



General Certificate of Secondary Education
2024

Centre Number

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Candidate Number

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Construction and the Built Environment

Unit 2



Sustainable Construction

[GCN21]

GCN21

THURSDAY 13 JUNE, AFTERNOON

TIME

1 hour 30 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all nine** questions.

Questions **1, 2, 3** and **5** should be answered in relation to the previously issued pre-release material.

You should **not** bring any of the material previously issued into this examination.

You will be provided with a clean copy of the pre-release material.

INFORMATION FOR CANDIDATES

The total mark for this paper is 120.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in questions **8** and **9**.

A scale ruler is required.

A calculator is required.

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Answer **all** questions.

Questions 1, 2, 3 and 5 relate to the pre-release material.

1 (a) List below the material that each of the following elements of the dwelling shown in the pre-release material is made from.

1. External roof covering _____ [1]

2. Soffit _____ [1]

3. Windows _____ [1]

4. External finish to the walls _____ [1]

5. What type of material is used to fill the cavity _____ [1]

(b) The external walls of the houses shown in the Pre-Release Material are constructed from two skins of masonry construction with a space between them.

1. What is the name given to this type of wall construction?

_____ [1]

The two skins of masonry are joined at regular intervals to increase structural stability.

2. What is the material used to make the components that join the two skins of blockwork together?

_____ [1]

3. What is the correct name for these components used to join the two skins together?

_____ [1]



4. What is the correct spacing of these components in walls?

Horizontal Spacing mm _____ [1]

Vertical Spacing mm _____ [1]

Vertical Spacing at window or door jambs mm _____ [1]

(c) As fuel costs continue to rise, homeowners are looking for alternative sources of sustainable energy.

1. What type of renewable energy source is shown in the pre-release material? [1]

_____ [1]

Identify two alternative sources of renewable energy other than the one shown in the pre-release material and describe briefly how your two alternatives work to produce electricity or heating.

2. Alternative source one _____ [1]

Describe how this source works to generate electricity or heat.

_____ [2]

3. Alternative source two _____ [1]

Describe how this source works to generate electricity or heat.

_____ [2]

[Turn over



- 2 (a) Using the attached pre-release material give the following internal room dimensions in **millimetres**.

Some dimensions may need to be scaled.

1. The length and width of **bedroom 2**.

Length _____ mm Width _____ mm [2]

2. Calculate the **overall length of the dwelling** at first floor level by adding the dimensions provided.

Length _____ mm [2]

3. The length and width of the **utility room**.

Length _____ mm Width _____ mm [4]

- (b) Calculate the total floor area of bedroom 1. Show your calculations below.

_____ square metres [3]

- (c) 1. What is the distance from finished ground floor to finished first floor level?

_____ mm [2]

2. How many individual 910mm wide windows are required for this house?

_____ [1]



3 (a) List **two** of the main functions of a foundation for the house shown in the pre-release material.

1. _____ [1]

2. _____ [1]

(b) Describe the stages in making a strip foundation.

[4]

(c) Describe how loads are **transferred from the roof and first floor** of the dwelling shown in the pre-release material. What provides the final support for these loads on top of the subsoil?

[2]

(d) Why is it sometimes necessary to place reinforcement in a foundation?

[2]

(e) Why would you use a pile foundation in a domestic construction project?

[2]

[Turn over



4 Complete a cutting list for the coffee table shown in Fig. 1.

The table, apart from the top, is made from solid beech timber.

All timber rails should have an **additional 75 mm of timber** added to their length, at each end, in order to cut the tenon joints. The beech timber will be finished with three coats of blue satin finish paint.

The table top will be cut to size from 30 mm thick MDF sheets.

Each sheet measures 3050 mm long and 1220 mm wide.

The MDF will be spray painted so no edging strips will be required. The table is shown in Fig. 2 without the table top and in Fig. 3 with the table top.

