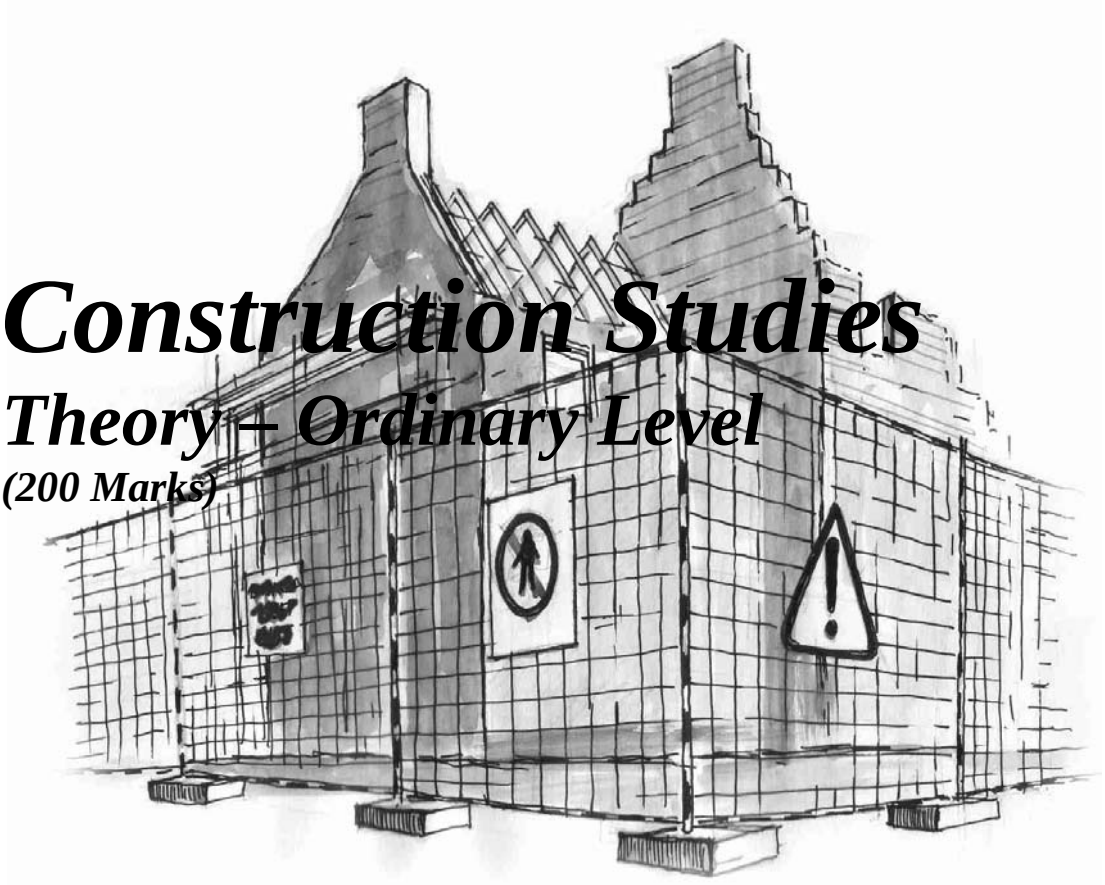
Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2004

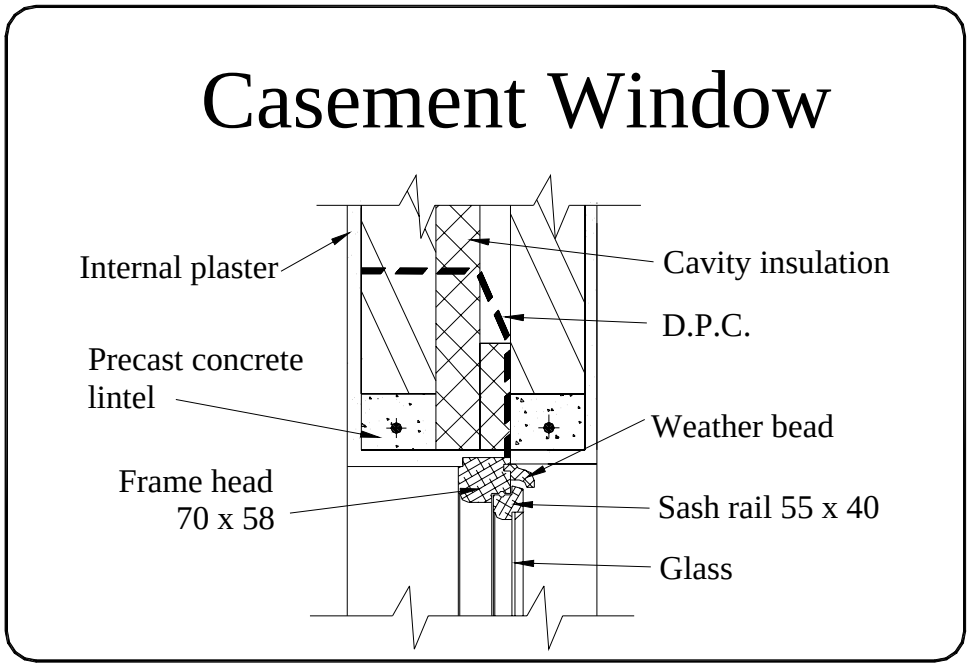
Staidéar Foirgníochta
Teoiric – Gnáthleibhéal



