Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2009

MARKING SCHEME

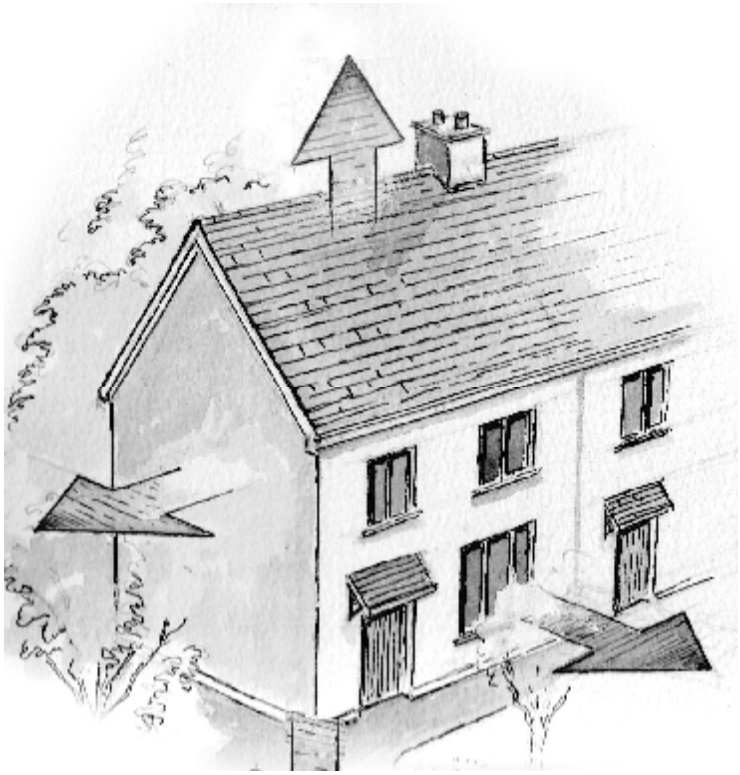
CONSTRUCTION STUDIES

ORDINARY LEVEL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

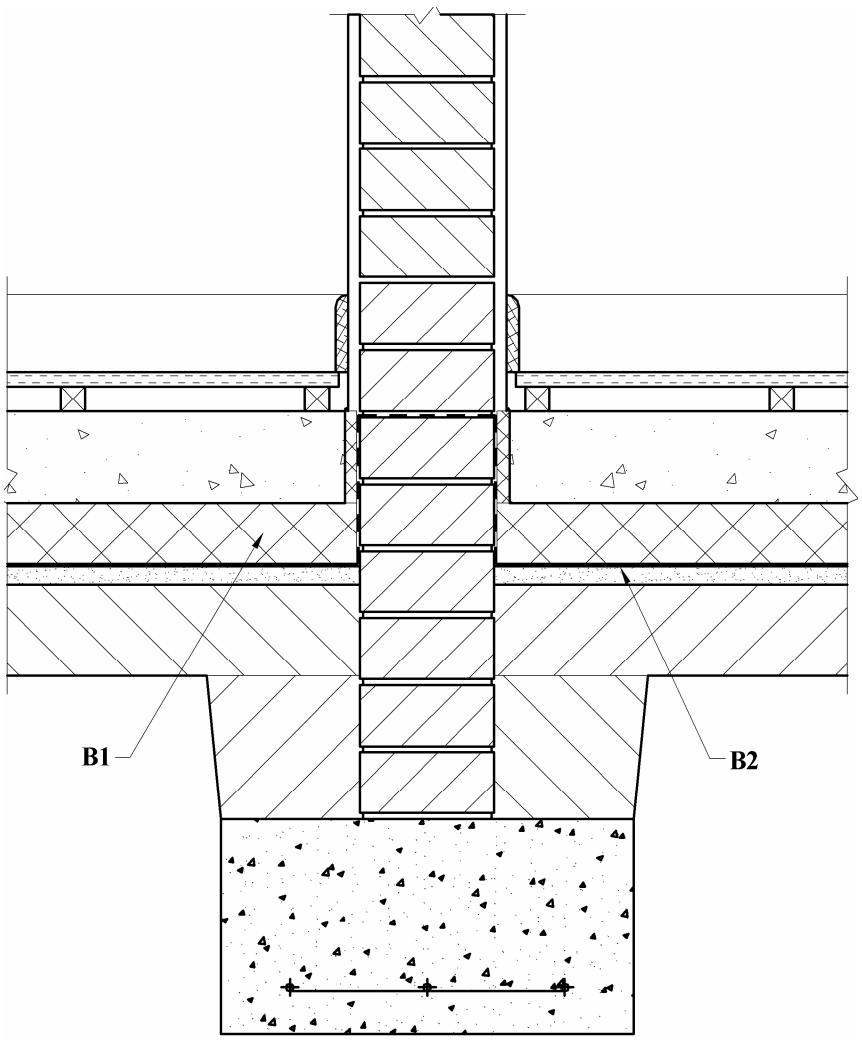
Scrúdú Ardteistiméireachta 2009

Staidéar Foirgníochta
Teoiric – Gnáthleibhéal



Construction Studies
Theory – Ordinary Level

Ceist 1 Part (a)



Specification

- 225 mm concrete block wall
- 15 mm internal plaster
- 100 x 15 mm skirting board
- 25 mm hardwood flooring
- 44 x 44 mm battens fixed to floor
- 150 mm smooth concrete floor
- 30 mm sand blinding.
- 200 mm hardcore
- 350 mm reinforced concrete foundation
- Steel bars in foundation
- Any four typical dimensions

Alternative detailing which complies with current Building Regulations is acceptable.

