compare the difference between solid stone walls in traditional domestic construction and modern cavity wall construction. Candidates will show an understanding of the difference between these wall types. Their level of accuracy for spelling, punctuation and grammar is limited. They discuss types of walls in a limited form and style of writing. Their discussion is not fully coherent or organised and there is little use of specialist terms.

**Level 2 ([5]–[7])**

Candidates compare the difference between solid stone walls in traditional domestic construction and modern cavity wall construction. Candidates will show an understanding of the difference between these wall types. Their level of accuracy for spelling, punctuation and grammar is satisfactory. They discuss types of walls in a satisfactory form and style of writing. Their discussion is coherent or organized in most cases and they use a range of specialist terms.

**Level 3 ([8]–[10])**

Candidates compare the difference between solid stone walls in traditional domestic construction and modern cavity wall construction. Candidates will clearly show an understanding of the difference between these wall types. Their level of accuracy for spelling, punctuation and grammar is excellent. They discuss types of walls in an excellent form and style of writing. Their discussion is coherent and very well organized and they use a wide range of specialist terms.

When a response is not worthy of credit a [0] should be awarded.

(AO1 [5], AO2 [5])

[10]

10

9 **Fig. 6** shows the early stages in the development of the Titanic Signature building in Belfast which will be several storeys high.

(a) List **five** operations which could be carried out by the Tower cranes shown on this site.

1. Move small items of plant into position.
2. Move concrete formwork into position.
3. Lift liquid concrete in skips for pouring into formwork.
4. Lift steel or other structural members into position.
5. Position large structural elements such as floor slabs or precast concrete stairs.
6. Supply materials for bricklayers or other construction operatives.
7. Lift heavy items of mechanical plant into position on the roof such as air-conditioning units.

[1] for one type of lifting operation up to a maximum of [5] or any other appropriate response. [5]

The domestic site shown in the pre-release material will use Telescopic Handlers such as the one shown in **Fig. 7**.

(b) List **five** operations which could be carried out by the Telescopic Handlers on the domestic building site.

1. Move small items of plant into position.
2. Move concrete formwork into position.
3. Lift liquid concrete in skips for pouring into formwork.
4. Supply materials for bricklayers or other construction operatives.
5. Unload materials from lorries which arrives on pallets.
6. Move material around site.

[1] for one type of lifting operation up to a maximum of [5] or any other appropriate response. [5]

(c) (i) Name the main plant item that would be used for lifting materials on to a new 7-storey office development site in a confined city centre location.

Tower Crane [2] or crane [1] [2]

(ii) Justify why you have chosen the item of plant you have listed above.

Confines city centre site influences choice of Tower Crane.  
Tower crane required as building is seven storeys high.  
Telescopic Handler would not have room to move round a confined site.  
Telescopic Handler could not reach seven storeys high.

[1] for each justification point shown above up to a maximum of [3] or any other appropriate response. [3]

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A contractor organises his/her resources under three main headings:

Plant  
Labour  
Materials

- |   |                       |                            |
|---|-----------------------|----------------------------|
| <p><b>(d) (i)</b> What does the term “labour” refer to?<br/>People used on site, both craft operatives and professional.</p> <p><b>(ii)</b> Provide <b>two</b> examples of this.</p> <p>Professionals in design team.<br/>Professionals in build team including site managers, site engineers, health and safety officer, etc.<br/>Operatives on site, joiners, bricklayers, plasters, etc.<br/>Subcontractors.<br/>Direct employees.</p> <p>[1] for each justification point shown above up to a maximum of [4] or any other appropriate response.</p> | <p>[2]</p> <p>[2]</p> | <p>AVAILABLE<br/>MARKS</p> |
| <p><b>(e) (i)</b> What does the term “materials” refer to?<br/>All resources used to construct a building.</p> <p><b>(ii)</b> Provide <b>two</b> examples of this.</p> <p>All resources required on site to construct building.<br/>Brick, concrete, steel, timber, sanitary appliances, glass, etc.</p> <p>[1] for each justification point or material shown above up to a maximum of [2] or any other appropriate response.</p>  | <p>[2]</p> <p>[2]</p> |                            |