Construction Studies
Theory – Ordinary Level
(200 Marks)

Freagraí
Solutions

Question No.1. **Leaving Certificate** **Ordinary Level 2004**



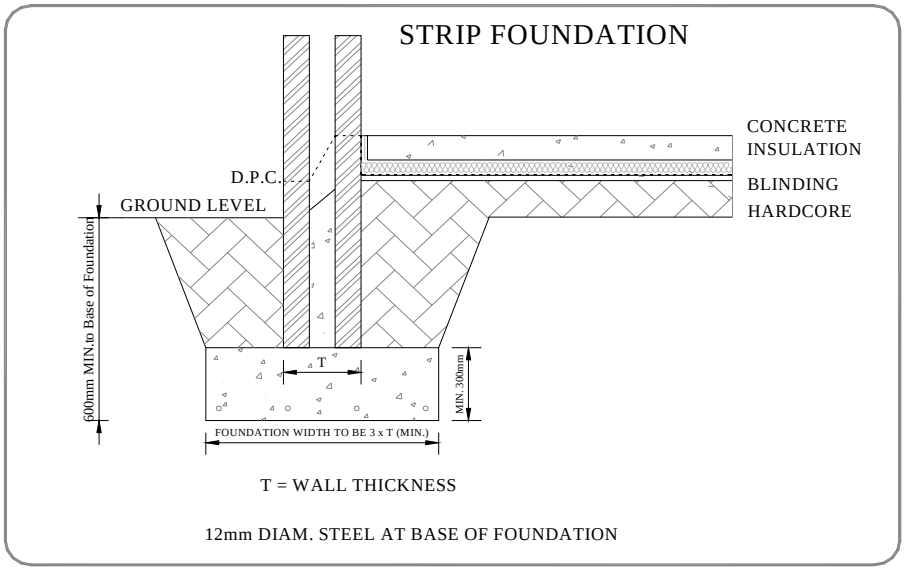
Question No.1. **Marks.**

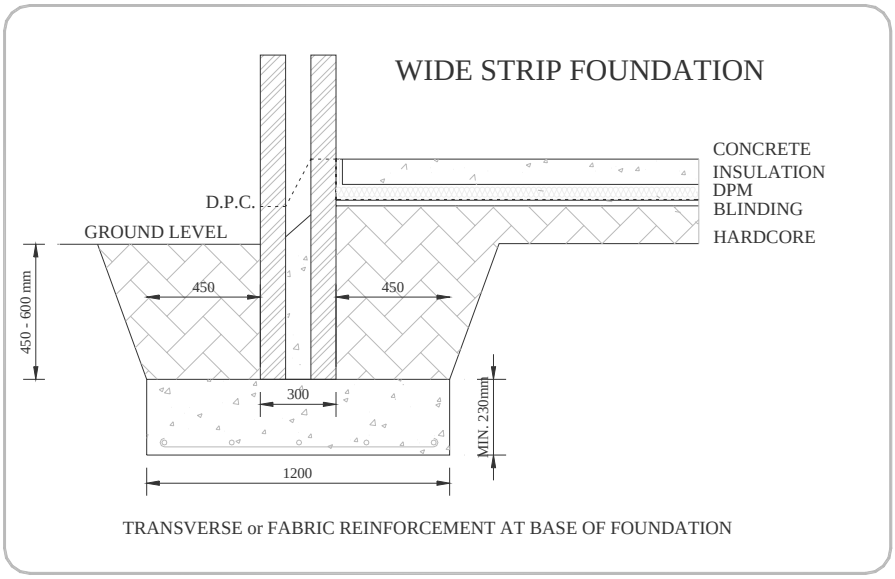
Render - external	**4**
Plaster – internal	**4**
Cavity wall	**4**
Cavity insulation	**4**
Wall Tie	**4**
Thermal bridging	**4**
Lintel	**4**
Reinforcing to lintel	**4**
Stepped D.P.C. over window head	**4**
Window head	**4**
Weather bead	**4**
Top sash rail	**4**
Rebate or Glass	**4**
Capillary groove	**4**
Any 10 of above details (4 marks each)	
Sub-total	**40**