Part (b)

- B1 – Insulation to the floor slab
- B2 – Position of the radon barrier.

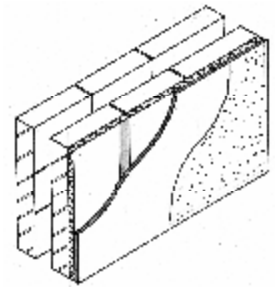
Ceist 2
Part (a)

Insulate roof

- Sheep wool, rockwool, fibreglass, cork, woodfibre insulation may be used
- Place insulation in the attic
- Insulation should be to a min depth of 200 mm, with 2nd layer over joists
- The insulation should be placed between the joists and above the joists
- Further insulation should be placed across and over the lower layer
- Care should be taken to allow ventilation of the attic space above the insulation.

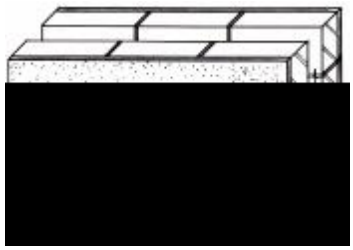
Insulate the walls

The walls may be insulated by insulation in the cavity placed against the inner leaf dry lining the internal surfaces, filling the cavity or applying insulation to the outside surfaces of external walls.



Dry lining with insulation fixed to internal surfaces

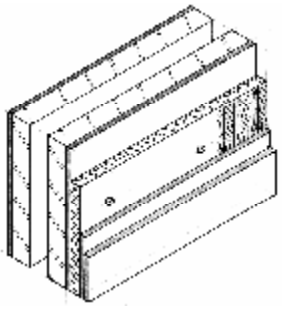
- Dry lining is fitted to the inner surface of the external walls
- Treated softwood battens 50 x 25 mm with insulation between
- Plasterboard of 12 mm thickness screwed to the battens
- Plastered with a skim coat or painted over
- Insulated dry lining plasterboard may also be mechanically fixed to inside leaf.



Injecting loose fill insulation into the cavity – full fill cavity

- Insulation may be pumped into the cavity of existing walls
- Polystyrene beads or cellulose may be used
- Holes of diameter 25 mm drilled into the external leaf
- A special pumping system used to pump the insulation into the cavity.

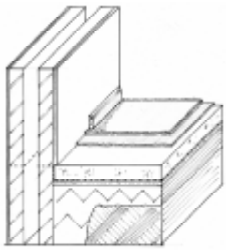
Insulation applied to the outside surface of external walls



- Mineral wool or expanded polystyrene slabs to outside of external walls
- The insulation is fixed mechanically and is covered with a special cement-based render
- Steel/fibreglass mesh is embedded in the render to provide strength and impact resistance
- Insulate the window and door openings to minimise thermal bridging
- A specialist contractor is employed to carry out this work.

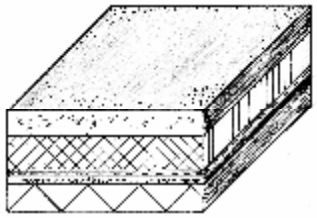
Insulate the floors - existing

- A good quality carpet may be fitted on the ground floor
- The carpet should be laid on a good quality underlay
- Gaps around the edges should be sealed with a suitable sealer
- Floating wooden floor with insulation beneath
- 150mm min insulation beneath floor slab in concrete floor



Part (b)

Advantages of increasing thermal insulation in a dwelling house

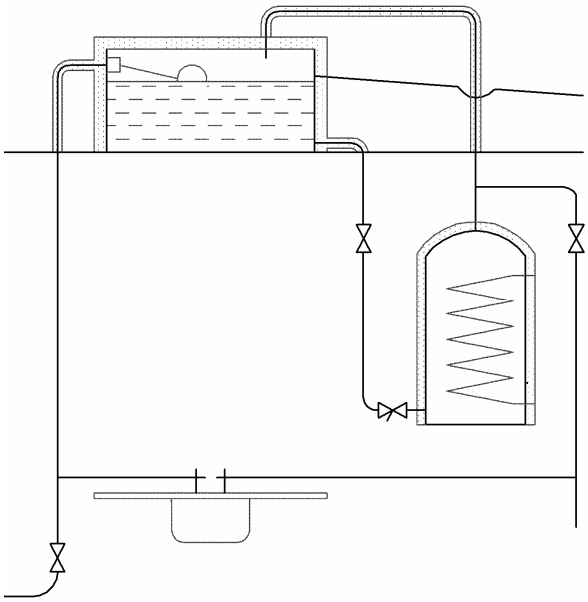


- The house will be warmer and more comfortable
- Reduction in the use of non-renewable fossil fuels
- Cost of heating reduced
- Condensation and draughts eliminated
- Floor area better utilised
- Reduction in CO_2 emissions into the environment.

