Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate 2021

Marking Scheme

Construction Studies

Ordinary Level

Note to teachers and students on the use of published marking schemes

Marking schemes published by the State Examinations Commission are not intended to be standalone documents. They are an essential resource for examiners who receive training in the correct interpretation and application of the scheme. This training involves, among other things, marking samples of student work and discussing the marks awarded, so as to clarify the correct application of the scheme. The work of examiners is subsequently monitored by Advising Examiners to ensure consistent and accurate application of the marking scheme. This process is overseen by the Chief Examiner, usually assisted by a Chief Advising Examiner. The Chief Examiner is the final authority regarding whether or not the marking scheme has been correctly applied to any piece of candidate work.

Marking schemes are working documents. While a draft marking scheme is prepared in advance of the examination, the scheme is not finalised until examiners have applied it to candidates' work and the feedback from all examiners has been collated and considered in light of the full range of responses of candidates, the overall level of difficulty of the examination and the need to maintain consistency in standards from year to year. This published document contains the finalised scheme, as it was applied to all candidates' work.

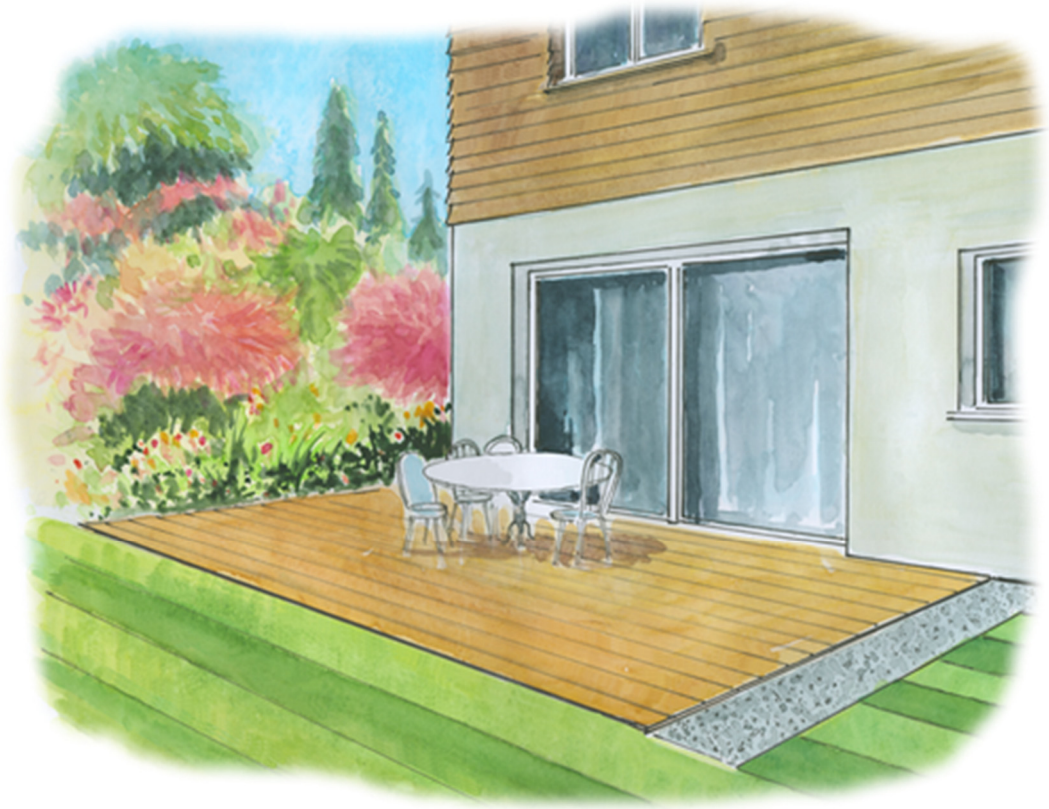
In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with their Advising Examiners when in doubt.

Future Marking Schemes

Assumptions about future marking schemes on the basis of past schemes should be avoided. While the underlying assessment principles remain the same, the details of the marking of a particular type of question may change in the context of the contribution of that question to the overall examination in a given year. The Chief Examiner in any given year has the responsibility to determine how best to ensure the fair and accurate assessment of candidates' work and to ensure consistency in the standard of the assessment from year to year. Accordingly, aspects of the structure, detail and application of the marking scheme for a particular examination are subject to change from one year to the next without notice.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2021