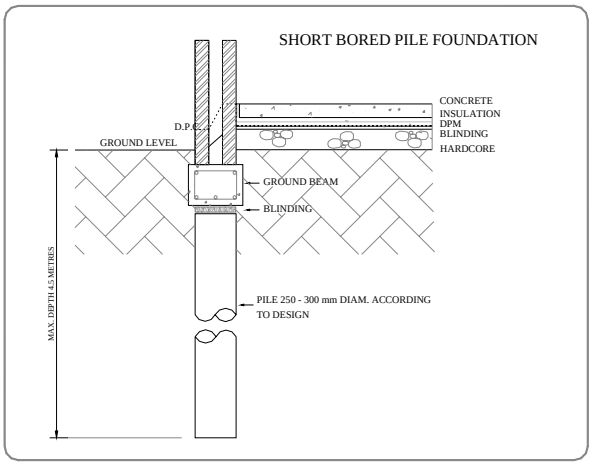
Draughting and scale ***(2 x 5 marks)***	**10**

Total: 50 marks.

Question No.2.







Question 2

(a)

Strip Foundation:

This is the most common form of foundation used for external walls of single and two storey buildings.

- It consists of a strip of concrete with minimum thickness of 300mm. resting on the soil.
- Walls are placed centrally on the foundation.
- The width is three times the wall thickness.
- Generally wall thickness is 300mm. and the width of the foundation 900mm.
- Strip foundations are used on good load-bearing soils.
- Reinforcement is provided at the base of the concrete.
- The strip foundation is stepped on sloping sites.
- Minimum depth below ground level is 600mm.

Wide Strip Foundation:

Wide Strip foundations are also used for external walls. This type of foundation is similar to the standard strip but it is wider.

- Wide Strip foundations are used where the load-bearing capacity of the soil is low or where the ground is made up.
- The width is 1200mm. with a thickness of 230mm.
- Fabric or transverse reinforcement is used to spread the strength right across the width of the beam. The amount of steel to be used is designed by an engineer.
- The wide strip foundation spreads the load over a wider area of soil.
- The wall is located in the centre of the foundation.
- Minimum depth below ground level is 450-600mm.

Short Bored Pile Foundation:

This type of foundation is widely used in the construction of modern dwelling houses. Special contracting firms are available to carry out the necessary groundwork associated with this type of foundation.

- This system consists of a series of short concrete piles cast in holes bored in the ground.
- The piles are spanned by beams of reinforced concrete on which the external or internal load-bearing walls will rest.
- The diameter of the pile is about 300mm.
- Depth depends on the soil with a maximum of 4.5m.
- The advantages of this type are, speed of construction, reduced surplus spoil and ability to proceed in bad weather.
- Steel bars are fitted into the top of the pile and bent over to link in with the beam when it is being cast.
- The beam with steel reinforcement may be cast using formwork. The beam has a cross section size of 400x200mm.
- The wall is located in the centre of the foundation.

Other foundation types that may be used are as follows:

- Raft Foundation
- Deep Strip Foundation.
- Wide Strip in the form of an inverted T-Beam.

Question 2

Part (a)
Foundation Type. **Marks.**

Primary Communication of relevant information.	
Correct naming of foundation detail.	**5**
Width of foundation relative to wall thickness.	**5**
Thickness of foundation relative to wall thickness.	**5**
Correct position of wall on foundation.	**5**
Any other relevant detail.	**5**

Other Communication of relevant information.	
Valid detail 1.	**5**
Valid detail 2.	**5**
Valid detail 3.	**5**

