



Rewarding Learning

General Certificate of Secondary Education

Construction and the Built Environment

Unit 2

Sustainable Construction

[GCN21]

Assessment

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.

Assessment Objectives

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

Candidates must:

- AO1** recall, select and communicate their knowledge and understanding of concepts, issues and terminology;
- AO2** apply skills, knowledge and understanding in a variety of contexts and in planning and carrying out investigations and tasks; and
- AO3** analyse and evaluate evidence, make reasoned judgements and present conclusions.

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.

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.

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.

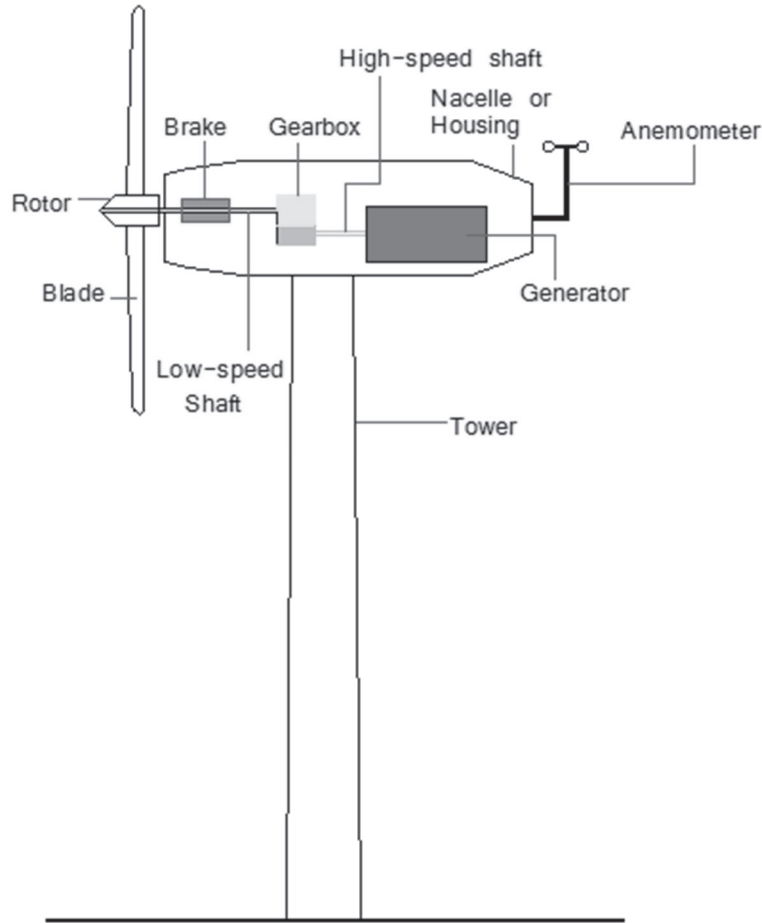
Level 2 (Satisfactory): The level of accuracy of candidates’ presentation, spelling, punctuation and grammar is satisfactory. The candidate makes a satisfactory selection and use of an appropriate form and style of writing supported with appropriate use of diagrams as required. Relevant material is organised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

Candidates are expected to answer **all** questions.

| | | | AVAILABLE MARKS | | |
|-------------------|---|---|-----------------|----|--|
| 1 | (a) | 1. Tegral Thrutone slate | [1] | 10 | |
| | | 2. Timber or engineered timber | [1] | | |
| | | 3. Plasterboard | [1] | | |
| | (b) | Seven of the following functions: | | | |
| | | • Strength | | | |
| | | • Stability | | | |
| | | • Weather exclusion | | | |
| | | • Thermal Insulation | | | |
| | | • Sound Insulation | | | |
| | | • Durability | | | |
| • Fire resistance | | | | | |
| • Appearance | | | | | |
| | [1] per correct function up a maximum of [7] or any other appropriate function. | [7] | | | |
| 2 | (a) | (i) Length 5650 mm [1] Width 3800 mm [1] Deduct one mark from each scaled dimension when the response is incorrect but within ± 100 mm tolerance. | | 12 | |
| | | (ii) Width 10 300 mm [2] | | | |
| | | (iii) Length 4150 mm [2] Width 3400 mm [2] | [8] | | |
| | (b) | Deduct [1] when the response is incorrect but within ± 1 m ² tolerance. 2550 × 2865 = 2.55 × 2.86 7.29 m ² | [2] | | |
| | | (c) | | | |
| | | (i) Wide 1960 mm [1] | | | |
| | | (ii) Wide 700 mm [1] | [2] | | |