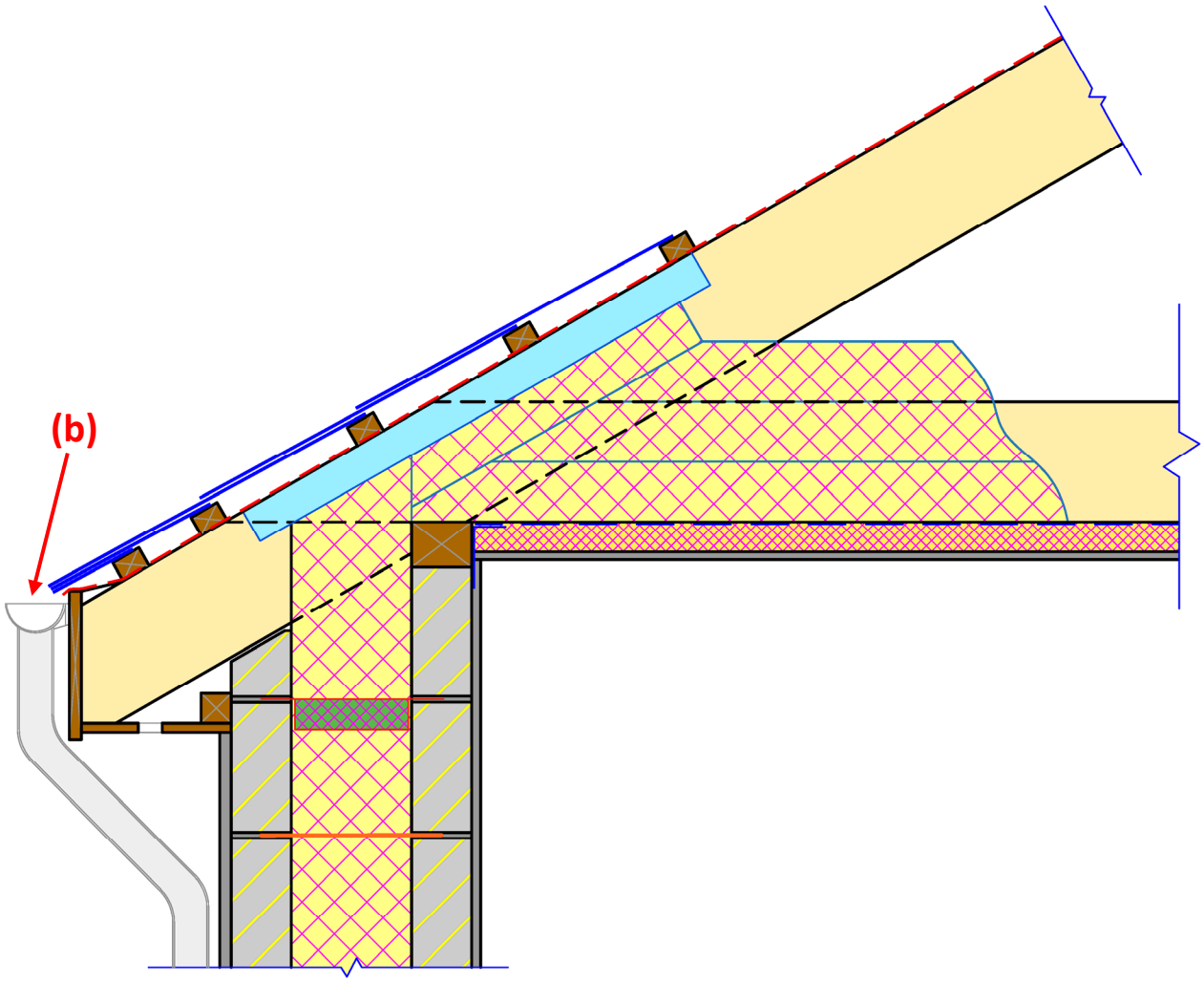
Construction Studies

Theory - Ordinary Level

Note: *Notes and graphics are for illustration and are not exclusive or exhaustive, other relevant notes and graphics are acceptable as responses and will be credited accordingly.*

Question 1

(a) Vertical section through eaves of the pitched roof and external wall.



Specification – typical detail

- Slates
- Battens 50 mm × 30 mm
- Breather membrane
- Rafters 200 mm
- Ceiling joist
- Tilting fillet
- Fascia
- Soffit
- Ventilation
- Insulated plaster board, skim coat
- Attic insulation
- Airtight tape
- Wallplate
- 13 mm internal plaster
- Concrete block inner leaf 100 mm
- Cavity closer
- Wall tie
- Full fill insulated cavity
- Concrete block outer leaf 100 mm
- 19 mm external render.

N.B. Any alternative detailing which complies with current Building Regulations is acceptable.

(b) On your drawing show how rainwater runoff is removed at the eaves.

Eaves gutter / downpipe.

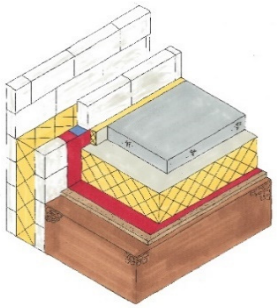
Question 2

(a) Two advantages of constructing a new ground floor with a high level of insulation.

- Better for the environment
- Increased thermal comfort for occupants
- Energy bills are reduced
- The overall house will be warmer
- It improves the Building Energy Rating (BER).

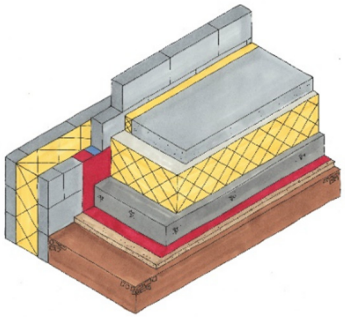
Any other suitable reason will be accepted.

(b) One suitable method of insulating a new solid ground floor.



- Builders install a layer of DPM/radon barrier on a layer of sand blinding
- A strip of perimeter insulation is installed along the perimeter to prevent cold bridging
- Insulation boards are arranged on the DPM/radon barrier
- Insulation boards are tightly butted together
- Concrete is poured on top of the insulation to form the floor slab.

Type of insulation



- Extruded Polystyrene foam boards (EPS)
- Polyurethane insulation boards
- Foil faced Polyisocyanurate boards (PIR)

Thickness of insulation

- 150 - 300 mm insulation boards.

(c) Suitable floor type for the open-plan kitchen and give two reasons for the selection.

Tiles	Easy to clean Hygienic surface Hard wearing
Solid wood	Aesthetics Natural feel Better acoustics
Laminate flooring	Cheap Easy to install Quick to change
Polished Concrete	Durability Maintenance free Long lasting
Natural stone	Local stone can be used to fit the locality Hard wearing Water resistance

