



Rewarding Learning

**General Certificate of Secondary Education
2024**

Construction and the Built Environment

Unit 2

Sustainable Construction

[GCN21]

THURSDAY 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.

Assessment Objectives

Below are the assessment objectives for Construction.

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.

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 (Basic): The candidate makes only 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. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

Level 2 (Good): The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

Level 3 (Excellent): The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

- | | | | |
|----------|------------|---|-----|
| 1 | (a) | 1. Concrete roof tile | [1] |
| | | 2. Plywood | [1] |
| | | 3. uPVC or uPVC plastic | [1] |
| | | 4. Red facing brick outer leaf | [1] |
| | | 5. Xtratherm CavityTherm CT/PI insulation | [1] |
| | (b) | 1. Cavity wall construction | [1] |
| | | 2. Stainless Steel | [1] |
| | | 3. Wall ties | [1] |
| | | 4. 750 mm or 900 mm | [1] |
| | | 450 mm | [1] |
| | | 300 mm | [1] |
| | (c) | 1. Solar panels | [1] |
| | | 2. Two of the following energy sources:
Geothermal ground pumps
Biomass
Wind | |
| | | [1] per correct energy source up a maximum of [2] or any other appropriate source [2] | |

Geothermal ground pumps

Typically a cold fluid at about 5 degrees Celsius is circulated around a network of plastic pipes buried in the ground.

As the fluid passes through the pipes it absorbs heat energy from the surrounding earth.

The fluid returns to the heat pump warmer than it left. This warmer water can be circulated round the home.

Increased running costs of electricity to drive heat pumps.

Biomass

Involves harvesting wood (normally willow in Northern Ireland).

The willow is grown as short rotation crop.

The willow is dried and burned in a highly efficient burner to generate heat.

Wind energy

Most popular sustainable energy source in Northern Ireland.

Propeller blades are forced round by the wind to turn a generator which creates electricity.

Difficult to get an efficient system that will work on a domestic scale.

[1] per description point up a maximum of [2] or any other appropriate descriptive point. [3] × [2] Total possible

[6]

18

- | | | | |
|----------|------------|--|-----|
| 2 | (a) | 1. Length 3275 mm [1]
Width 2195 mm [1] | [2] |
| | | 2. Length 10452 mm [2] | [2] |
| | | 3. Length 1800 mm [2]
Width 1900 mm [2] | [4] |

Scaled dimension ± 100 mm tolerance

- (b) $4002.5 \times 3290 = 13.17$ square metres [1]
- $2090 \times 450 = 0.94$ square metres [1]
- Total floor area of bedroom 1 = 14.11 square metres [1] [3]
- (c) 1. 2600 mm
Scaled dimension \pm 100 mm tolerance [2]
2. 4 windows \times 910 wide [1]
- 3 (a) 1. Support the load of the building
2. Support the load of the building contents
3. Distribute the load to the underlying substrata
4. Distribute the load of the walls over a larger surface area
5. Increase stability
6. Firm surface to build on/level surface
- [1] per correct step up a maximum of [2] or any other appropriate step. [2]
- (b) The following describes the stages in making a strip foundation
1. Topsoil is removed
 2. Excavate to reduced level
 3. Foundation trench is excavated for a strip foundation
 4. Wooden pegs are driven in suitable intervals to establish the finished level of the concrete
 5. Concrete is poured to the depth of the pegs and allowed to harden
 6. If the bearing capacity of the soil is considered weak, reinforcement is added to the base of the concrete to increase strength
- [1] per description point up a maximum of [4] or any other appropriate property. [4]
- (c) The following describes how loads are transferred to the subsoil
1. Roof loads are transferred through roof members to the load bearing walls
 2. First floor loads are transferred through floor members to the load bearing walls
 3. The load bearing walls are supported on strip foundations
 4. The strip foundations are supported by the load bearing subsoil
- [1] per description point up a maximum of [2] or any other appropriate **descriptor**. [2]
- (d) Reinforcement increases the strength of the foundation, particularly over pockets of soil which have a poor bearing capacity. [2]
- (e) Pile foundations are used when underlying substrata is weak. [2]

AVAILABLE
MARKS

14

12

4 [1] for each shaded box completed correctly up to a maximum of [26]

[1] additional mark for getting the total cost of the table correct.

