



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2025

Construction Studies
Theory - Higher Level
(300 marks)

Friday, 13 June
Afternoon, 2:00 - 5:00

- (a) Answer **any five** questions.
- (b) All questions carry equal marks.
- (c) Answers must be written in ink.
- (d) Drawings and sketches are to be made in pencil.
- (e) Write the number of the question distinctly before each answer.
- (f) Neat freehand sketches to illustrate written descriptions should be made.
- (g) The name, sizes, dimensions and other necessary particulars of each material indicated must be noted on the drawings.

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1. A triple glazed window is fitted in the external wall of a dwelling house, as shown. The window has a thermally broken wooden frame. The fixed frame of the window is 120 mm × 80 mm. The wall is of timber frame construction with an external rendered concrete block outer leaf. The internal timber frame is 250 mm × 50 mm with a 50 mm service cavity provided at the internal surface. The bottom of the concrete cill is located 300 mm above finished floor level. The ground floor is a solid concrete floor with a 20 mm quarry tile finish.

- (a) To a scale of 1:5, draw a vertical section through the external wall, ground floor, and window. Show the typical construction details from the bottom of the strip foundation to a level 200 mm above the bottom frame of the window.

Show a 1.0 metre width of ground floor.

- (b) On your drawing, show the typical design detailing that will prevent the penetration of radon gas into the house.

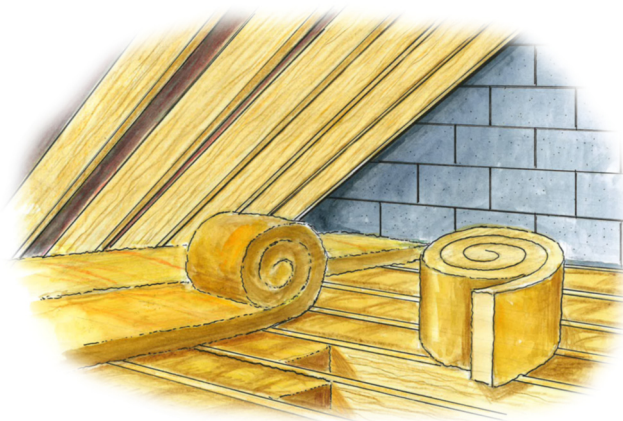


2. (a) Discuss in detail the importance of any **two** of the following in maintaining a positive health and safety culture among workers on a construction site:

- safety training
- health and safety officer
- risk assessment audit.

- (b) Outline **one** possible risk to personal safety associated with **each** of the following:

- working in a deep trench
- installing insulation in an attic space
- repairing a chimney capping.

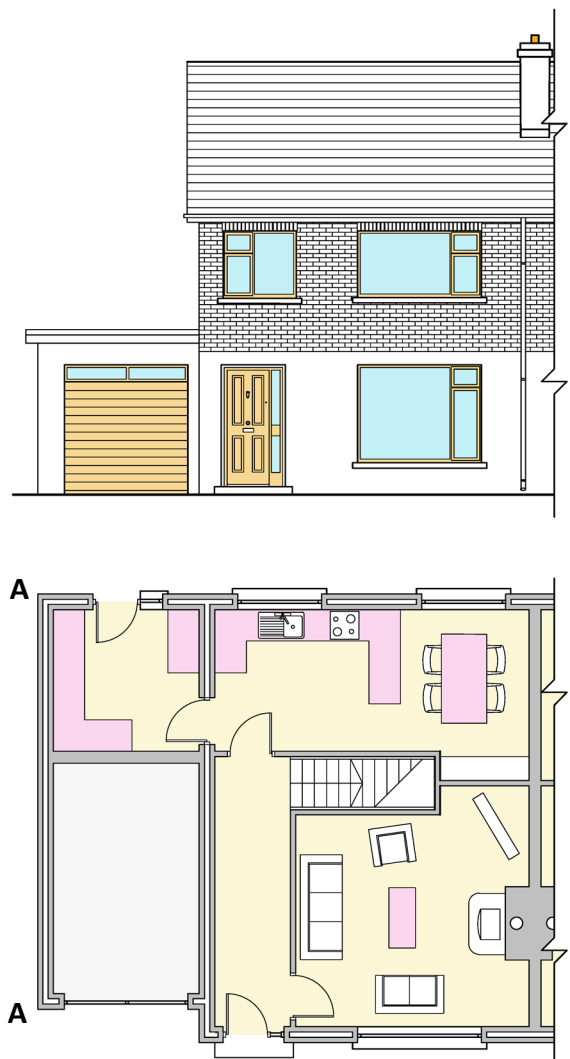


- (c) For **each** risk discussed at 2(b) above, show, using notes and freehand sketches, **two** best practice guidelines that should be observed to reduce the possibility of injury to a worker undertaking each task.