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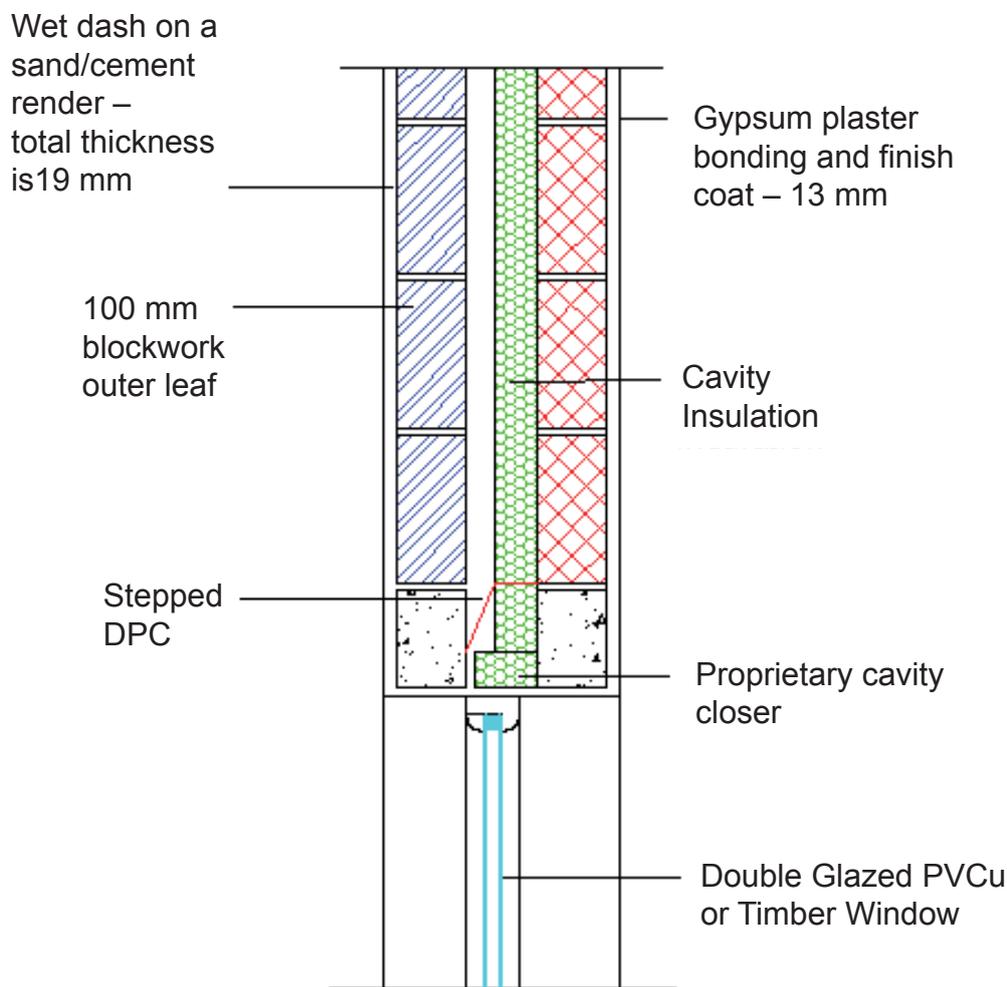
10 Fig. 8 below shows a head detail used in cavity wall construction for the dwelling shown in the pre-release materials.

Add the following labels to the drawing, leader lines have been provided for your guidance.

- Wet dash on a sand/cement render – total thickness is 19 mm
- Cavity Insulation
- Gypsum plaster bonding and finish coat – 13 mm
- Stepped DPC
- Double Glazed PVCu or Timber Window
- 100 mm blockwork outer leaf
- Proprietary cavity closer.

[1] per element up to a maximum of [7]

[7]



AVAILABLE MARKS

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- 11 Before the client gives their final approval for the attached pre-release drawing and specifications, he has asked you to identify ways in which he can reduce the use of fossil fuels in the day to day running costs of the house.

Evaluate how this can be achieved under the following headings:

- The building structure
- Renewable energy

### The building structure

Increase insulation within the structure in the walls, floors, roof, etc.

Use highly insulated windows and doors.

Use methods of construction which reduce heat loss such as timber frame or increased inner skin with insulation.

Other uses of innovative technology.

### Renewable energy

Use more solar panels in the building.

Use wind energy

Use a heating system which is based on renewable energies such as biomass.

(Or any other suitable suggestion)

### Level 1 ([1]–[4])

Candidate will show an understanding of how to reduce reliance on fossil fuels by creating an evaluation under the above headings. Their level of accuracy for spelling, punctuation and grammar is limited. They will evaluate in a limited form and style of writing. Their evaluation is not fully coherent or organized and there is little use of specialist terms.

### Level 2 ([5]–[7])

Candidate will show an understanding of how to reduce reliance on fossil fuels by creating an evaluation under the above headings. Their level of accuracy for spelling, punctuation and grammar is satisfactory. They will evaluate in a satisfactory form and style of writing. Their evaluation is coherent or organized and there is use of specialist terms.

### Level 3 ([8]–[10])

Candidate will show an understanding of how to reduce reliance on fossil fuels by creating an evaluation under the above headings. Their level of accuracy for spelling, punctuation and grammar is excellent. They will evaluate in a excellent form and style of writing. Their evaluation is coherent and very well organized and there is use of specialist terms.

When a response is not worthy of credit a [0] should be awarded.

(AO1 [5], AO2 [5])

[10]

10

**Section B**

**50**

**Total**

**120**

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