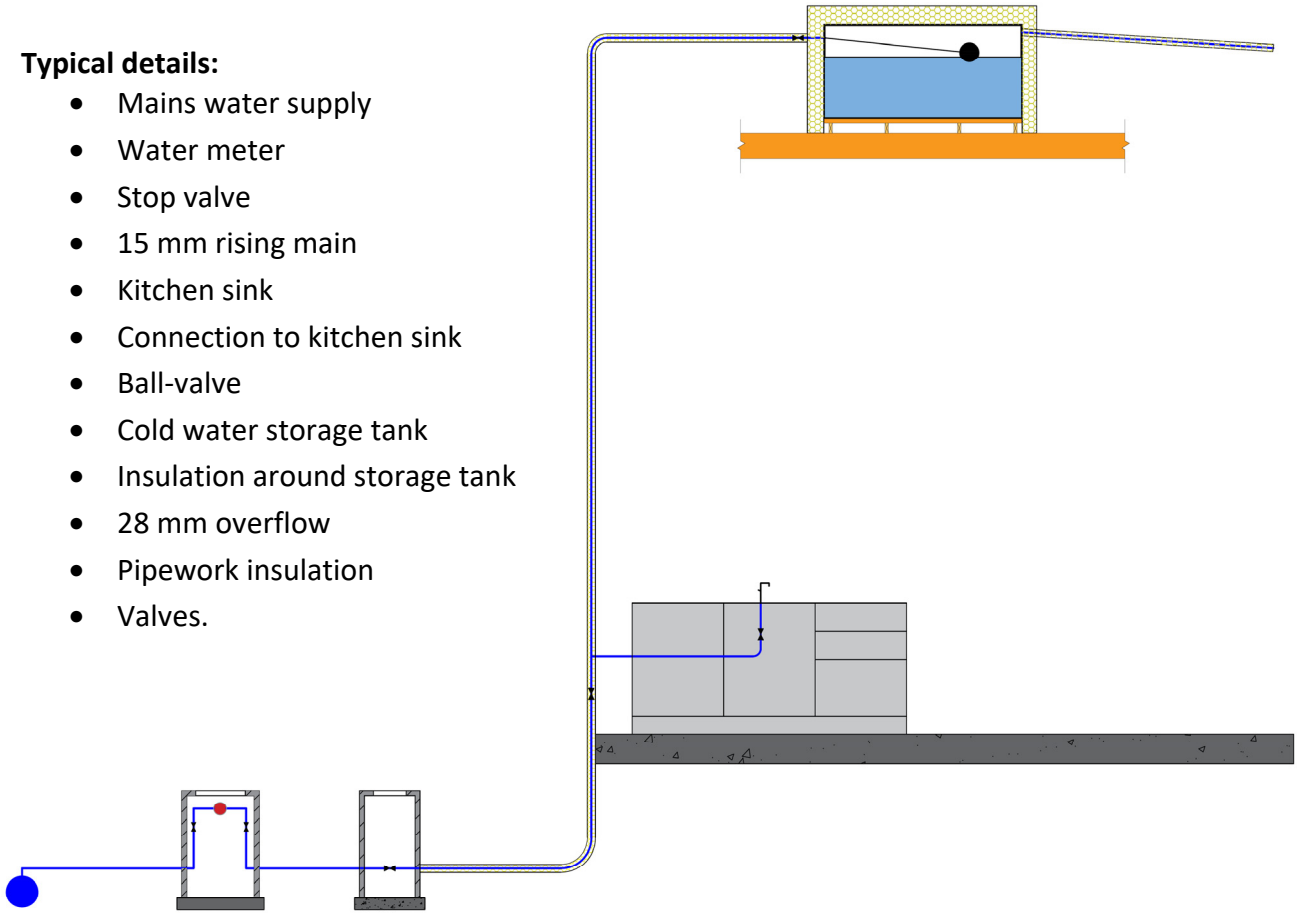
Any other suitable floor type and reason will be accepted.

Question 3

(a) Pipework to supply cold water from the water main to the kitchen sink and water storage tank.

Typical details:

- Mains water supply
- Water meter
- Stop valve
- 15 mm rising main
- Kitchen sink
- Connection to kitchen sink
- Ball-valve
- Cold water storage tank
- Insulation around storage tank
- 28 mm overflow
- Pipework insulation
- Valves.



N.B. Any alternative detailing which complies with current Building Regulations is acceptable.

(b) Two advantages of installing a domestic water meter.

- Encourage water conservation
- Reduce the cost of water treatment due to reduced usage
- Show leaks and wastage if water meter reading is high
- Reduce the water usage bill.

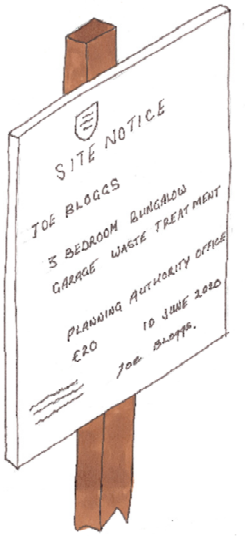
Any other suitable reason will be accepted.

Question 4

(a) Two reasons why it is necessary to apply for planning permission to build a new dwelling house.

- To ensure structures meet all current building regulations
- To ensure no environmental damage is done to localities
- Informs the public about the development
- It controls the design, shape, height and location of developments
- To provide better designed communities
- Legal requirement.

Any other suitable reason will be accepted.



(b) Describe the information that must be contained in each of the following planning documents:

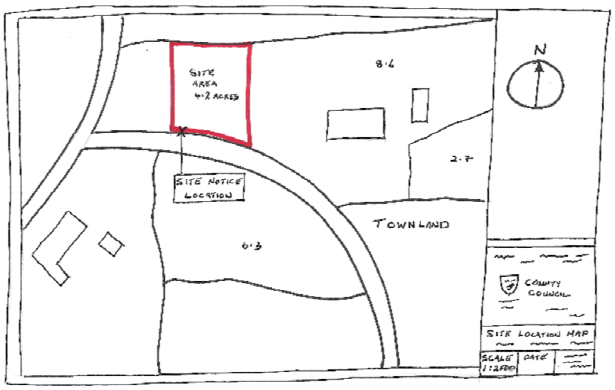
site notice

- Name of applicant
- Reference number of application
- A description of what the development is to consist of
- Where the application and plans can be inspected
- The date when the site notice was erected.

site location map

- Identify the location of the dwelling and local areas
- A scale of between 1:10560 and 1:2500
- Boundary of site must be outlined in red colour
- Position of neighbouring buildings
- Position of north.

Any other valid information



(c) One advantage and one disadvantage of building a dwelling house in a town.