Ceist 3

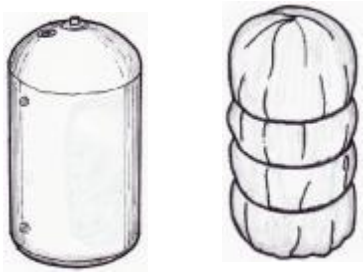
Part (a)

- Stop valve
- Connection to kitchen sink
- 12 mm rising main
- Ballvalve
- Cold water storage tank 230 litres min
- Insulation around storage tank and pipes
- 28 mm overflow
- 22 mm cold feed
- Gate valve
- Drain off valve
- Insulated hot water cylinder
- 22 mm expansion pipe
- 22 mm hot water supply
- Gate valve



Part (b)

- Use a factory-insulated hot water cylinder
- Use lagging jacket in existing copper hot water cylinder



Ceist 4

Part (a)

Environmental hazards of this waste going to landfill

Metal content

- Materials with a metal content will rust
- This will contaminate the water supply
- It may also percolate into nearby springs or rivers
- This will lead to damage of fish life and other wildlife.

Wood content

- Items such as wooden doors windows furniture will rot slowly
- This may lead to disease of plants and animals
- It will also lead to pollution of the surrounding area
- Wood may contain residue of paint or preservative.

Plastic material

- Plastic materials will not biodegrade
- Plastic is not a natural material and should be properly disposed
- It takes up space in landfill sites
- Plastics will affect wildlife.

Fluorescent tube

- These tubes contain mercury and this is a serious hazard
- These have be recycled properly.

Asbestos

- Demolition work may contain elements of asbestos sheeting
- This should be removed by specialist companies
- If brought to landfill the fibre may come in contact with operators
- The fibres could also come in contact with water supply.

Transport

- Transport of the waste leads to extra use of fossil fuels
- This produces emissions into the atmosphere
- The cost of tyres
- The resultant damage to roads and streets.

Paint/varnishes

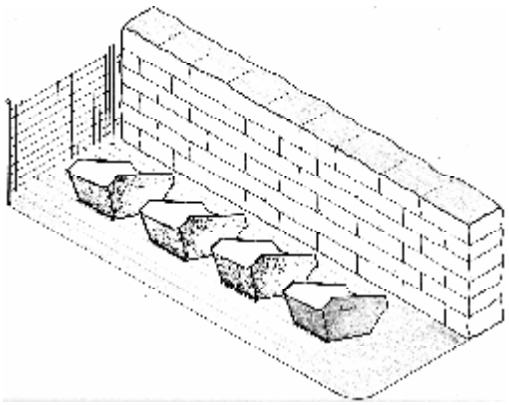
- Paint and varnishes are toxic
- Paint, varnishes, adhesive are to be disposed of separately
- This type of waste should not be sent to landfill
- These materials should not be disposed into drains
- This waste will contaminate water, rivers and lakes
- The local Waste Management Site will accept this type of waste.

Part (b)

Methods of managing the disposal of waste

A new mindset is required to reduce all waste in construction

- A site management policy of Reduce, Re-use and Recycle should be put in place
- Wood should be recycled
- Scrap metal should be recycled
- Special bins to be placed on a site and labelled to segregate different materials. They are then transmitted to the Waste Management Site
- Most electrical parts can be recycled
- Paper and plastics can be recycled
- Any materials not used on building sites may be sent to Waste Management Sites
- Fluorescent tubes and light bulbs may be taken to Waste Management Sites
- Paint may also be disposed of at these sites
- Separation should take place on site.



Brick, block, concrete and other building materials

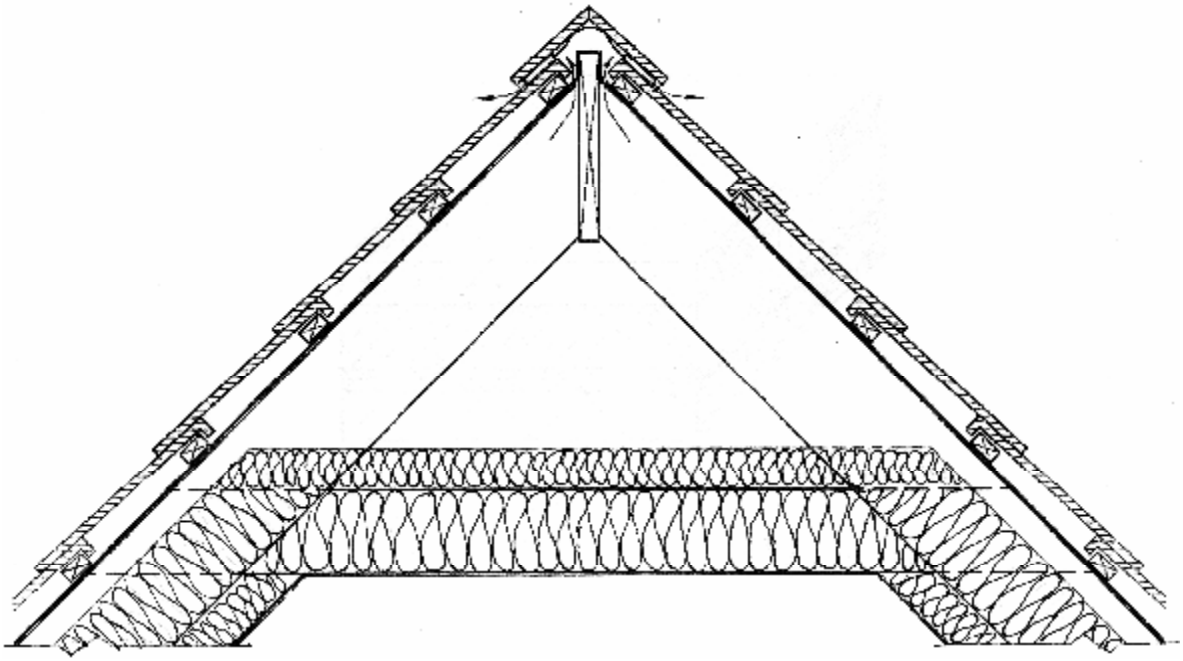
- When a building is being demolished most materials should be reused
- Brick may be used again
- Block brick and concrete can be ground down and used as a base for roadways and entrance drives
- Slate in good condition should be reused
- Windows and doors in good condition should be reused
- A lot of wood items can be re-used
- As a general rule separation of waste should take place at the demolition stage.