Item	Part	Quantity	Description of material required	Length in mm	Width in mm	Thickness in mm	Total length required	Cost per linear metre	Total cost
1	Legs	4	Beech	400	100	100	1600	£12.75	£20.40
2	Long rails	2	Beech	850	100	30	1700	£10.96	£18.63
3	Short rails	2	Beech	450	100	30	900	£10.96	£9.86
4	Table top	1	MDF	1000	600	30	6 table tops from one sheet of MDF	Cost per sheet £120	£20
Total cost of glue, connection blocks, paint etc.									£5.39
Total Cost of table									£74.28

Marks will be awarded for working out.
 Allow total length to be in mm or metres
 Width and length must be in the correct order.

5 (a) Candidates should complete the drawing in Fig. 4 to include the following.

1. The Cavity
2. Damp Proof Membrane
3. Sand and cement screed [3]

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

1. Hardcore
2. Floor insulation
3. Cavity insulation
4. Outer skin of block work
5. Inner skin of block work
6. Sand and cement screed
7. Foundation concrete [7]

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

- | | | |
|--------------------------|--------------------------------|------|
| Subfloor concrete | Hardcore | |
| Skirting board | Inner plaster with skim finish | |
| Outer skin of block work | Cavity insulation | |
| Floor insulation | Damp Proof Course (DPC) | |
| Inner skin of block work | Foundation concrete | [10] |

AVAILABLE MARKS
26

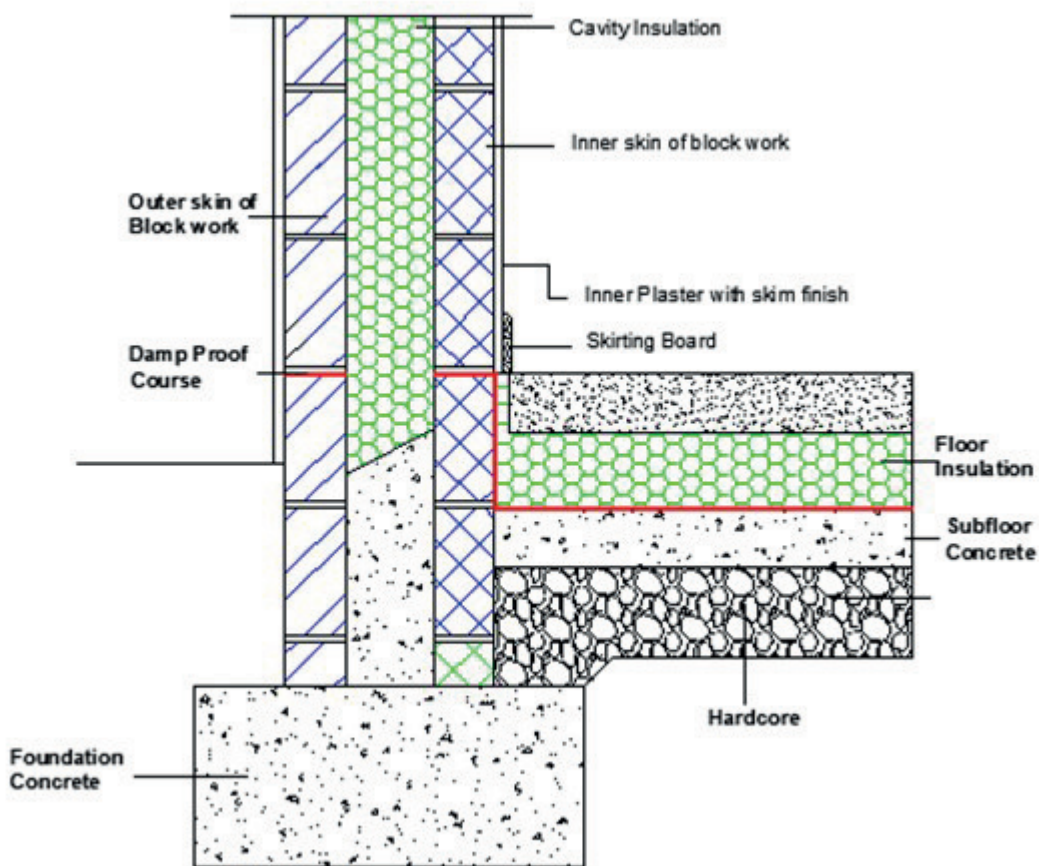


Fig. 4

6 The candidates answer should demonstrate knowledge and understanding of:

Recycling / reusing of stone

Recycling of all types of hardcore that are being excavated.
Examples: road excavations, utility installations, demolition of concrete in buildings.

Carbon footprint of materials in relation to their source.

Building materials sourced locally have often the least detrimental carbon footprint.

Renewable energy, usually wind, reduces the carbon footprint.

Minimise the adverse impact of quarry operations on the environment.