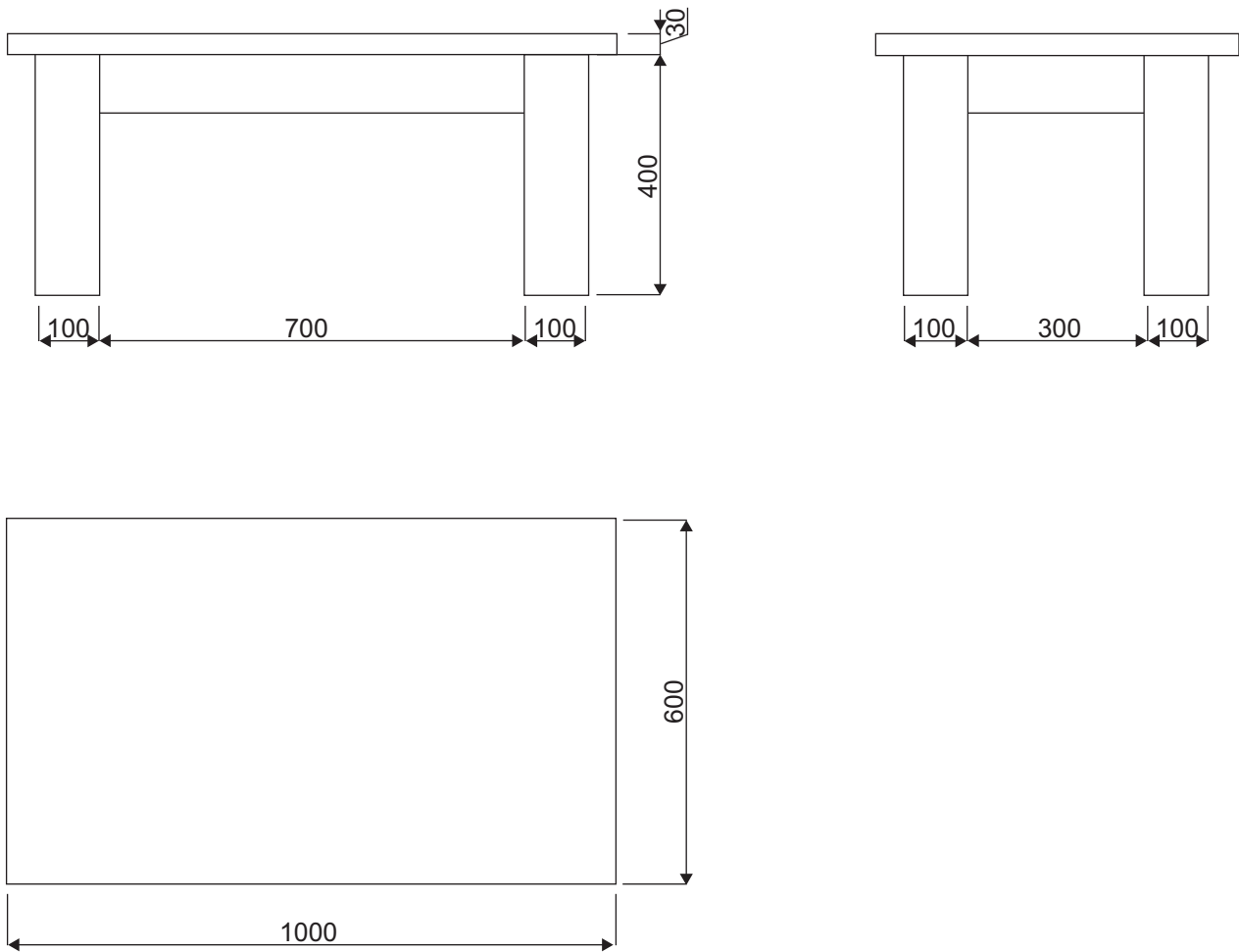


Fig. 1



The costs of the materials to be used in your table are shown below.

The cost of 100 mm × 100 mm square section beech timber legs is **£12.75** per linear metre.

Rails 100 mm × 30 mm planed all round (PAR) beech timber is **£10.96** per linear metre.

MDF 30 mm thick costs **£120** for a sheet measuring 3050 mm long and 1220 mm wide.

You will be able to cut six table tops from one sheet of MDF.

Remember to allow 75 mm each end of the rails for cutting out the tenon joints.

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			£12.75	
2	Long rails	2							
3	Short rails								
4	Table top						6 table tops from one sheet of MDF	Cost per sheet £120	
Total cost of glue, connection blocks, paint etc.									£5.39
Total Cost of table									£

Complete the shaded boxes in the cutting list above.



Use this page for calculations where necessary.

[26]

[Turn over

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5 **Fig. 4** shows an incomplete foundation detail which is to be used for the house shown in the pre-release material.