3. The drawing shows the front elevation and ground floor plan of a semi-detached house with an adjoining garage. The wall **A-A** is south facing. The owners wish to revise the design of the ground floor layout and garage space to:

- include a downstairs bathroom
- create an open-plan kitchen/dining and living area
- optimise daylight into the ground floor.

- (a) Using notes and freehand sketches, show a revised internal layout for the ground floor that incorporates **each** of the above design requirements.
- (b) Outline **three** reasons for your proposed layout.
- (c) Using notes and freehand sketches, show a revised external design for the garage that will enhance the overall visual appearance of the house.



4. (a) Discuss in detail, using notes and freehand sketches, **three** functional requirements of an external wall suitable for a new dwelling house.
- (b) The sketch shows the proposed design of a new house. The owners wish to specify a high-performance external wall design for their house.

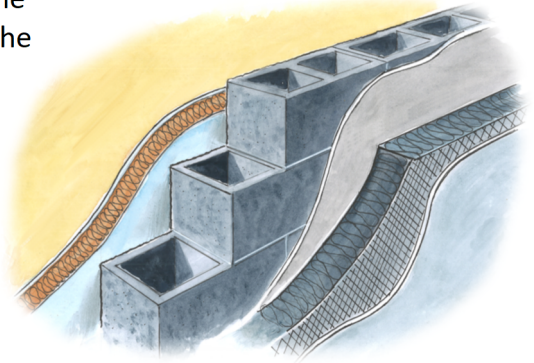
Using notes and freehand sketches, show the typical design detailing for **two** different external wall construction types that can achieve a high-performance for their house.

For each design detail show the position of the insulation **and** include the typical dimensions of the wall.

- (c) Discuss **one** advantage and **one** disadvantage of **each** wall type you have shown at 4(b) above.



5. The external wall of a house built in the 1970s is of single leaf hollow-block construction with an external render. Insulated plasterboard is fixed to the internal surface of the wall. It is proposed to upgrade the thermal properties of the external wall by installing external insulation as shown.



- (a) Calculate the U-value of the proposed wall, given the construction has the following sequence and data:

External acrylic render	thickness	8 mm
External polystyrene insulation	thickness	100 mm
External render	thickness	16 mm
Hollow concrete block	thickness	215 mm
Insulation	thickness	25 mm
Plasterboard	thickness	12.5 mm
Internal skim coat	thickness	3 mm

Thermal data of the external wall:

Resistance of external surface	(R)	0.048	m ²	°C/W
Conductivity of acrylic render	(k)	0.670	W/m	°C
Conductivity of external insulation	(k)	0.030	W/m	°C
Resistivity of external render	(r)	2.170	m	°C/W
Resistance of hollow concrete block	(R)	0.210	m ²	°C/W
Conductivity of insulation	(k)	0.037	W/m	°C
Conductivity of plasterboard	(k)	0.160	W/m	°C
Resistivity of skim coat	(r)	5.550	m	°C/W
Resistance of internal surface	(R)	0.122	m ²	°C/W

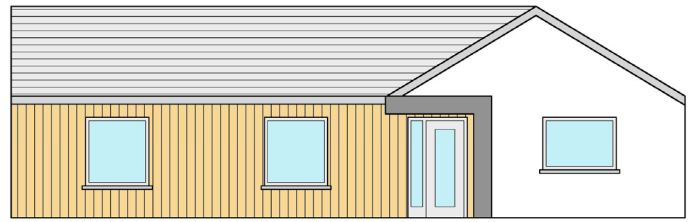
- (b) Using the U-value of the wall obtained at 5(a) above and the following data, calculate the cost of heat lost annually through this wall:

• area of external wall	144 m ²
• average internal temperature	19 °C
• average external temperature	6 °C
• heating period	7 hours daily for 33 weeks per annum
• cost of wood pellets	55 cent per kg
• calorific value of wood pellets	17350 kJ per kg
• 1000 Watts	1 kJ per second.