Advantage	Disadvantage
Access to public transport	Reduced air quality
Not reliant on private car	Noise pollution
Walking distance to public amenities	Loss of connection to nature
Access to services	Less privacy from neighbours
Access to public sewage treatment	Usually, limited space for site

Any other suitable advantage or disadvantage will be accepted.

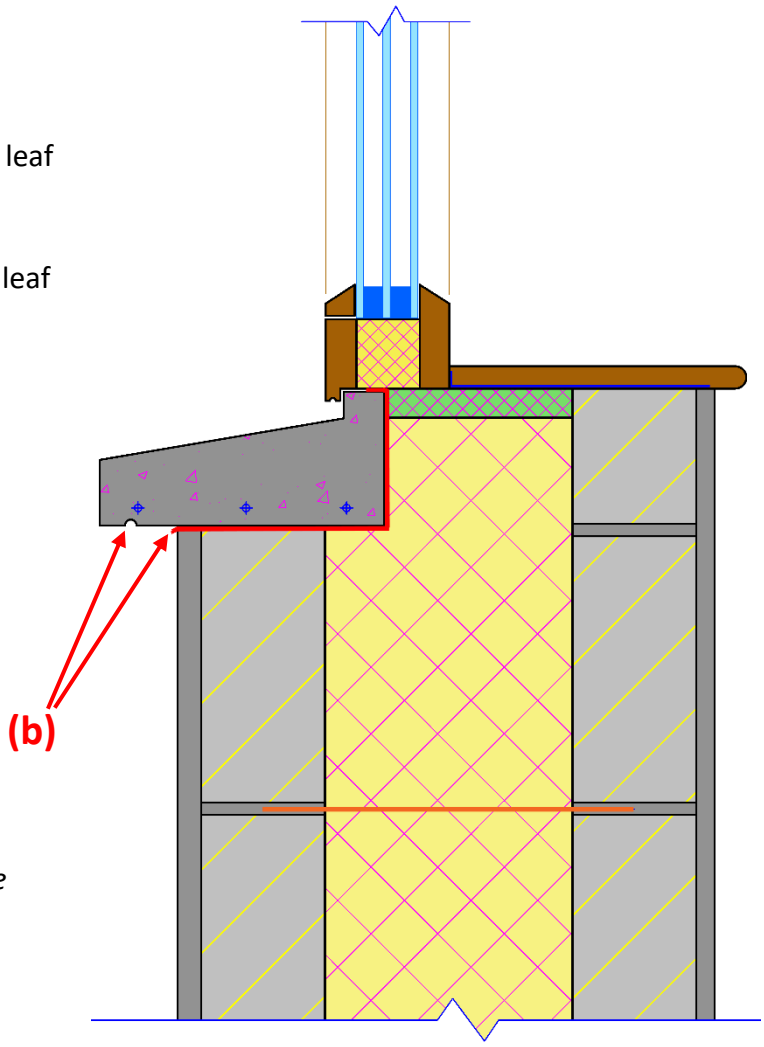
Question 5

(a) Vertical section through the external wall and bottom portion of the window.

Specifications:

- 19 mm external render
- 100 mm concrete block outer leaf
- Full filled insulated cavity
- Wall ties
- 100 mm concrete block inner leaf
- 13 mm internal plaster
- Cavity closer
- DPC
- Precast concrete window cill
- Throating / drip
- Window board
- Airtight tape
- Window frame 120 × 80 mm
- Triple glazing.

***Note**: Any alternative detailing which complies with current Building Regulations is acceptable*



(b) Typical design detailing to prevent dampness entering at the window cill.

Sloped cill over-hanging the external render with a throating / drip / wrapped in DPC.

Any other suitable detail will be accepted.

Question 6

(a) Show the safety sign for each of the following personal protection equipment (PPE) items. One specific reason why each item of personal protective equipment must be worn.

High-visibility vest

Allows workers to be visible on-site. Allows machine operators see construction workers and avoid accidents.

Safety boots

Protects workers from heavy materials and objects being dropped and injuring their foot.

Safety helmet

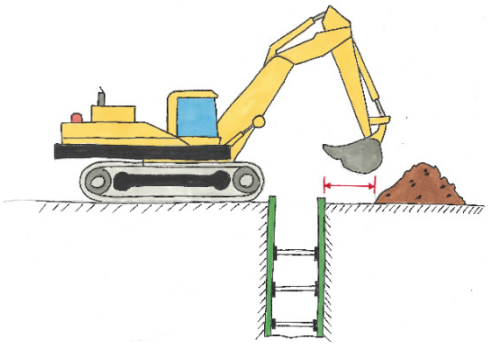
Protect workers head against impact from falling objects and materials from heights.

(b) Two potential risks to construction workers when working in a deep trench.

Possible Risks:

- Cave-ins or collapse of trench sides
- Equipment falling in on workers
- Machinery falling in on workers
- Workers falling on entering or exiting the trench
- Coming in contact with underground services.

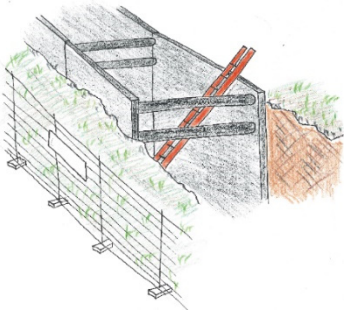
Any other suitable risk will be accepted.



(c) Show one safety precaution that workers should observe when working in a deep trench on a construction site.

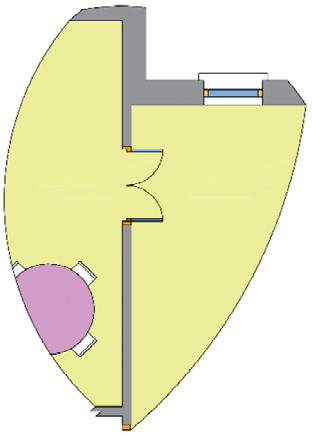
- Slope or battering back the trench sides to a safe angle to stabilise the sides and stop collapse
- Support trench walls with sheeting/trench box when the depth exceeds 1.25 metres to prevent the collapse of the sides
- Ensure guard rails and exclusion zone notices are in place to limit the proximity of machines and workers to the edge of the trench
- Ensure excavated material is stored at a safe distance from the open trench to prevent material falling into the trench.

