



*Rewarding Learning*

**General Certificate of Secondary Education  
2025**

---

## **Construction and the Built Environment**

Unit 2

Sustainable Construction

**[GCN21]**

**THURSDAY 12 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.

### **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.

			AVAILABLE MARKS	
<b>1</b>	<b>(a)</b>	<b>(i)</b> Sustainable oak window frames [1]		
		<b>(ii)</b> Grey concrete [1]		
		<b>(iii)</b> Precast concrete insulated floors or sand, cement, D.P.C. [1]		
		<b>(iv)</b> Painted wet dash or plaster [1]		
	<b>(b)</b>	• Weather exclusion		
		• Security		
		• Resistance to air penetration		
		• Thermal Insulation		
		• Sound insulation		
		• Privacy		
• Durability or strength				
• Ability to let light in				
• Open easily				
• Ventilation				
	[1] Per correct performance requirement up a maximum of [6] or any other appropriate source [1]	[6]	10	
<b>2</b>	<b>(a)</b>	<b>(i)</b> Length 2953 mm [1] Width 4039 mm [1]	[2]	
		<b>(ii)</b> Length 9000 mm or 10300 mm [2]  Scaled dimension ± 200 mm tolerance	[2]	
		<b>(iii)</b> Length 3350 mm [2] Width 4400 mm [2]  Scaled dimension ± 200 mm tolerance	[4]	
	<b>(b)</b>	3350 × 5330 = 17.8555 [1] Total floor area of kitchen = 17.86 square metres [1]	[2]	
		Deduct a mark when the response is incorrect but within ± 1m square tolerance.		
	<b>(c)</b>	10 doors		
		Deduct one mark where the response is ±1 door, i.e. 9 or 11 doors	[2]	12

<b>3 Concrete Blocks</b>	[1]
These are the building blocks of the cavity wall	[2]
<b>Cement</b>	[1]
The glue used to join the masonry components together.	[2]
<b>Aggregate or stones</b>	[1]
The aggregate is used in the manufacture of concrete blocks or in concrete used in foundations.	[2]
<b>Bricks (clay or concrete or sand lime)</b>	[1]
These may be the building blocks of the cavity wall external skin.	[2]
<b>Sand</b>	[1]
Used to make mortar or fill the voids in concrete between the larger aggregate.	[2]
<b>Bricks (engineering brick)</b>	[1]
These may be the building blocks of the cavity wall, external skin at the base of the wall.	[2]
<b>Stainless steel wall ties</b>	[1]
These are used to join the inner and outside skin of the cavity wall.	[2]
<b>Water</b>	[1]
Used as the catalyst when mixing concrete or mortar using cement and sand.	[2]
<b>Damp Proof Course</b>	[1]
A damp proof course is used to prevent the passage of moisture from the ground to the cavity wall.	[2]
<b>Insulation</b>	[1]
Keeps heat in.	[2]
<b>Cavity</b>	[1]
Prevents moisture travelling across cavity.	
It allows a position to place insulation.	[2]

[1] per correct material up a maximum of [4] and [2] per description up to a maximum of [8]  
 Materials from the list above or any other appropriate answer will be awarded marks.

**AVAILABLE  
MARKS**

12

4 (a) **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. [4]

(b) **Solar energy**

Energy from the sun which can be harnessed to generate electricity or heat water.

The solar panels (photovoltaic cell) is an electrical device that converts the energy of light directly into electricity. The energy can be stored using a battery bank which is quite expensive to buy. [4]

(c) **Biomass**

Involves harvesting wood (normally Willow in Northern Ireland).

The willow is grown as a short rotation crop.

The willow is dried and burned in a highly efficient burner to generate heat. [4]

A description showing limited understanding [1]

A description showing some understanding [1]

A description showing good understanding [1]

A description showing a very good understanding [1]

Maximum marks [4] per renewable energy type.