- (c) It has been decided that the wall at 5(a) above should meet the Passive House standard, by further increasing the thickness of the external insulation.

Calculate the thickness of additional external insulation required to achieve a U-value of 0.11 W/m²°C.

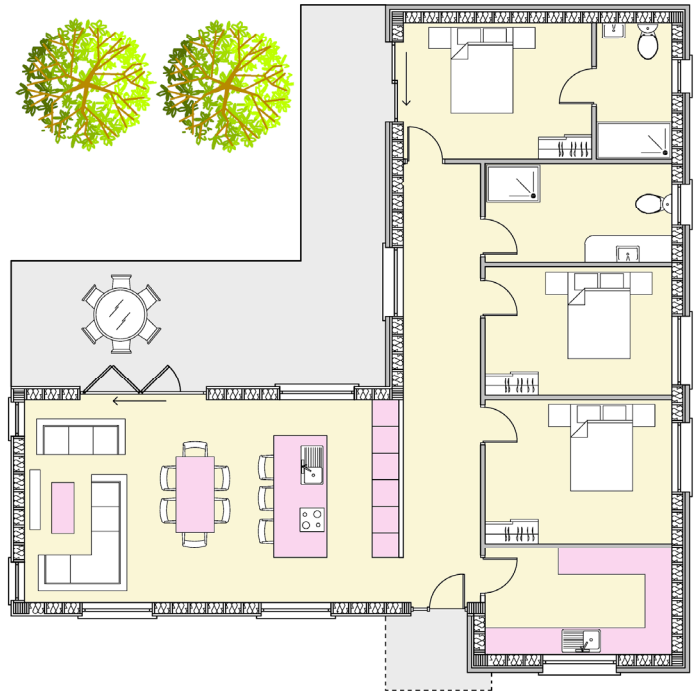
6. The elevation and ground floor plan of a single-storey house are shown. The external walls are of timber frame construction with a rendered concrete block and locally sourced larch cladding external finish. Space heating is provided using a renewable heat source. The house is designed to have a low environmental impact.



- (a) With reference to the design shown, discuss using notes and freehand sketches, **three** features of the design that contribute to the house having a low environmental impact.

- (b) Discuss in detail, how **each** of the following contribute to the creation of a healthy indoor environment:

- indoor air quality
- natural light
- materials and finishes.

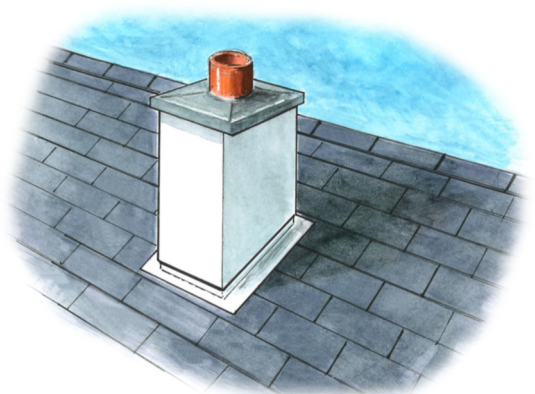


- (c) Discuss in detail **two** benefits of using locally sourced materials in the construction of a dwelling house.

7. A chimney stack projects through the pitched roof of a house as shown. The chimney stack is of solid concrete block construction with an external sand/cement render finish. The traditional cut roof has a pitch of 30° with a slate finish.

- (a) To a scale of 1:5, draw a vertical section through the centre of the chimney stack and roof structure. The section should be parallel to a common rafter, and show the typical construction details through the chimney stack, flue liner, chimney capping, and portion of the roof structure.

Show **two** courses of slate above and below the chimney stack.