Any other suitable precaution will be accepted.



Question 7

(a) **Draw a large freehand sketch of the given design and show on the sketch how the kitchen could be accessed directly from the living room.**



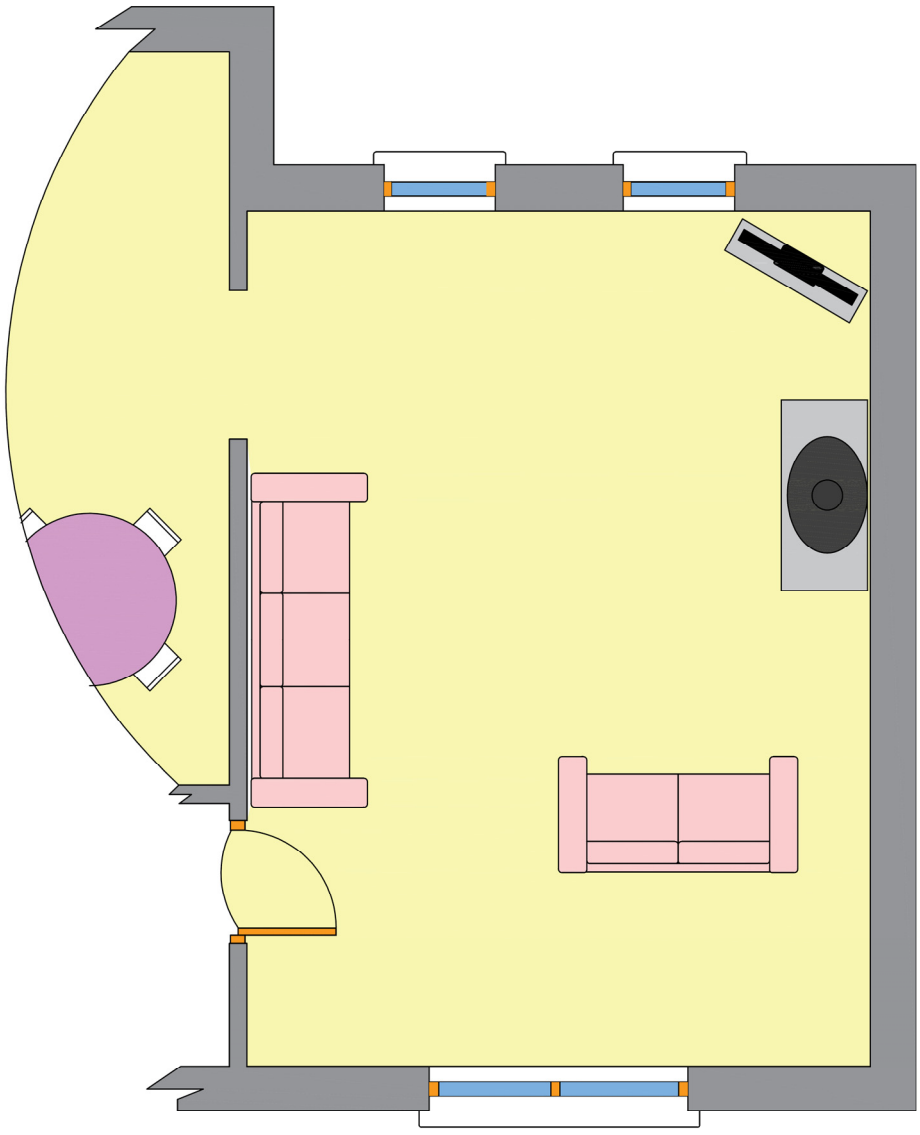
One advantage of including access to the kitchen.

- Quicker to enter the kitchen to prepare meals
- Larger space for the family to socialise/gather
- Allow heat to circulate freely between the most used rooms of the house
- Allow for a family together-space while carrying out different tasks.

(b) **Show your preferred locations for each of the following in the living room:**

- **Sofa (3 seater)**
- **Sofa (2 seater)**
- **Stove**
- **Television.**

Give one reason for selecting each location.



Sofa (3 Seater)

- Located to allow clear view of the television and stove
- Fitted against the wall to limit the total space being taken up
- Allow space in the room to locate a coffee table.

Sofa (2 Seater)

- Located to allow clear view of television and adjacent to stove
- Located to allow occupants to socialise together
- Reduce the amount of light blocked entering the room.

Stove

- On external wall to allow the removal of fumes
- Centre of the room to allow for circulation of heat
- Centre of the room for it to be a focal point to gather around.

Television

- On a wall to allow for fixtures and fittings to be attached securely
- Located in corner of room to limit glare from external windows
- Located in corner to limit the chance of damage.

Any other suitable location and valid reason will be accepted.

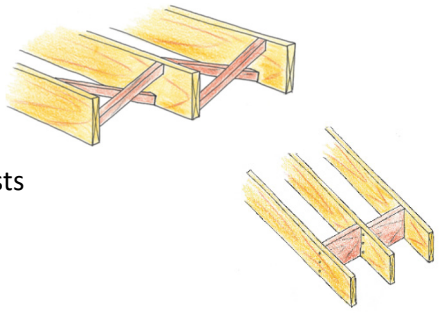
(c) Discuss one advantage of incorporating a stove in a modern living room.

- A centre piece for a group to gather around and socialise
- Provides warmth to the family in the main room of the dwelling
- Environmentally friendly if using timber for fuel
- Reduces the use oil and gas to heat the area.