AVAILABLE  
MARKS

12

5 [1] for each shaded box completed correctly up to a maximum of 24

[2] for getting the total cost of 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	Top of bookshelf	1	40mm thick solid pine sheeting	650	300	40	0.65	£11.96	£7.77
2	End of bookshelf	2	20mm thick solid pine sheeting	900	300	20	1.80	£7.46	£13.43
3	Toe space	1	20mm thick solid pine	580	100	20	0.580	£2.51	£1.46
5	Back of bookshelf	1	6mm MDF	800	580	6mm	6 backs from one sheet	Cost per sheet £7.00 or £42	£7.00
<b>Total cost of glue, connection blocks, varnish and shelves</b>									£20
<b>Total Cost</b>									£49.66

Marks will be awarded for correctly following through calculations

**AVAILABLE MARKS**

26

- 6 Pitched roofs are traditional in Northern Ireland and provide the best way of keeping the water out in our relatively wet climate. Pitched roofs are much better suited to the climate in Northern Ireland than flat roofs.

The first type of roof covering was thatch. Thatched roofs were the traditional roof coverings for much of Northern Ireland. The timbers which supported the thatch were initially straight branches which had been cut from the local area.

Gradually the rough timbers gave way to sawn timbers. The thatch in Ireland was often reeds which were found in many parts of the country.

Natural slate

Concrete roof tiles, a much more recent development, manufactured from concrete and used as a roof covering. It has about a 50-year life expectancy.

Traditional cut roof

A traditional cut roof was the first development away from a thatched roof. This type of roof structure is still widely used for individual dwellings or for roofs of a complicated shape. The timber rafters are cut individually and nailed into position.

A purlin is often placed halfway up the length of the rafter to help support the roof and allow smaller sections of timber to be used. The timber wall plate is secured on top of the wall. The rafters are nailed to this timber member. Truss rafters are a relatively recent development using small sections of timber. They can span much greater distances without using purlins to support them.

Composite sheeting

A relatively modern development in roof construction. Normally two thin sheets of metal or plastic with insulation between them. Can span long lengths. One of the greatest advantages is that this type of roof covering is very good at retaining heat within the building.

Ventilation

All modern structures must have sufficient ventilation to allow the building to comply with the Building Regulations and keep the timber in good condition.

Insulation must be incorporated into all buildings to reduce heat loss.

The insulation could be installed at ceiling level or on the underside of the roof covering.

A well-insulated house is very energy efficient and will need very little additional heating and cooling.

### **Level 1 ([1]–[4])**

Candidate demonstrates a basic evaluation of how construction methods for roofs have changed over time. They evaluate at least two of the following:

Pitched or Flat roof

Roof coverings, Natural slate, concrete tiles, thatch and composite sheeting

Traditional cut roof structure, Trussed rafter structure

Support, wall plate, purlin

Ventilation

Insulation

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])**

Candidate demonstrates a satisfactory evaluation of how construction methods for roofs have changed over time. They evaluate at least three of the following:

- Pitched or Flat roof
- Roof coverings, Natural slate, concrete tiles, thatch and composite sheeting
- Traditional cut roof structure, Trussed rafter structure
- Support, wall plate, purlin
- Ventilation
- Insulation

Their evaluation is coherent and organised in most cases and they use a range of specialist terms.

The quality of written communication is good.

**Level 3 ([8]–[10])**

Candidate demonstrates an excellent evaluation of how construction methods for roofs have changed over time. They evaluate at least four of the following:

- Pitched or Flat roof
- Roof coverings, Natural slate, concrete tiles, thatch and composite sheeting
- Traditional cut roof structure, Trussed rafter structure
- Support, wall plate, purlin
- Ventilation
- Insulation

Their evaluation is coherent and 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.

[4] of the total marks awarded for quality of written communication.