Part (c)

Reuse of wood on a construction site

- It may be reused for formwork
- Plywood would be ideal for formwork
- Old joists/rafters could be used for formwork
- Good quality flooring boards can be planed and reused
- If wood is reused in this way it will reduce cost
- By reusing wood it will cut down on the amount of waste on site.

Ceist 5



- Ridge tile
- Ridge vent
- Ridge board 300 x 32 mm
- Tiles
- Tile lap
- Battens 50 x 25 mm or 44 x 30 mm
- Micro porous vapour barrier
- Rafters 200 x 50 mm
- Collar tie 125 x 50 mm
- Insulation between and over collar ties
- Insulation between rafters with air space

Alternative detailing which complies with current Building Regulations is acceptable.

Ceist 6

Part (a)

Safety precautions to be observed when placing ready-mix concrete in a foundation

- Ensure that the sides of deep foundation trenches are well supported
- The delivery truck must be kept well clear of the trench
- All workers to wear the correct safety jackets boots and helmets
- Children should not be allowed on site
- Overhead power lines should be noted and the necessary barriers put in place
- The ESB should be consulted when there are overhead power lines across the site
- Safety notices to alert people regarding open foundation trenches should be put in place
- Depth pins should be highlighted for the safety of workers.

Reasons

- Prevent trench collapse
- Workers should be visible
- Prevent contact with overhead power cables
- Prevent persons falling into unmarked trenches
- Depth pins are usually of steel and cause injury to workers.

Safety precautions to be observed when cutting a pre-stressed concrete lintel

- Place the lintel on solid supports, beneath the worker
- Carefully support the point on the lintel where cutting is carried out
- Use a good quality angle grinder with the correct disk fitted
- Enlist the help of another person
- Cut carefully and concentrate on the task in hand
- Use a mask, correct footwear and hard hat
- Always wear a high visibility jacket on site.

Reasons

- Mask will prevent inhalation of very fine dust
- Workers must be visible on site
- It is important for personal safety that workers concentrate on the task
- Good quality equipment is safer
- The help of another person makes the work easier and safer.

Part (b)

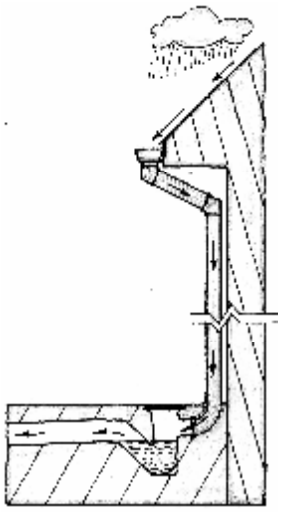
Safety precautions to be observed when slating a pitch roof

- Correct scaffolding should be in place
- Correct boards and toe boards must be used
- The scaffolding should be erected by qualified personnel
- Safe secure ladders should always be used
- Ladders should be placed correctly in place and at the correct angle
- Workers should wear correct safety boots, helmet and high visibility jacket
- Work on the roof should be carried during good weather conditions
- Workers should use a safety rope or harness during roofing process.

Ceist 7

Part (a)

Components



- Eave gutter 125 mm
- Fascia brackets 125 mm
- Offset bends 65 mm
- Downpipe 65 mm
- Shoe 65 mm
- Gully trap or backend gully
- Underground piping 100 mm
- Watercourse or soak area.

Description

- Rainwater falls into gutter from sloping roof.
- Stopends prevent rainwater flowing out the ends of the gutter
- Rainwater flows into the downpipe through outlets in the gutter
- Flows down the downpipe to the shoe or back inlet gully
- Flows from gully trap to underground piping
- Goes into sump or rainwater collecting tank.

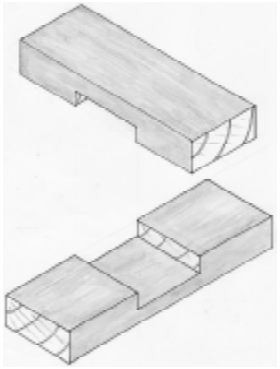
Part (b)

Conservation

- Can reduce domestic water consumption
- Ideal for watering vegetable gardens – no chlorine
- Used for watering flowers, washing vehicles, outdoor cleaning e.g. power washing
- *Soft water* is easier on washing machines
- Reduces the amount of detergents required for washing
- Used for flushing toilets, with separate header tank and piping
- Reduces the volume of surface water going into drains and decrease the risk of flooding
- Drinking water for animals
- Cooling industrial machinery
- Washing raw materials for industry
- Washing vehicles and industrial plant.