3 (a) [1] per correct label up a maximum of [10]



[10]

(b) Answer must reflect the following as a discussion:

- Exposed elevated location
- Coastal location very exposed to wind

Identification of each of the above [1] mark each up to a maximum of [2]

Basic discussion reflecting an exposed coastal location as being an appropriate site in which to locate a wind turbine [1]

or

Well-reasoned discussion reflecting an exposed coastal location as being an appropriate site in which to locate a wind turbine [2]

or

No discussion [0]

[4]

14

AVAILABLE MARKS

4 [1] mark for each shaded box completed correctly up to a maximum of 23

[2] Additional marks for getting the total cost of table correct. +/- £1

[1] Additional mark for getting the total cost of table correct. +/- £2

| Item | Part | Quantity | Description of material required | Length in mm | Width in mm | Thickness in mm | Total length required | Total cost |
|---|--------------|----------|----------------------------------|--------------|-------------|-----------------|-----------------------------|------------|
| 1 | Legs | 4 | Oak | 700 | 45 | 45 | 2800 | £20.89 |
| 2 | Top Rails | 4 | Oak | 470 | 80 | 20 | 1880 | £12.39 |
| 3 | Bottom Rails | 4 | Oak | 470 | 40 | 20 | 1880 | £9.34 |
| 4 | Table Top | 1 | MDF | 600 | 600 | 40 | 8 table tops from one sheet | £7.75 |
| Total cost of glue, connection blocks, varnish etc. | | | | | | | | £4.20 |
| Total cost of table | | | | | | | | £54.57 |

[25]

25

AVAILABLE MARKS

5 Fig. 6 shows an incomplete eaves detail.

AVAILABLE
MARKS

Quality of drawing [1] per accurate drawing/hatch pattern

(a) Candidates should complete the drawing in **Fig.6** to include the following:

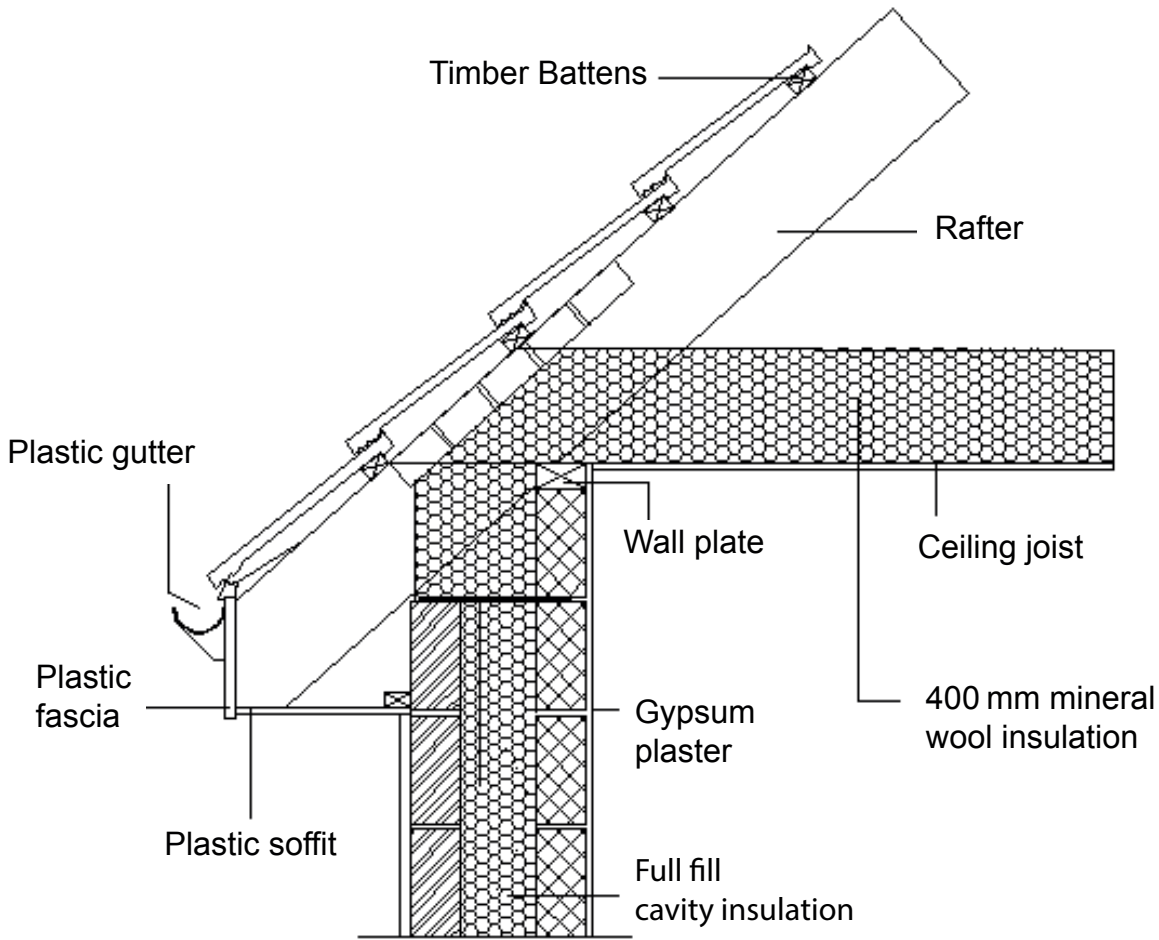
1. Outer skin of block work
2. External plaster
3. Rafter
4. Concrete tiles
5. Ceiling joist
6. Fascia board
7. All internal plaster/plasterboard
8. Cavity closer
9. Tiling battens
10. Roofing membrane [10]