10

**7 (a)** Complete the drawing in Fig. 3 adding the following details:

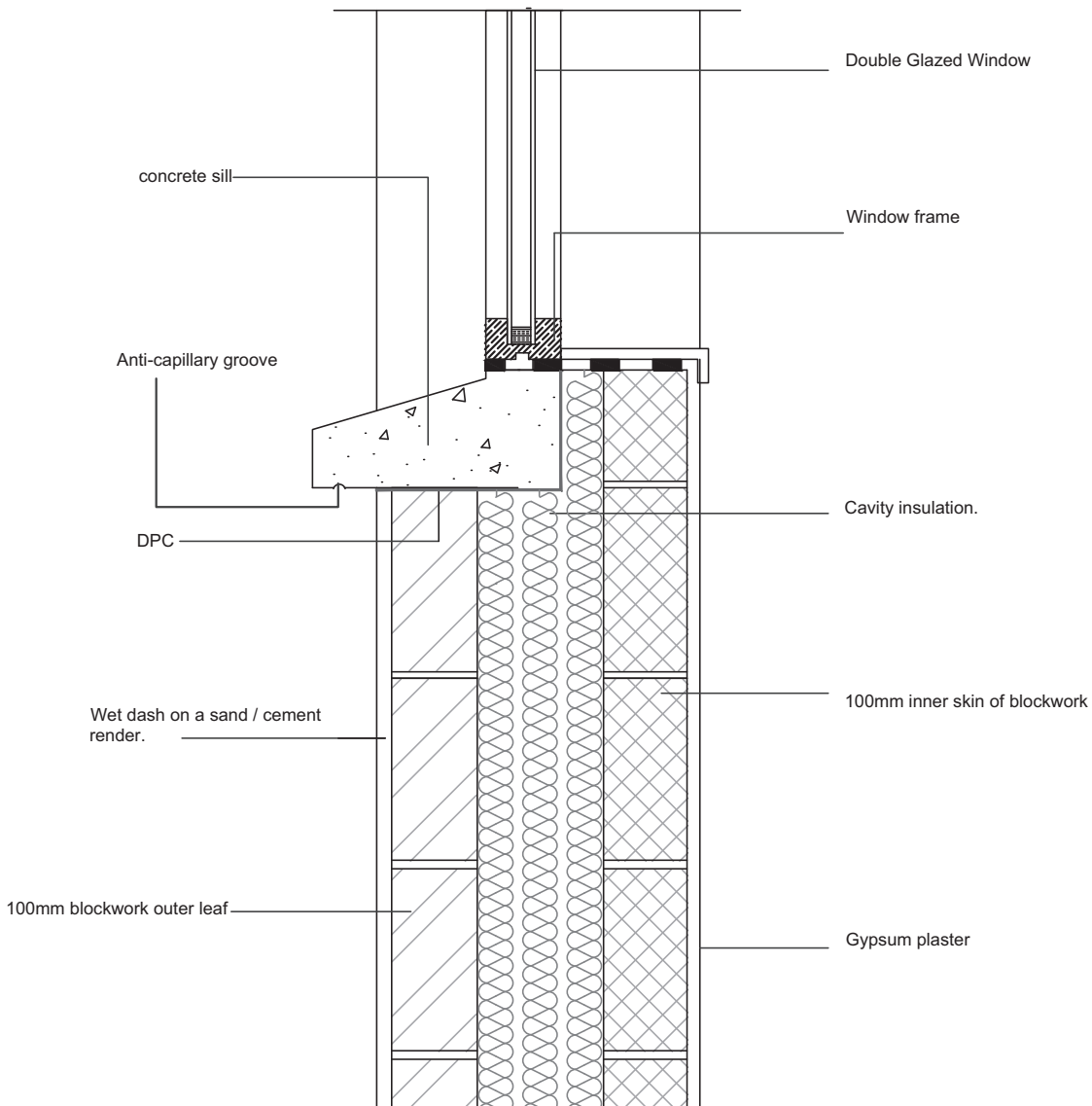
1. Outer skin of blockwork
  2. External wet dash plaster
  3. Concrete sill
  4. DPC
  5. Inner skin of blockwork
  6. Window frame
  7. Double glazing
  8. Gypsum plaster
- [8]