Ceist 8

Cross Halving Joint

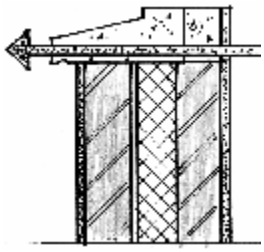


- The joint is in the form of a cross
- It is a simple basic woodworking joint
- The joint may be formed on the width or thickness
- This joint is used in the construction of windows , doors and furniture
- When constructing the joint half the width or thickness is removed from both pieces
- There is no visible end grain.

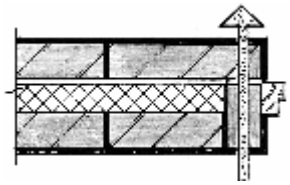
Heartwood

- This is the heart of the tree
- It is the older part of the tree
- It gives the tree strength and rigidity
- It has a darker colour than the sapwood
- It is better quality than sapwood and is very durable
- The heartwood is excellent as a woodworking medium.

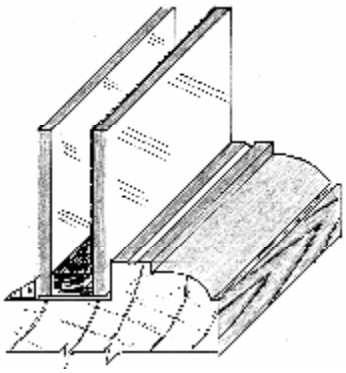
Thermal/cold bridge



- A thermal bridge is a solid bridge that conducts heat from inside to outside a structure
- The cold bridge effect is especially evident at window cills, lintels and jambs
- It may also occur at the junction between ground floor and the external wall
- Thermal bridge occurs when the insulation of a wall is bridged at the floor, roof or window
- Thermal bridge causes a higher level of heat loss at these points
- The cold bridge effect causes condensation on the internal surface
- Insulation should be continuous as a break will allow a higher level of heat loss.

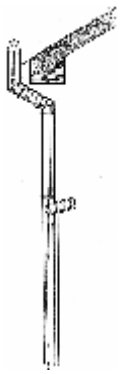


Double glazing



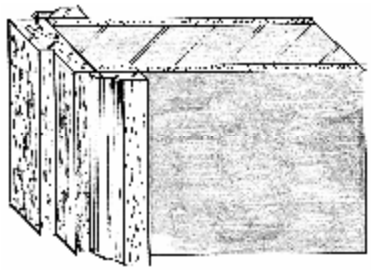
- This is used to help conserve heat in houses
- Double glazed units are made up of two panes of glass with a space between
- The space between the panes reduces the transfer of heat through the window
- Double glazing also reduces sound transfer
- The space between the panes is usually 12 – 16 mm wide
- The units are hermetically sealed with a continuous spacer right around the perimeter
- The cavity between the panes is filled with dehydrated air or argon or krypton gas
- Modern units have a special low-emissivity coating on the inner pane to reduce heat loss through the panes.

Soil pipe



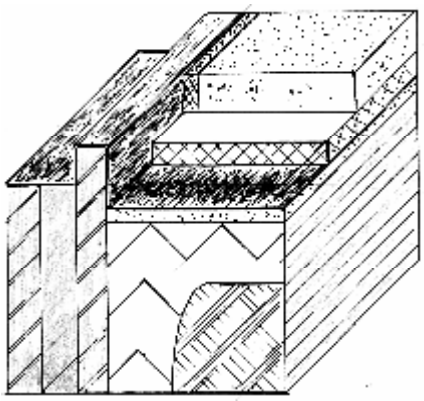
- This is the vertical pipe used to carry the waste from one or more WC
- Transfers sewer gasses to the atmosphere
- It is connected at its base to the underground drainage system
- It is generally fitted on the outside of the external wall
- It may carry waste from one or two WC
- The pipe is made from UPVC and has a diameter of 100mm
- The soil pipe is extended up beyond the fascia level
- It should be terminated above the top of any adjacent window
- The modern version is referred to The Single Stack System.

Architrave



- This is special moulded wooden strip fixed to the internal door uprights
- It is also fixed along the top of the door and wall
- Architrave may be of hardwood or softwood
- The section size of architrave may vary and there is a wide variety available
- A paint or varnish finish is normally applied to the architrave.

Radon barrier



- This is a continuous membrane placed under the floor of a dwelling house
- It is joined on to the inner leaf of the external wall and extends across the cavity to the external leaf
- The radon barrier replaces the former DPM
- The radon barrier prevents radon gas from entering the building
- The radon barrier is placed on top of the sand blinding of the hardcore
- The sand blinding prevents damage to the radon barrier
- All joints and service penetrations must be fully and carefully sealed
- The radon barrier should be installed by trained personnel.

Ceist 9

Part (a)
Reasons for using wood

- Wood is a natural material and is grown locally
- Wood has low embodied energy having a low carbon footprint
- Wood can be reused and recycled
- Wood looks well and is eco-friendly
- Trees provide a balance in nature
- Wood is renewable and is widely available

Part (b)
Larch

Larch is suitable for the following reasons

- Naturally durable for outdoor use
- Preferable for posts in the soil, a less durable wood for rails as they can be replaced
- Is easily grown in Ireland
- Will not decay easily and lasts a long time.