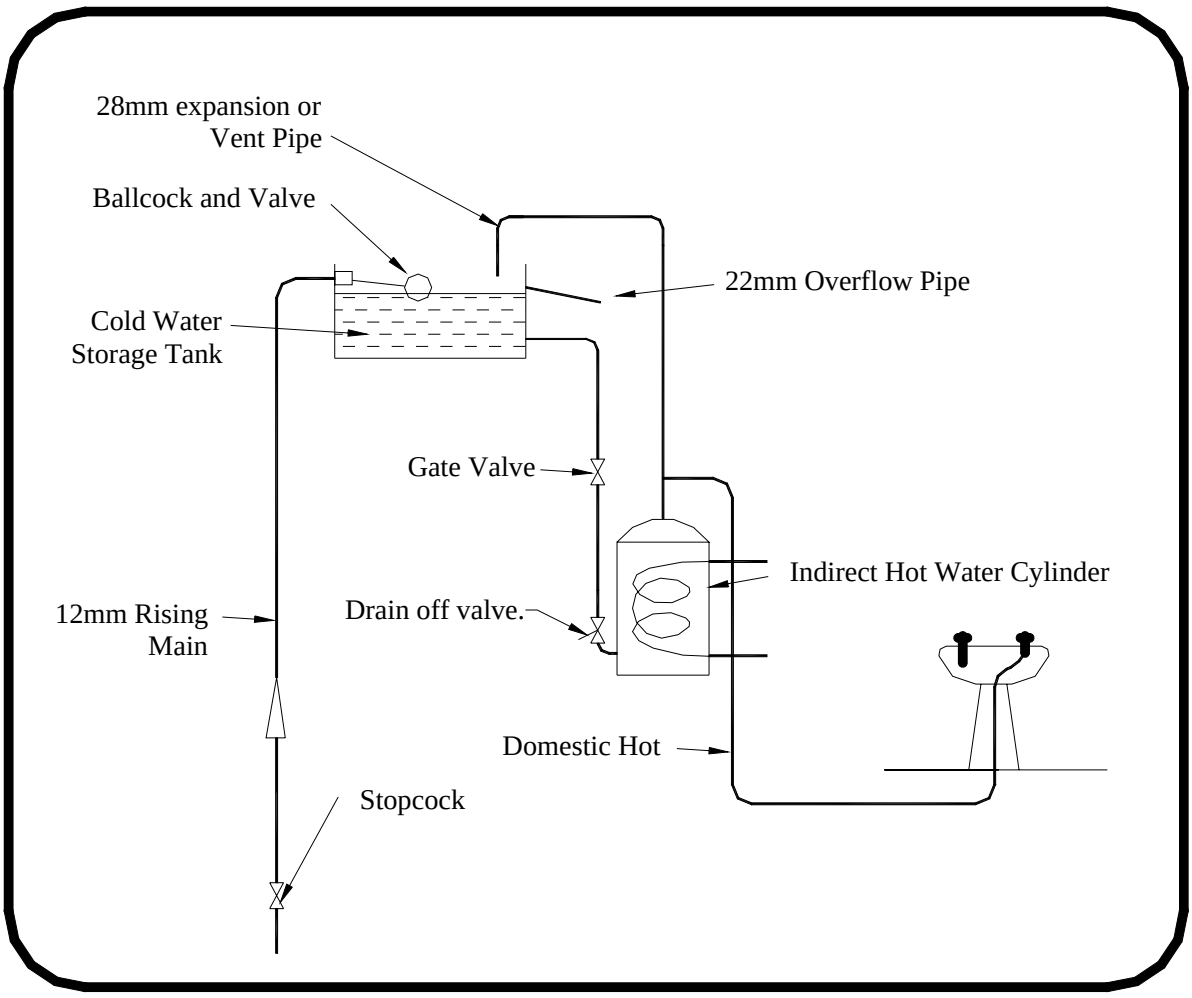
Part (b)

Show Design detail.

Label design detail	**5**
Appropriateness of detail	**5**

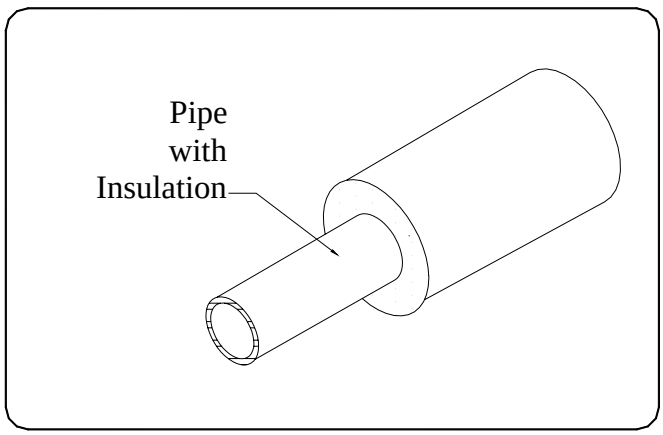
Total Marks = 50.

Question 3 (a)



Question 3(b).

- Insulate all pipework.
- Use bonded insulated cylinder or insulate existing cylinder.
- Have short runs of pipework from the cylinder to the sink, bath and W.H.B.