(a) Complete the drawing in **Fig. 4** adding the following details:

1. The cavity
2. Damp Proof Membrane
3. Sand and cement screed

[3]

You 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) Include labels from the list below:

Subfloor concrete

Skirting board

Outer skin of block work

Floor insulation

Inner skin of block work

Hardcore

Inner plaster with skim finish

Cavity insulation

Damp Proof Course (DPC)

Foundation concrete

[10]



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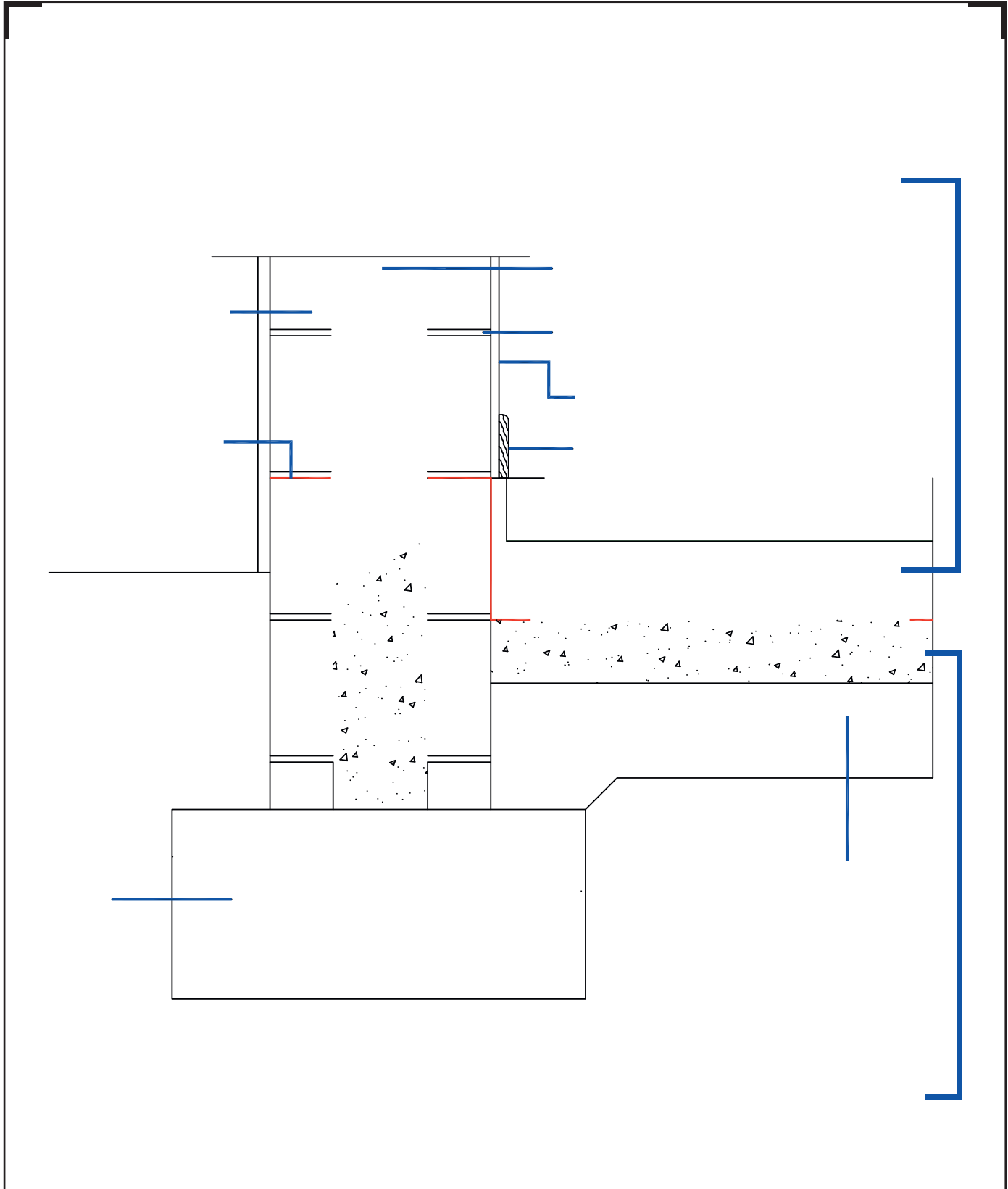


Fig. 4

[Turn over

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20GCN2111



7 Clearly demonstrate what you understand by the following terms relating to domestic stairs.

Riser

[1]

Tread

[1]

String

[1]

Handrail

[1]

[Turn over

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
Total Marks	

Examiner Number

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**General Certificate of Secondary Education
2024**

Construction and the Built Environment

Unit 2

Sustainable Construction

[GCN21]

THURSDAY 13 JUNE, AFTERNOON



GCN21

INFORMATION FOR CANDIDATES

A copy of the pre-release information for this examination is included in the following pages.