**(b)** Candidates should also draw in hatch patterns to represent the following:

1. Insulation behind the Concrete sill
  2. Inner skin of blockwork
  3. Outer skin of blockwork
  4. Cavity insulation
- [4]

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

1. 100mm blockwork outer leaf
2. Wet dash on a sand/cement render
3. Concrete sill
4. DPC
5. 100mm inner skin of blockwork
6. Cavity insulation
7. Window frame
8. Double glazed window
9. Gypsum plaster
10. Anti-capillary groove



[10]

22

AVAILABLE  
MARKS

**8 Recycling asphalt planed from an existing road.**

The existing carriageway is planed to a depth of approximately 25mm. The planings are taken back to the quarry where they can be heated and blended with new asphalt to make new asphalt roadways.

**Reduced Carbon footprint when crushing rock which can be used by a local homeowner.**

The Carbon footprint of a homeowner can be reduced by sourcing materially locally.

Renewable energy such as wind can be used to drive the machines used to crush rock.

**The use of a wind turbine to generate electricity to be used in the Quarry.**

Renewable energy such as wind can be used to drive the machines used to crush rock.

Renewable electricity can also generate electricity for the manufacture of cement.

**Working with Utility contractors to recycle waste from Utility excavations.**

Waste materials from utility companies such as pieces of broken concrete and stones are crushed in a quarry and reused. These materials can be used as base course aggregate for roads etc.

Up to [2] marks awarded for each evaluation of improvements made by modern Quarry practice up to a maximum of 3

6

## 9 Stone walls

Stone were originally used for wall construction. Solid walls built from local stones, lime mortar. Damp easily passes through the walls from the outside or rises from the ground.

### One brick thick wall

These were the original walls built from brick. Very often found in terrace houses. English bond was very popular. This type of wall has no cavity to prevent the passage of water from the outside to the inside if the building.

### Cavity wall construction

A cavity wall consists of two skins, each a brick thick with a cavity between them. The outer skin in conjunction with the cavity acts as a barrier to moisture. The inner leaf supports most of the load from roof and floors. The cavity originally had a width of 100mm with 40mm insulation. It is now normal practice to have a 150mm cavity filled with insulation.

### Insulation

Usually contained in your roof or walls, insulation helps your home retain heat, helping to bring down your energy bills.

### DPC

This plastic sheeting is commonly used to protect a building from moisture rising from the foundations. It is also used at door and window openings.

### Timber frame construction

Offsite timber frame construction allows homes to be built faster and to a higher sustainability standard compared with traditional construction methods, making them more cost-effective to build and live in. Modern timber frame structures are precision-engineered, strong, and durable. This method of construction relies on a factory-manufactured timber frame as a means of structural support, carrying the loads imposed by the floors and roofs, before transmitting them to the foundations.

### Walls of the future

Cavity walls with further insulation bonded to the inner skin to help reduce heat loss.

They should also be airtight.

### Level 1 ([1]–[4])

Candidate demonstrates a basic evaluation of how construction methods for walls have changed over the last century. They evaluate at least two of the following:

- Stone walls
- One brick thick walls
- Cavity wall construction
- Insulation
- Timber frame construction
- DPC
- Walls of the future

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])**

Candidate demonstrates a satisfactory evaluation of how construction methods for walls have changed over time. They evaluate at least three of the following:

- Stone walls
- One brick thick walls
- Cavity wall construction
- Insulation
- Timber frame construction
- DPC
- Walls of the future

Their evaluation is coherent and organised in most cases and they use a range of specialist terms.

The quality of written communication is good.

**Level 3 ([8]–[10])**

Candidate demonstrates an excellent evaluation of how construction methods for walls have changed over time. They evaluate at least four of the following:

- One brick thick walls
- Cavity wall construction
- Insulation
- Timber frame construction
- DPC
- Walls of the future

Their evaluation is coherent and 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.  
[4] of the total marks awarded for quality of written communication.

**AVAILABLE  
MARKS**

10

**Total**

**120**