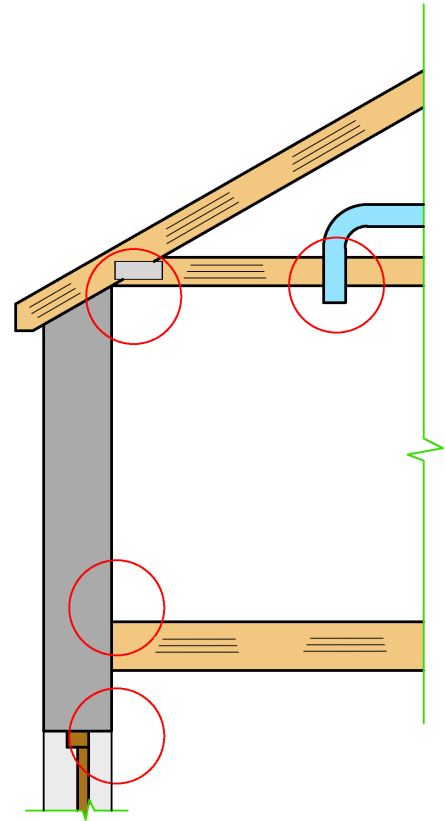
- (b) On your drawing, show the typical design detailing to prevent the penetration of rainwater between the chimney stack and the adjoining roof.

8. An airtight external building envelope is important in the design of a dwelling house.

- (a) Discuss in detail **two** benefits of preventing air leakage from a dwelling house.
- (b) The drawing shows an outline section of a two-storey house having a 450 mm external concrete block wall with a 250 mm full-fill insulated cavity. The house has a truss roof and a first floor of timber construction. The external door has a thermally broken frame.

A Mechanical Ventilation with Heat Recovery system supplies ventilation through ceiling ducts.

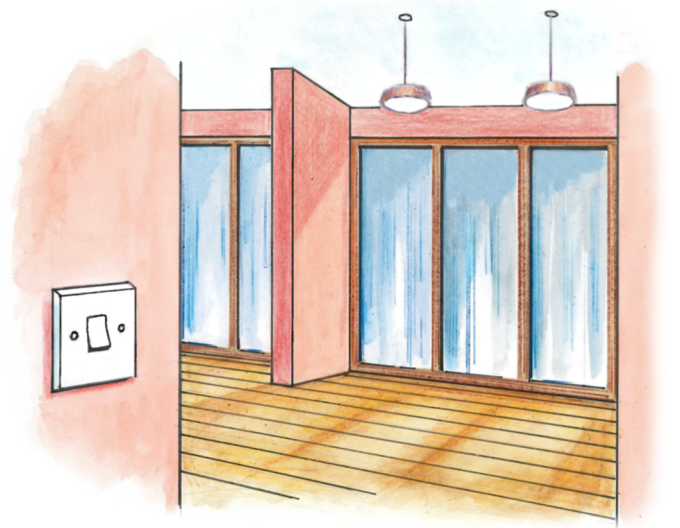
Using notes and freehand sketches, show best practice design detailing that will prevent air leakage at **any three** of the locations circled on the drawing.



9. (a) Using notes and freehand sketches, show the design of a typical wiring layout for two electrical light points which are controlled by a single switch. Show the lighting circuit from the distribution board to the switch and to the light points.

Indicate the typical sizing and colour coding of the cables.

- (b) Using notes and freehand sketches, describe **two** safety features that are typically incorporated into the design of lighting circuits.
- (c) Discuss **two** approaches that homeowners could take to reduce the consumption of electricity in the home.



10. The sketch shows the proposed design of a Passive House which is to be constructed in a rural setting.

(a) Using notes and freehand sketches, discuss the importance of any **two** of the following in Passive House design:

- building form
- foundation design
- space heating energy demand.



(b) Using notes and freehand sketches, suggest a preferred orientation for the house shown. Show the sun path on your sketch.

Discuss **two** benefits to the homeowner of your preferred orientation.

(c) Solar overheating may occur during the summer months in the house shown. Using notes and freehand sketches, suggest **two** ways to reduce the possibility of solar overheating while respecting the character of this house design.

OR

10. “The historic built environment is critical in addressing climate change. Protecting, adapting and reusing historic building stock reduces environmental waste and the carbon dioxide emissions associated with demolition and reconstruction. Traditional building methods and materials have much to teach us about the skills needed to work with prevailing weather conditions and the use of available local materials.”

Adapted from: Heritage Ireland 2030
Department of Housing, Local Government and Heritage
Published on: gov.ie/housing

(a) Discuss the above statement in detail.

(b) Propose **three** best practice guidelines that would promote the reuse of historic buildings.

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