You must use this clean copy of the Pre-release Material in the examination and not your own annotated copy.

**PRE-RELEASE
MATERIAL**

Scenario

A client has purchased a green field site in a semi-urban area. An Architectural Technologist has been appointed to lead the design team. The client will develop the site with a mixture of single storey and two storey house types. The following working drawings for a detached house type have been completed, receiving full planning and building control approval.

The architectural style complements the surrounding area, matching existing adjacent developments.

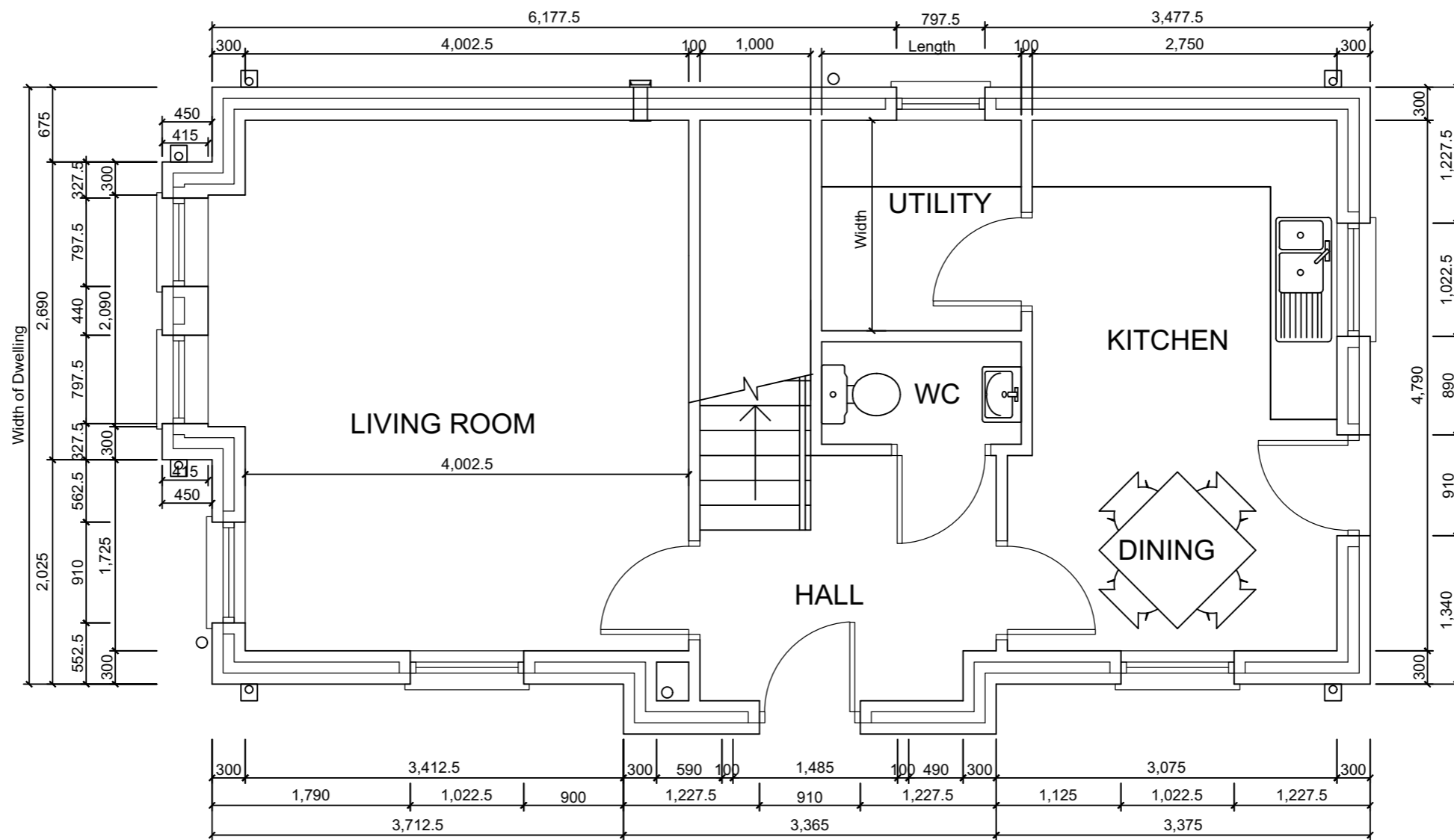
Specification notes for construction:

- **Foundations:** Foundation depth and size to be determined by Structural Engineer where employed. Provide C20 mix with minimum crushing strength for foundations to be 25 N/mm² after 28 days. Depth of foundation to subject to local ground conditions but in all cases should be taken down to a firm bearing minimum 750 mm below finished ground level to protect from frost damage.
Foundation sizes:
100 mm wall – 450 mm × 225 mm deep
215 mm wall – 600 mm × 225 mm deep
300 mm wall – 600 mm × 225 mm deep
- **Walls:** External walls in 300 mm cavity construction with 100 mm red facing brick outer leaf and 100 mm blockwork inner leaf. Provide 100 mm cavity with 100 mm Xtratherm Fulfil insulation to inner leaf. Wall ties to be placed every 750 mm centres horizontally, 450 mm centres vertically, 300 mm vertically at all openings and within 150 mm of opening. Provide horizontal and vertical damp proof course to all openings with minimum 25 mm high density polystyrene insulation where cavities close to prevent cold bridging. Blockwork inner leaf and internal walls to be 100 mm unless stated otherwise with minimum crushing strength of 7 N/mm². Inside of wall to be finished with 12.5 mm carlite browning and 3 mm hardwall plaster finish. Wall ties to be rawl RT2 stainless steel.
Provide DPC minimum 150 mm above finished ground level, lapped and bonded to floor damp proof membrane.
- **Ground Floor Construction:** Solid ground floor construction of 100 mm sand/cement screed on 120 mm Xtratherm Hyfloor insulation board on 100 mm concrete SUBFLOOR (1:2:4) on 300 µm polythene DPM / radon barrier. 25 mm blinding all on well consolidated hardcore. Hardcore to be laid in well compacted layers of 225 mm to a maximum depth of 600 mm. DPM to be of sufficient size to allow for upstand to be lapped and bonded to wall damp proof course (DPC).
- **Roof:** Provide concrete roof tiles, with universal ridge tiles to match on 25 mm × 38 mm treated softwood battens on Kooltherm sarking felt (or equal and approved) to BS 747 on C16 kiln dried trussed rafters as indicated on structural roof plan/sections. Trussed rafters to be designed and manufactured by specialist with calculations to be forwarded to Building Control for approval prior to manufacture. Trusses fixed to 100 mm × 50 mm wall plate secured to wall at 900 mm centres with 30 mm × 6 mm galvanised straps. Cavity to be closed with 12.5 mm fibreboard.
Provide 225 mm × 19 mm treated softwood fascia.
Provide 200 mm × 12 mm external grade plywood soffit.
Solar panels to be installed on the south facing elevation.

- **Timber First floor:** Timber first floor construction of 22 mm tongue and groove flooring grade chipboard on timber floor joists as stated on drawing. Double joist to be provided below first floor stud walls which run parallel to joist and below first floor baths/showers. Solid strutting to be provided below first floor stud walls which run perpendicular to floor joist. Floor joist spanning more than 4.5 m to be strutted by two rows of solid or herringbone strutting at one third span. Solid strutting to be at least 38 mm thick and at least $\frac{3}{4}$ times the depth of the joist. Herringbone strutting shall be at least 38 mm × 38 mm but should not be used when the distance between the joist is 3 times the depth of the joist. Mineral wool to be in between joists on 1st floor.
- **Windows and doors:** uPVC Plastic. Glazing to be double glazed with soft coat (en=0.20) Low-E Argon Filled units with 16 mm glass spacing (minimum to U Value of 1.4) including safety glazing.