Candidates should also draw in hatch patterns to represent the following:

1. Ceiling insulation
2. Inner skin of block work
3. Outer skin of block work
4. Cavity insulation [4]

(b) Candidates should add the labels from the list below once they have completed their drawing. [1] per label.

1. timber battens
2. plastic gutter
3. wall plate
4. plastic fascia
5. plastic soffit
6. rafter
7. 400 mm mineral wool insulation
8. ceiling joist
9. Gypsum plaster
10. Full fill cavity insulation. [10]



(c) Answer must reflect the following as a discussion:

- Wall insulation
- Ceiling insulation
- Cavity wall construction
- Roof ventilation
- Roofing membrane

Identification of two of the above [1] mark each up to a maximum of [2]

Candidate will show how they have analysed the eaves detail they have completed in order to demonstrate a basic understanding of how human comfort can be improved using modern day construction methods and materials. [1]

or

Candidate will show how they have analysed the eaves detail they have completed in order to demonstrate a well-reasoned understanding of how human comfort can be improved using modern day construction methods and materials. [2]

or

No evidence of the eaves detailed having been analysed [0]

[4]

28

- 6 An answer should be constructed using the following points below or any other suitable answer:

Walls

- Cavity wall construction or composite wall panelling
- Minimum 150mm insulation
- All wall ties or other fixings made from stainless steel to prevent corrosion

Windows

- Made from durable materials UPVC or Powder Coated Aluminium.
- Double or tripled glazed
- Well fitted neoprene draft excluders round each window opening.
- Correctly positioned DPC round all openings.
- Silicon sealing round windows.

Roof Construction

- Pitched roof construction
- Well insulated
- Roof ventilation to prevent timber decay

Construction methods which will have a positive long term impact on the natural environment

- Reduced demand for fossil fuels to heat the habitable accommodation as high specification insulation should be used.
- High specification insulated windows and doors with high quality draft exclusion strips.
- New LED lights which use a minimum of electricity.

Carbon footprint

- Retaining the concrete frame considerably reduces the carbon footprint as no new steel is required.
- No new cement will have to be manufactured for the frame which uses fossil fuels.

Long term benefits to the community.

- Providing high quality living accommodation for the community.
- Employment opportunities while under construction.

Level 1 ([1]–[4])

Candidates demonstrate a limited ability to analyse suitable methods of wall construction or window manufacture including insulation or roof construction. They justify at least one of the following: construction methods which will have a positive long term impact on the natural environment, the impact on the carbon footprint of retaining the concrete frame and the long term benefits to the community in a limited form and style of writing. Their evaluation is not fully coherent or organised and there is little use of specialist terms. The quality of written communication is basic.

Level 2 ([5]–[7])

Candidates demonstrate a satisfactory ability to analyse suitable methods of wall construction, window manufacture including insulation or roof construction. They justify at least one of the following: construction methods which will have

a positive long term impact on the natural environment, the impact on the carbon footprint of retaining the concrete frame and the long term benefits to the community in a satisfactory form and style of writing. Their evaluation is coherent or organised in most cases and they use a range of specialist terms. The quality of written communication is good.

Level 3 ([8]–[10])

Candidates demonstrate a satisfactory ability to analyse suitable methods of wall construction, window manufacture including insulation or roof construction. They justify at least two of the following: construction methods which will have a positive long term impact on the natural environment, the impact on the carbon footprint of retaining the concrete frame and the long term benefits to the community in an excellent form and style of writing. Their evaluation is coherent and very well organised in all cases and they use a good range of specialist terms. The quality of written communication is excellent.