Douglas Fir

- A softwood, but naturally durable outdoors
- Easily machined and planed
- Takes oils and preservatives easily
- Beautiful to look at

Oak

Oak is suitable for the following reasons

- Is a hardwood and has attractive grain pattern
- Widely available
- Has a long life span
- It is resistant to insect attack and disease
- Can be painted or treated easily.

Red deal or Scots pine

Red deal is suitable for the following reasons

- Easy to cut and work
- Provides a good finish when painted or varnished
- Reasonably priced
- Strong durable and stable.

Lodgepole pine

Lodgepole pine is suitable for the following reasons

- It is durable when pressure treated
- It is strong
- It has an attractive grain and colour
- Plentiful and cheap.

Sitka spruce or White deal

Only suitable when treated with preservatives – pressure treated

- Easy to cut and work
- Provides a good finish when painted or varnished
- Cheap
- Widely available.

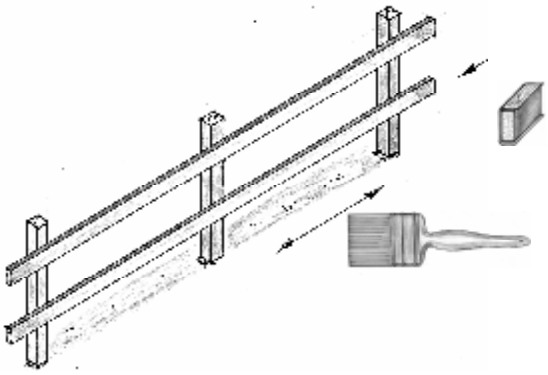
Part (c)

Suitable finish for the fencing

- A wide range of oil and water-based finishes is available
- Boron is an eco-friendly preservative
- These are available from well known manufacturers
- They are supplied under a range of brand names
- They are available in a range of colours
- Any of these are suitable as an applied finish for the fencing
- These finishes will help to preserve the wood
- The fence could be painted.

Apply the finish as follows

- Ensure the wood is clean and dry
- Sand lightly and clean with white spirits
- Apply the finish using a good quality brush
- Spray finish is not as effective as a brushed-on finish
- Apply even coats and finish in the direction of the grain
- Apply three coats and sand lightly between coats
- For a paint finish apply primer, undercoat and gloss
- Preparation for a paint finish would be as for other finishes.



Question 1	
Details	**Marks**
Part (a)	
225 mm concrete block wall	**4**
15 mm internal plaster	**4**
100 x 15 mm skirting board	**4**
25 mm hardwood floor	**4**
44 x 44 battens fixed to floor	**4**
150 mm smooth concrete floor	**4**
30 mm sand blinding	**4**
200 mm hardcore	**4**
350 mm reinforced concrete foundation	**4**
Steel bars in foundation	**4**
Any four typical dimensions	**4**
Any 8 of the above details (4 marks each) **Sub-total**	**32**
Draughting, accuracy and scale ***(excellent, good, fair)***	**10**
Part (b)	
Indicate on drawing	
B1 – Insulation to the floor slab	**4**
B2 – Position of the radon barrier	**4**
Total	**50 marks**

Question 2	
Details	**Marks**
Part (a)	
Area one – Description of insulation - Notes	
Valid detail one	**4**
Valid detail two	**4**
Area one – Insulation - Sketch	
Type of insulation	**4**
Thickness of insulation	**4**
Quality of sketch ***(excellent, good, fair)***	**5**
Area two – Description of insulation - Notes	
Valid detail one	**4**
Valid detail two	**4**
Area two – Insulation - Sketch	
Type of insulation	**4**
Thickness of insulation	**4**
Quality of sketch ***(excellent, good, fair)***	**5**
Part (b)	
Advantages of increasing thermal insulation	
Advantage one	**4**
Advantage two	**4**
Total	**50 marks**

Question 3	
Details	**Marks**
Part (a)	
12 mm rising main	**4**
Stop valve	**4**
To kitchen sink	**4**
Ballvalve	**4**
Cold water storage tank 230 litres min	**4**
Insulation around storage tank and pipes	**4**
28 mm overflow	**4**
22 mm cold feed	**4**
Gate valve-cold	**4**
Drain off valve	**4**
Insulated hot water cylinder	**4**
22 mm expansion pipe	**4**
22 mm hot water supply	**4**
Gate valve-hot	**4**
Connections to sink – hot and cold	**4**
Any 8 of the above details (4 marks each) **Sub-total**	**32**
Quality of sketch ***(excellent, good, fair)***	**10**
Part (a)	
Primary communication of relevant information	**4**
Other communication of relevant information	**4**
Total	**50 marks**

Question 4	
Details	**Marks**
Part (a)	
Environmental hazards associated with the disposal construction waste	
Hazard one	
Valid detail one	**5**
Valid detail two	**5**
Hazard two	
Valid detail one	**5**
Valid detail two	**5**
Part (b)	
Methods of managing waste disposal - Notes	
Method one	**5**
Method two	**5**
Methods of managing waste disposal - Sketch	
Quality of sketch ***(excellent, good, fair)***	**10**
Part (c)	
Example of wood reuse	**5**
How reuse helps to reduce waste	**5**
Total	**50 marks**