Any other valid reason

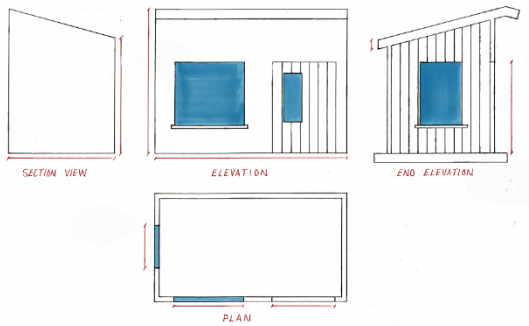
Question 8

Joist bridging



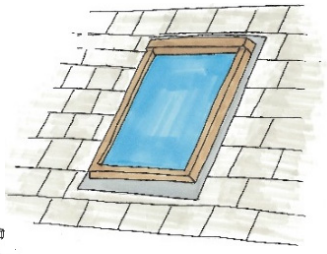
- Used to keep joists vertical to prevent twisting
- Stiffens and strengthens the joists by tying then together
- Used to spread the load from one joist to other nearby joists
- Two methods: solid bridging and herringbone bridging.

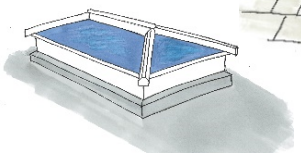
Working drawing



- A scaled drawing to use as a guide when constructing furniture or buildings
- Will include an elevation, end elevation, plan, and sectional views
- Will include dimensions and graphical information to aid construction of the building or artefact
- Can be hand drafted or created using Computer Aided Design (CAD)
- Often referred to as building plans or blueprints.

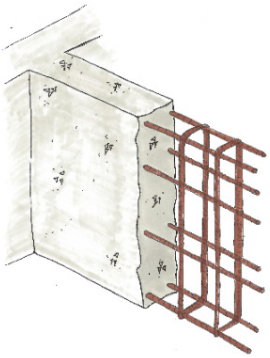
Roof light





- Used on roof surfaces for a means of natural light
- Units are fitted with double, triple or quadruple glazing
- Allows attic space to be used as a usable room
- Form an important part of modern house design
- Gives more privacy compared to dormer windows.

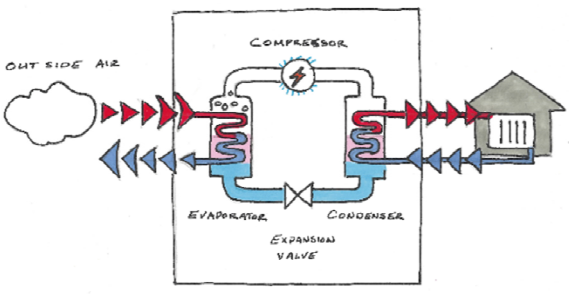
Steel reinforcement



- Combined with concrete to create a strong building material called reinforced concrete
- Encased in load-bearing concrete structures to increase strength and hold the concrete in tension
- Placed at a depth of two thirds a foundations thickness.
- The steel is usually patterned to improve the bond and grip with the surrounding concrete
- Often referred to as rebar and comes in bars or mesh which can be tied together into cages.

Heat pump

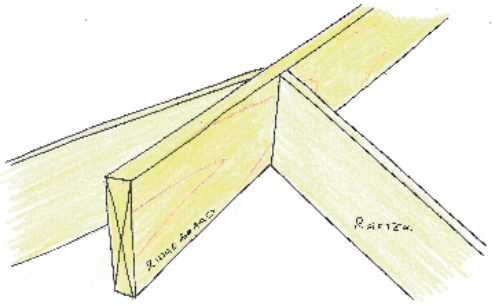
- Used to extract heat from one area to another by means of the refrigeration cycle



- A fan is used to pass air over an evaporator coil which removes the heat energy from the air and passes it to the refrigerant
- The refrigerant is then compressed, which increases the temperature, this heat is transferred to water running through radiators or underfloor heating
- Heat pumps that use the ground for heating are called geothermal heat pumps.

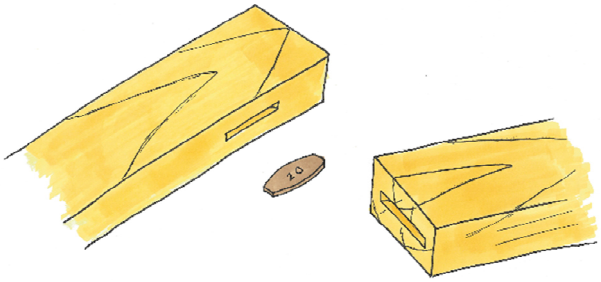
Ridge board

- Horizontal member placed between the top end of the rafters
- Forms the apex of a cut roof
- Supported by the rafters or/and at the gable wall
- Gives rigidity and straightness to the roof
- Rafters are nailed to the ridge board
- Typical sizes - 225 × 32 mm, 225 × 25 mm.



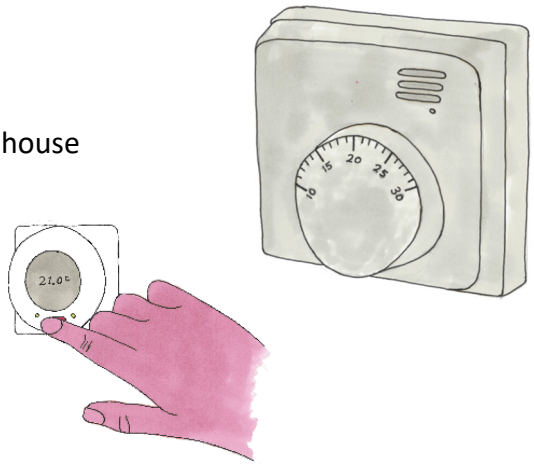
Biscuit joint

- Widely used joint in manufacturing modern furniture to butt joint and edge joint.
- Joint used to join board of various width and thickness
- Biscuit manufactured from pressed beech and available in different sizes
- Biscuit joiner used to form a groove in opposing edges to allow biscuit to fit
- Forms a larger surface area for gluing hence strengthens joint.