When a response is not worthy of credit [0] should be awarded. [10] 10

7 (a) 1. Dead loads

Dead Loads are those normally associated with the weight of the structure itself, and as such remain stationary and relatively constant over time.

Dead loads may include the weight of the floors, roof, walls, immovable fixtures such as plasterboard, built-in cupboards, etc.

[1] for a definition and [1] for an example relating to the pre-release material. [2]

2. Imposed Load

Imposed Loads are usually temporary and change over time.

These include loads such as occupants/people, furniture and other equipment.

The intensity of these loads may vary depending on the time of day.

[1] for a definition and [1] for an example relating to the pre-release material. [2]

(b) Bearing Capacity of the ground

Bearing capacity is the capacity of soil to support the loads applied to the ground.

The element of the building resting on the ground is the foundation.

[1] for limited definition and [2] detailed definition. [2]

(c) Answer must reflect the following as a discussion:

- Investigation of platform.
- Platform has been made up of the spoil from a previous demolition.
- The spoil in the platform consists of topsoil, builder’s rubble and excavated subsoil to a maximum depth of three metres.
- Soil of a firm bearing capacity was found below 3 metres.
- Pile foundations should be used for foundations for the raised platform.
- Strip foundation would not be suitable for this site as a normal strip foundation would not extend down to the firm soil at 3 metres deep.

Identification of three of the above [1] mark each up to a maximum of [3]

Candidate will illustrate through discussion how they have examined the pre-release material relating to soil type and foundation design. They have a basic discussion with one reasoned point why they would choose a pile foundation in preference to a strip foundation. [1]

or

Candidate will illustrate through discussion how they have examined the pre-release material relating to soil type and foundation design. They have a good discussion with two or more reasoned points why they would choose a pile foundation in preference to a strip foundation. [2]

No evidence of the reasoned discussion [0] [5]

AVAILABLE
MARKS

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- 8 An answer should be constructed using the following points below or any other suitable answer:

Solid stone walls

Traditional walls of dwellings were constructed from stone which was found locally. Larger stones were built in courses with small stones interspaced. The walls were usually very thick at about 400 to 700 mm in width. Most had no damp proof course included. Some of these stone walls were built with lime or more recently with sand and cement.

Solid brick walls

Solid brick walls were commonly used to build rows of red brick terrace houses in close proximity to mills. These houses were constructed cheaply by mill owners from bricks which were usually made locally. The solid wall allowed moisture to travel from the outside of the wall to the inside causing damp patches on the wall inside the house. Damp proof courses were included in some of the one brick walls.

Cavity walls with no insulation

Cavity walls were the first development to prevent the spread of damp into the inside of buildings. These walls were constructed from two skins of brick or block joined together by galvanized 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.

Cavity walls with 150 mm low quality insulation

This wall is similar in construction to the first cavity wall, the only exception being the inclusion of 150 mm insulation. The cavity is built 150 mm wide. Wall ties are now manufactured from stainless steel. When cavity walls are used as part of a cellular structure they provide buildings which are structurally sound. Some of their other advantages are the prevention of damp penetrating to the inside of the building, good thermal insulation properties and a cost efficient method of construction.

Timber framed wall construction

Timber framed construction is normally constructed from high quality softwood timber members forming the inner skin of the cavity. The outer skin is usually constructed from brick or block work. These timber walls are highly insulated.

Level 1 ([1]–[4])

Candidates demonstrate a limited ability to discuss suitable methods of domestic wall construction including insulation, DPC/DPM. They discuss at least two of the methods of building walls and how they have changed over the last century. Their discussion is not fully coherent or organised and there is little use of specialist terms. The quality of written communication is basic.

Level 2 ([5]–[7])

Candidates demonstrate a satisfactory ability to discuss suitable methods of domestic wall construction including insulation, DPC/DPM. They discuss at least three of the methods of building walls and how they have changed over the last century. Their discussion is coherent or organised in most cases and they use a range of specialist terms. The quality of written communication is good.

Level 3 ([8]–[10])

Candidates demonstrate an excellent ability to discuss suitable methods of domestic wall construction including insulation, DPC/DPM. They discuss at least four of the methods of building walls and how they have changed over the last century. Their discussion is coherent or organised in most cases and they use a range of specialist terms. The quality of written communication is excellent.

[10]

10

AVAILABLE MARKS