Electricity generated through wind turbine.
Site waste management to minimise materials going to landfill.

Reed beds to filter dirty water

[1] per point of knowledge and understanding up a maximum of [6] or any other appropriate descriptive point. Total possible [6]

20

6

7 Riser:
The vertical member connecting two treads.

Tread:
The upper surface of a step (where the foot is placed).

String:
The side of the stairs.

Handrail:
Member parallel to the string and spanning between newels or fixed to the wall.

[1] per definition of Riser, Tread, Step and Handrail up a maximum of [4] or any other appropriate descriptive point. Total possible [4]

4

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

Social implications	Likely impact on an inner city community positive or negative
Social benefits / concerns	Problems associated with traffic congestion during and after construction As part of the construction process improved social interaction with residents, donations to local charities, etc. 10m high wall around much of its perimeter will create a shadow over houses Long term sustainable employment opportunities.
Regeneration of the area	£26 million pounds coming into the area as part of the regeneration project will create: new retail opportunities new or regenerated housing increased interest in occupying social housing in the area, and buying properties that are for sale. Regeneration of area with stadium will encourage other private development in the area.
Employment opportunities during construction and post construction	Increase of employment opportunities in the area for: tradesmen retraining of long term unemployed training of apprentices Long term employment for staff associated with the stadium including: Management staff, grounds staff, estate management staff, cleaners and match day staff.
Carbon footprint of the building during construction and when in use	Encourage the use of cycle lanes Cycle to work schemes Green travel arrangements Recycling of all materials possible at old sports ground.

Level 1 ([1]–[4])

Candidates demonstrate a limited ability to evaluate the likely impact on an inner city community of the proposed development of a 10,000 seater sports stadium on the site of the local sports ground.

They evaluate at least two social implications 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 good ability to evaluate the likely impact on an inner city community of the proposed development of a 10,000 seater sports stadium on the site of the local sports ground.

They evaluate at least three social implications in a good form and style of writing. Their evaluation is coherent and organised and there is good use of specialist terms. The quality of written communication is good.

Level 3 ([8]–[10])

Candidates demonstrate an excellent ability to evaluate the likely impact on an inner city community of the proposed development of a 10,000 seater sports stadium on the site of the local sports ground.

They evaluate at least five social implications 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]

Up to [5] of the total available marks will be awarded for the quality of the written communication. [10]

**AVAILABLE
MARKS**

10

- 9 An answer should be constructed using the following points below or any other suitable answer.

AVAILABLE
MARKS

The following information is available from analysing the Building Conditions Survey.

Identified construction method that needs to be improved	Possible method(s) of improvement
No cavity wall insulation	<p>Fill the cavity with insulation</p> <p>Line the internal wall with 50 mm of high quality insulation covered with plaster board.</p> <p>Wrap the exterior of the dwelling in insulation. Held in place with galvanised expanded metal and rendered with sand and cement plaster.</p>
No Roof insulation	<p>Place 600 mm of fibreglass insulation on top of the ceiling joist in the roof space.</p> <p>Remove the slates from the roof and place 100 mm rigid insulation sheeting on top of the rafters.</p> <p>Fix slating battens through the insulation and re-slate the roof.</p>
Single glazed softwood windows	<p>Replace softwood windows with double or triple glazed uPVC windows, or triple glazed aluminium windows.</p> <p>Secondary glazing of the existing windows.</p>
The only way of heating the home is an open fire	<p>Remove the open fire and replace with a wood burning or multi fuel stove.</p> <p>Install central heating.</p> <p>Block up the open fireplace and install an energy efficient oil or gas fired boiler.</p> <p>Install solar panels on the roof.</p>

Each of these points should be taken.

Level 1 ([1]–[4])

Candidates demonstrate a limited ability to analyse the Building Conditions Survey and advise the first time buyer on ways in which the thermal insulation properties of the house could be improved. They justify their answer using at least two findings available from the Building Conditions Survey. 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 good ability to analyse the Building Conditions Survey and advise the first time buyer on ways in which the thermal insulation properties of the house could be improved. They justify their answer using at least three findings emanating from the Building Conditions Survey. 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 analyse the Building Conditions Survey and advise the first time buyer on ways in which the thermal insulation properties of the house could be improved. They justify their answer using at least four findings emanating from the Building Conditions Survey. Their discussion is coherent or organised in most cases and they use a range of specialist terms. The quality of written communication is excellent.

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

Up to 5 of the total available marks will be awarded for the quality of the written communication.

[10]

Total

**AVAILABLE
MARKS**

10

120