Question 5	
Details	**Marks**
Ridge tiles	**4**
Ridge / tile vent	**4**
Tiles	**4**
Tile lap	**4**
Ridge board 300 x 32 mm	**4**
Battens 50 x25 mm or 44 x 30 mm	**4**
Micro porous vapour barrier	**4**
Collar ties 125 x 50 mm	**4**
Rafters 200 x 50 mm	**4**
Insulation between and over collar ties	**4**
Insulation between rafters with air space	**4**
Labels and typical sizes of components	**4**
Any 10 of the above details (4 marks each) **Sub-total**	**40**
Draughting, accuracy and scale ***(excellent, good, fair)***	**10**
Total	**50 marks**

Question 6	
Details	**Marks**
Part (a)	
Safety precaution when placing ready mix-concrete	
Precaution one	**4**
Reason	**4**
Precaution two	**4**
Reason	**4**
Safety precaution when cutting pre-stressed concrete lintel	
Precaution one	**4**
Reason	**4**
Precaution two	**4**
Reason	**4**
Part (b)	
Safety precaution when slating a pitched roof - Notes	
Precaution one	**6**
Precaution two	**6**
Safety precaution when slating a pitched roof - Sketch	
Quality of sketch ***(excellent, good, fair)***	**6**
Total	**50 marks**

Question 7	
Details	**Marks**
Part (a)	
Collection and discharge of rainwater - Sketch	
Eave gutter 125 mm	**4**
Fascia brackets 125 mm	**4**
Offset bends 65 mm	**4**
Downpipe 65 mm	**4**
Shoe 65 mm or backend gully	**4**
Gully trap	**4**
Underground piping	**4**
Sump / rainwater collecting tank	**4**
Any 4 of the above details (4 marks each) **Sub-total**	**16**
Quality of sketch ***(excellent, good, fair)***	**10**
Collection and discharge of rainwater - Notes	
Valid description one	**4**
Valid description two	**4**
Valid description three	**4**
Part (b)	
Suitable uses for stored rainwater	
Valid suitable use one	**6**
Valid suitable use two	**6**
Total	**50 marks**

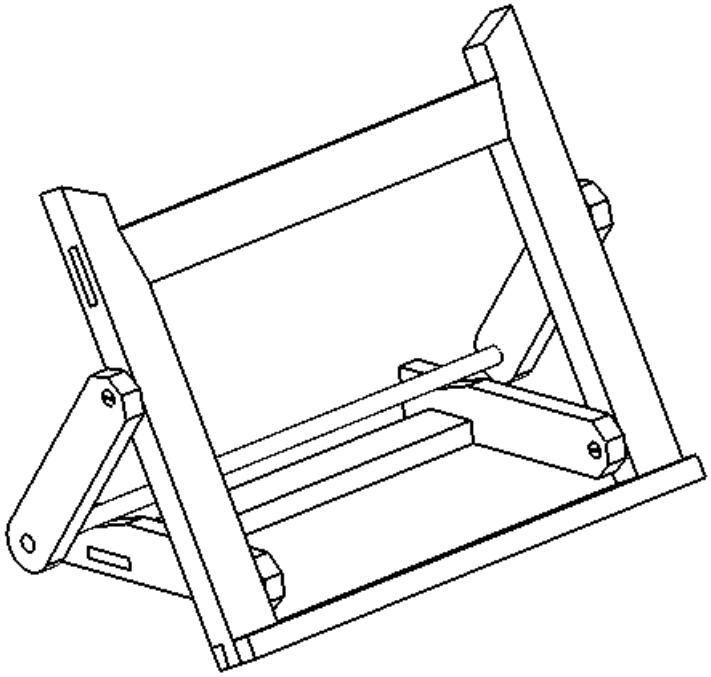
Question 8	
Details	**Marks**
Item one	
Primary communication of relevant information	**6**
Other communication of relevant information	**4**
Item two	
Primary communication of relevant information	**6**
Other communication of relevant information	**4**
Item three	
Primary communication of relevant information	**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	
Details	**Marks**
Part (a)	
Environmental reasons why wood is preferred	
Valid reason one	**4**
Valid reason two	**4**
Part (b)	
Suitable home grown wood	
Name of suitable wood	**4**
Reasons for choice of wood	
Valid reason one	**4**
Valid reason two	**4**
Part (c)	
Name of suitable finish	**4**
Applying finish - Notes	
Stage one – Filling / repair / cleaning	**5**
Stage two – Sanding / filling	**5**
Stage three – Application of finish	**5**
Stage four – Sand and final finish	**5**
Applying finish - Sketch	
Quality of sketch ***(excellent, good, fair)***	**6**
Total	**50 marks**

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scrúdú Ardteistiméireachta 2009
Leaving Certificate Examination 2009

Scéim Mharcála
Marking Scheme
(150 marc)



Staidéar Foirgníochta
Triail Phraiticiúil

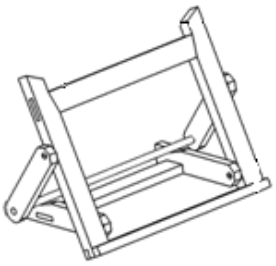
Construction Studies
Practical Test

Construction Studies 2009 - Marking Scheme - Practical Test

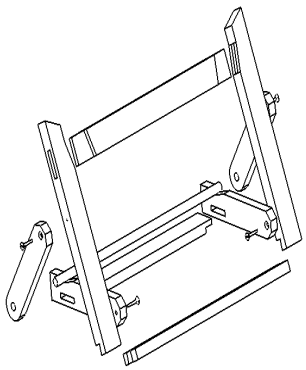
Note:

The test piece is to be hand produced by candidates without the assistance of machinery- except a battery powered screwdriver which is allowed.