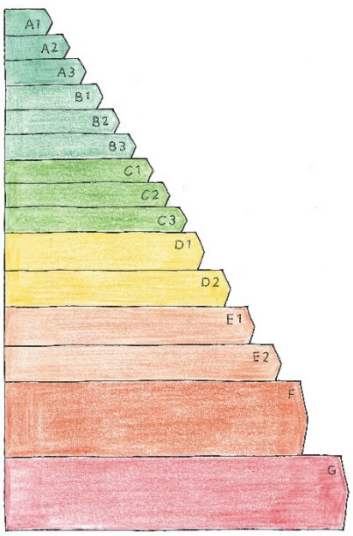
Room thermostat

- Senses the air temperature in the room and communicates with the heating system
- Regulates a desirable temperature throughout the house
- Can be digital, dial or touchscreen controlled
- Smart home thermostats are connected to the Wi-Fi and can be controlled remotely
- Allows for a reduced home heating bill and less home heating wastage.



Building Energy Rating

- BER certificates indicates the homes energy performance
- Rates the energy performance of a house from A - G
- An A-rated house is the most energy efficient and will have the lowest energy bills
- BER is calculated on the energy used to space heat, heat water, ventilate, and light a house
- An A-rated house is the current building standard and can improve its appeal to buyers and renters.



Question 9

(a) Suitable applied finish to preserve the decking:

- Oils (Decking oil, Teak oil, furniture oil)
- Solvent based preservative
- Exterior wood paint
- Varnish
- Decking stain

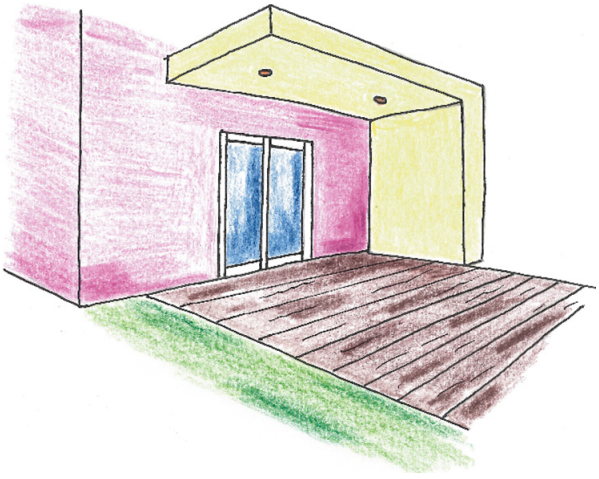
Two reasons for your choice:

- Improve appearance of the decking
- Protects against UV damage and fading
- Extends the life span of the softwood decking
- Prevents against algae growth on the decking boards
- Protects the boards against rot and decay
- Changes the colour of the decking boards.

Any other valid reason

(b) Show two modifications to the outdoor space that would allow use during the winter months.

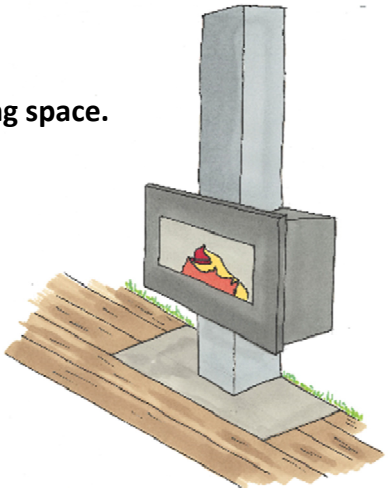
- Install a wind breaker around the decking
- Install a permanent roof
- Install a heat source - fire pit, outdoor patio heater, external fireplace.



(c) Two advantages for the occupants by creating an outdoor living space.

- Increase the owner's usable space
- Connection with nature and the outdoors
- Area to have outdoor meals during warmer seasons
- Increase the resale value of the property.

Any other valid reason



Question 1

Vertical section through wall and eaves.	
Details - typical sizes	**Marks**
Part (a)	
Slates 600 mm × 300 mm on battens 50 mm × 30 mm	
Breather membrane	**5**
Rafters 200 mm × 50 mm	
Ceiling joist with insulation between joists	**5**
Insulated plasterboard with skim coat	**5**
Wallplate 100 mm × 75 mm	
Airtight membrane and tape	**5**
Ventilation	**5**
Tilting fillet, fascia, soffit and eaves gutter	
Concrete block inner leaf	**5**
Full fill cavity insulation 200 mm, wall ties and cavity closer	**5**
Concrete block outer leaf	
13 mm internal plaster and 19 mm render	
Any 7 x 5 marks **Sub-total**	**35**
Any **three** typical dimensions	**4**
Draughting, accuracy and scale ***(excellent, good, fair)*** ***8 6 4***	**8**
Sub-total	**12**
Part (b) Show how rainwater runoff is removed at the eaves.	
Eaves gutter/ downpipe	**3**
Sub-total	**3**
Total	**50 marks**

Question 2

Insulating a ground floor	
Details	**Marks**
Part (a) **Two** advantages of constructing a new ground floor with a high level of insulation	
Advantage 1	**5**
Advantage 2	**5**
Sub-total	**10**
Part (b) Show how to insulate the concrete floor	
Method of insulating floor note & sketch (8 + 8 marks)	**16**
Preferred insulation type for the floor	**5**
Thickness of insulation	**5**
Sub-total	**26**
Part (c) Suitable floor type for kitchen and give **two** reasons for the selection.	
Suitable floor type	**6**
Reason 1	**4**
Reason 2	**4**
Sub-total	**14**
Total	**50 marks**