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Notes

Project Name

Pre-Release Materials

Unit

Unit 2: Sustainable Construction

Drawing Title

Ground Floor Plan

Scale

1:50

Date

Summer 2024

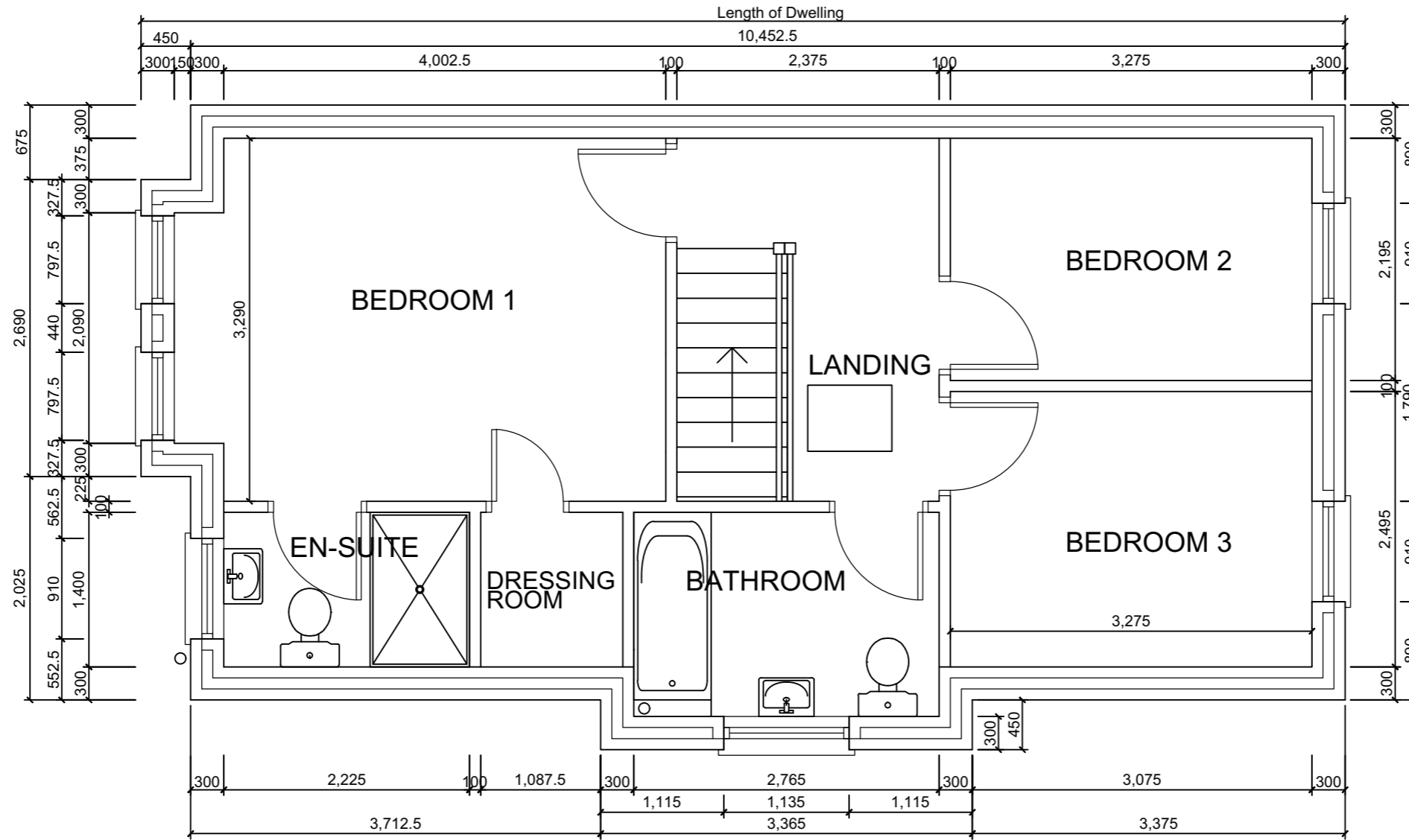
Dwg. No

01

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Notes

Project Name	Pre-Release Materials
Drawing Title	First Floor Plan

Unit	Unit 2: Sustainable Construction	
Scale	1:50	Date
Dwg. No	02	Drawn by
		CCEA