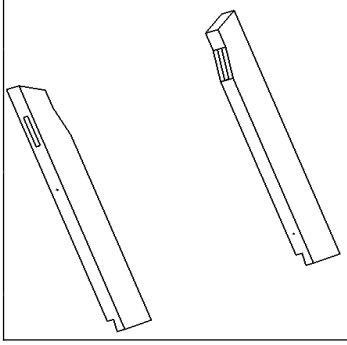
Where there is evidence of the use of machinery for a particular procedure a penalty applies. The component is marked out of 50% of the marks available for that procedure.

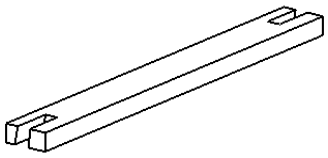


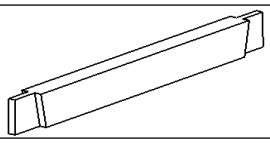
A	OVERALL ASSEMBLY	MARKS
1	Overall quality of assembled artifact	**10**
2	Dowel located and fitted correctly	**4**
3	Design and applied shaping of edge • design ***(4 marks)*** • shaping ***(4 marks)***	**8**
	Total	**22**

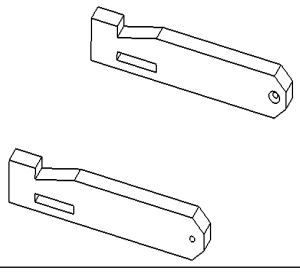


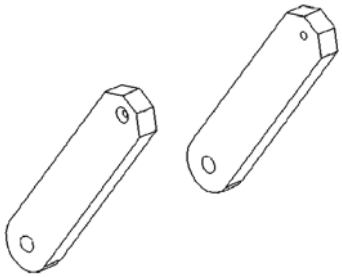
B	MARKING OUT	Marks
1	Left side - vertical • joints - mortice ***(2 marks)*** - dovetail ***(2 marks)*** • top slope ***(1 mark)*** • vertical line ***(1 mark)*** • sloped shoulder ***(2 marks)***	**8**
2	Right side – vertical • joints - mortice ***(2 marks)*** - dovetail ***(2 marks)*** • top slope ***(1 mark)*** • vertical line ***(1 mark)*** • sloped shoulder ***(2 marks)***	**8**
3	Bottom rail • dovetail joints ***(2 x 2 marks)***	**4**
4	Top rail • tenon joints ***(2 x 2 marks)*** • sloped shoulder ***(2 marks)***	**6**
5	Left and right horizontal supports • mortice joint ***(2x2 marks)*** • notch ***(2 marks)*** • shape of end ***(2 marks)***	**8**
6	Left and right strut - semi-circles and shaping ***(6 x 1 marks)***	**6**
7	Back horizontal rail ***(2 x 2 marks)***	**4**
	Total	**44**

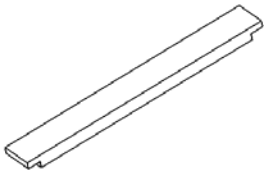
TWO SIDES	C	PROCESSING	Marks
	1	Shaping sloped top *(2 x 1 mark)*	**2**
	2	Two mortices • mortices *(2 x 3 marks)* • shaping *(2 x 2 marks)*	**10**
	3	Two dovetails *(2 x 3 marks)* • **Slope** *(2 marks)* • **Shoulder** *(1 mark)*	**6**
		Total	**18**

BOTTOM RAIL	D	PROCESSING	Marks
	1	Two dovetail pins *(2 x 5 marks)*	**10**
		Total	**10**

TOP RAIL	E	PROCESSING	Marks
	1	Two tenons *(2 x 8 marks)*	**16**
		Total	**16**

HORIZONTAL SUPPORTS	F	PROCESSING	Marks
	1	Shaping sloped ends *(4 x 1 mark)*	**4**
	2	Notches • sawing vertically *(2 x 1 mark)* • shaping slopes *(2 x 2 marks)*	**6**
	3	Two mortices *(2 x 3 marks)*	**6**
	4	Drilling and countersinking screws *(2 x 1 mark)*	**2**
	5	Attaching supports *(2 x 1 mark)*	**2**
		Total	**20**

TWO STRUTS	G	PROCESSING	Marks
	1	Shaping • slopes *(4 x 1 mark)* • curve *(2 x 3 marks)*	**10**
	2	Drilling and countersinking screws *(2 x 1 mark)*	**2**
	3	Attaching supports *(2 x 1 mark)*	**2**
		Total	**14**

BACK RAIL	H	PROCESSING	Marks
	1	Two tenons • sawing with grain *(2 x 2 marks)* • sawing across grain *(2 x 1 mark)*	**6**
		Total	**6**