Question 3

Cold water connection and supply	
Details – typical sizes	**Marks**
Part (a) Pipework required to supply **cold water** to **kitchen sink** and **storage tank**	
Mains water supply	
Water meter	
15 mm rising main	**4**
Kitchen sink	**4**
Connection to kitchen sink	**4**
Ball-valve	**4**
Cold water storage tank	**4**
Insulation around storage tank	**4**
28 mm overflow	**4**
Pipe insulation	**4**
Valves / pumps	
Annotation	
Any 8 × 4 marks **Sub-total**	**32**
Quality of sketch ***(excellent, good, fair)*** ***8 6 4***	**8**
Sub-total	**8**
Part (b) **Two** advantages of installing a domestic water meter	
Advantage 1	**5**
Advantage 2	**5**
Sub-total	**10**
Total	**50 marks**

Question 4

Planning permission			
Details			**Marks**
Part (a) **Two** reasons why it is necessary to apply for planning permission			
Reason 1			**6**
Reason 2			**6**
		Sub-total	**12**
Part (b) Information that must be contained in **each** of the following planning documents.			
Site notice	note & sketch	(8 + 5 marks)	**13**
Site location map	note & sketch	(8 + 5 marks)	**13**
		Sub-total	**26**
Part (c) **One** advantage and **one** disadvantage of building a dwelling house in a town			
Advantage			**6**
Disadvantage			**6**
		Sub-total	**12**
		Total	**50 marks**

Question 5

Vertical section through wall and window	
Details - typical sizes	**Marks**
Part (a) Draw a vertical section through external wall and bottom of window	
Concrete block outer leaf	**5**
Full filled insulated cavity	**5**
Wall ties	**5**
Concrete block inner leaf	**5**
13 mm internal plaster and 19 mm external render	**5**
Cavity closer	**5**
DPC	**5**
Precast concrete window cill with throating / drip	**5**
Window board	**5**
Airtight tape	
Window frame 120 mm × 80 mm	
Triple glazing	
Any 7 x 5 marks **Sub-total**	**35**
Any **three** typical dimensions	**3**
Draughting, accuracy and scale ***(excellent, good, fair)*** ***8 6 4***	**8**
Sub-total	**11**
Part (b) Show on your drawing design detailing to prevent water entering at the window cill.	
Throating / drip / DPC	**4**
Sub-total	**4**
Total	**50 marks**

Question 6

Site Safety			
Details			**Marks**
Part (a) Show safety sign for **each** of the following (PPE) items and **one** specific reason why it must be worn.			
High-visibility vest sign and specific reason		*(6 + 3 marks)*	**9**
Safety boots sign and specific reason		*(6 + 3 marks)*	**9**
Safety helmet sign and specific reason		*(6 + 3 marks)*	**9**
		Sub-total	**27**
Part (b) List **two** potential risks to construction workers when working in deep trench excavations.			
Risk 1			**5**
Risk 2			**5**
		Sub-total	**10**
Part (c) Show **one** safety precaution that workers should observe when working in a deep trench.			
Safety precaution	note & sketch	(8 + 5 marks)	**13**
		Sub-total	**13**
		Total	**50 marks**

Question 7

Living room access and area design		
Details		**Marks**
Part (a) Draw a **sketch** of living room and **show** kitchen access. Discuss **one** advantage of including access to the kitchen.		
Sketch of living room		**8**
Suitable access from kitchen		**6**
Advantage		**6**
Sub-total		**20**
Part (b) Show preferred location and a reason for each of the following; sofa (3 seater), sofa (2 seater), stove and television.		
Location and valid reason for 3 seater sofa position	(3 + 3 marks)	**6**
Location and valid reason for 2 seater sofa position	(3 + 3 marks)	**6**
Location and valid reason for stove position	(3 + 3 marks)	**6**
Location and valid reason for television position	(3 + 3 marks)	**6**
Sub-total		**24**
Part (c) Discuss **one** advantage of incorporating a stove in a modern living room.		
Advantage		**6**
Sub-total		**6**
Total		**50 marks**

Question 8

Construction Terms	
Details	**Marks**
Item one	
Primary communication of relevant information	**6**
Other communication of relevant information	**4**
Item two	
Primary communication of relevant information	**6**
Other communication of relevant information	**4**
Item three	
Primary communication of relevant information	**6**
Other communication of relevant information	**4**
Item four	
Primary communication of relevant information	**6**
Other communication of relevant information	**4**
Item five	
Primary communication of relevant information	**6**
Other communication of relevant information	**4**
Total	**50 marks**

Question 9

Outdoor living space			
Details			**Marks**
Part (a) Suitable applied finish and **two** reasons for choice.			
Suitable finish			**4**
Reason 1			**4**
Reason 2			**4**
		Sub-total	**12**
Part (b) **Two** modifications to the outdoor space that would allow use during the winter months.			
Modification 1 to space	*notes + sketch*	*(8 + 5 marks)*	**13**
Modification 2 to space	*notes + sketch*	*(8 + 5 marks)*	**13**
		Sub-total	**26**
Part (c) **Two** advantages for the occupants by creating an outdoor living space.			
Advantage 1			**6**
Advantage 2			**6**
		Sub-total	**12**
		Total	**50 marks**

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination, 2021

Construction Studies

Ordinary Level and Higher Level

(150 marks)

COURSEWORK -
DESIGN AND REALISATION

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Form A

Leaving Certificate Examination

Construction Studies

Practical Coursework

Marking Scheme

Marking Criteria		Marks
A	**Planning of Project** • Coursework selection, exploration and management planning • Investigation and relevant research • Design development through annotated sketches, models or working drawing(s)	**40**
B	**Report Writing** • Design folio detailing planning, research, execution and evaluation of coursework • Sequence of manufacture including photographic evidence and/or sketches • Critical appraisal and conclusions from coursework experience	**35**
C	**Manipulative Skills** • Marking-out of materials • Processing of materials • Assembly and finishing of materials	**40**
D	**Presentation of Project** • Overall quality and presentation of artefact • Overall quality and presentation of design folio • Range and depth of skills evident in the coursework	**35**
	Total	**150**

Note*: While the general headings and marks above will largely remain the same, breakdowns may vary for any given year.*

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