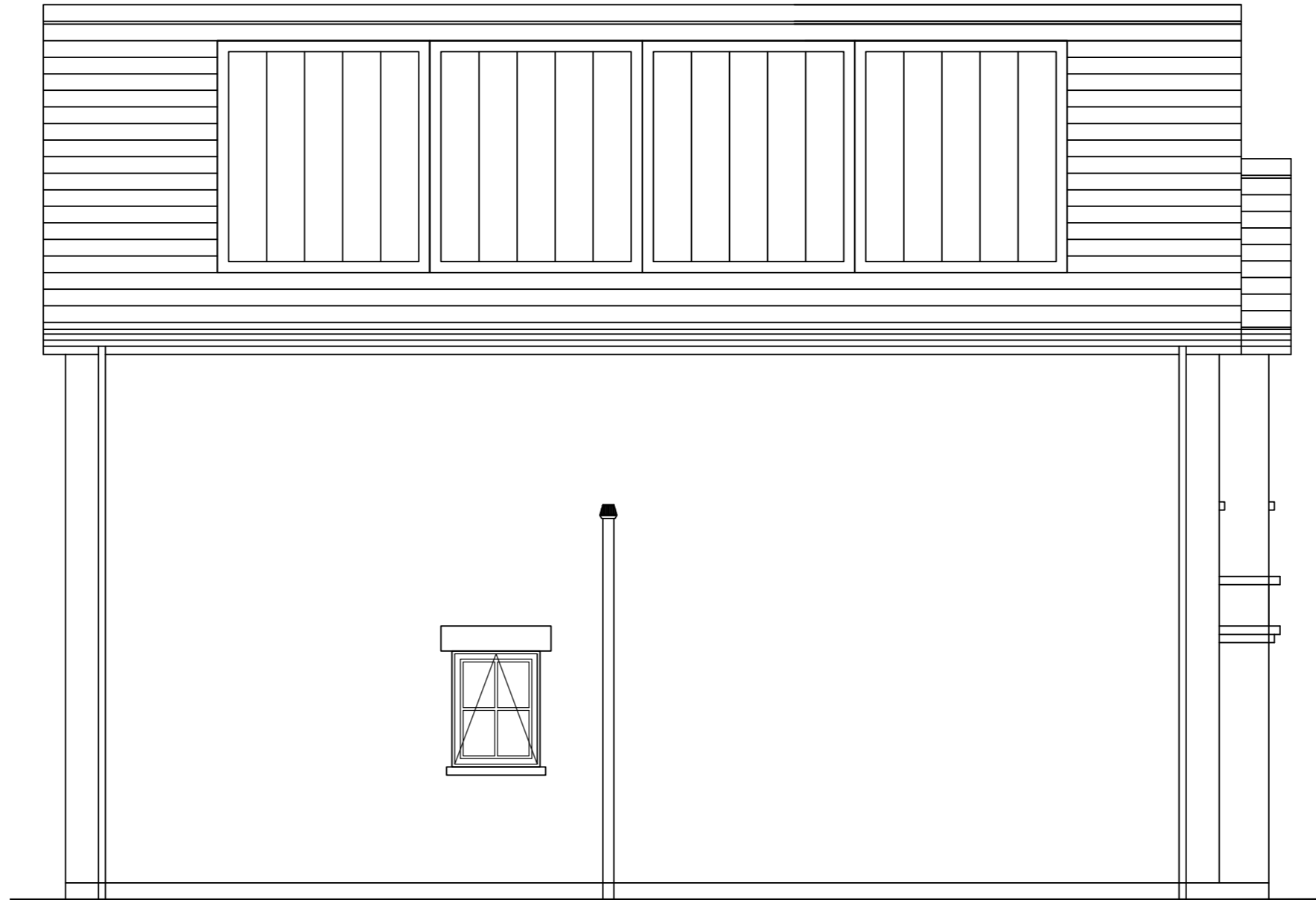
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Notes

Project Name	Pre-Release Materials		Unit	Unit 2: Sustainable Construction	
Drawing Title	Front Elevation		Scale	1:50	Date
			Dwg. No	03	Drawn by
					CCEA

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Notes

Project Name

Pre-Release Materials

Unit

Unit 2: Sustainable Construction

Drawing Title

Rear Elevation

Scale

1:50

Date

Summer 2024

Dwg. No

04

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Notes

Project Name

Pre-Release Materials

Unit

Unit 2: Sustainable Construction

Drawing Title

Side Elevations

Scale

1:50

Date

Summer 2024

Dwg. No

05

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