Question 3

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Part (a). **Marks**

Rising main (12mm)	**4**
Stop cock	**4**
Ballcock and valve.	**4**
Water storage tank.	**4**
Overflow (28mm)	**4**
Gate valve.	**4**
Cold feed (22mm)	**4**
Drain off valve.	**4**
Indirect hot water cylinder.	**4**
Expansion pipe.	**4**
Connection to W.H.B.	**4**
Any 8 of the above (4 marks each)	
Quality of sketch.	**8**

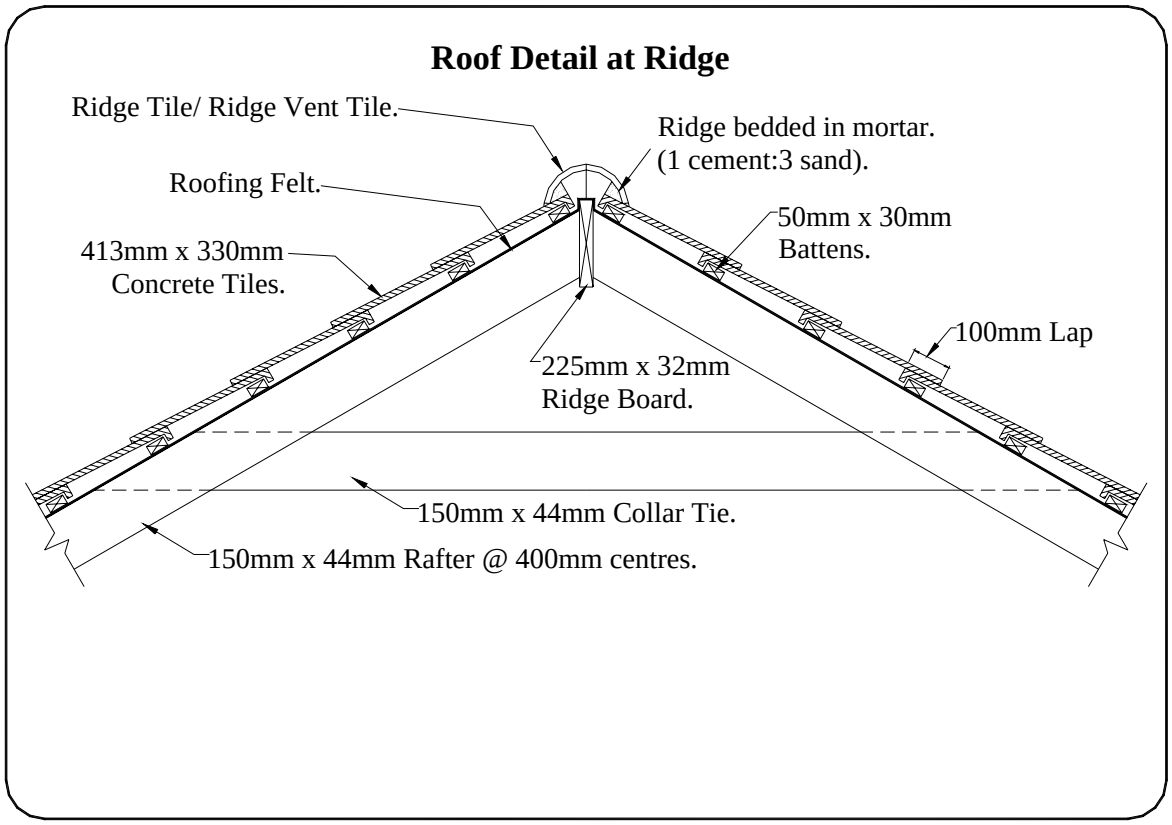
Part (b).

Primary communication of relevant information.	**6**
Other communication of relevant information.	**4**

Total = 50Marks

Question 4.

Part (a).



Part (b).

- Water based preservatives.
- Organic solvent preservative (common trade names)

Safety precautions.

- Wear protective gloves and clothing.
- Do not use near a naked flame.
- Always follow the safety instructions.
- Do not re-use container.
- Store only in original container.
- Store carefully away from children.
- Dispose of empty containers in a proper manner.

Question 4

Part (a).

	Marks.
Ridge tile	**4**
Mortar bedding	**4**
Tiles	**4**
Tile fixings	**4**
Lap of tiles	**4**
Ridge board 200 x 32	**4**
Battens 50 x 25 or 44 x 30	**4**
Roofing Felt	**4**
Rafters 150 x 44	**4**
Collar tie 150 x 44	**4**
Any 8 of the above details (4 marks each).	
Sub-total	**32**

Draughting and scale ***(2 x 4 marks)***	**8**

Part (b).

Preservative	**2**
Two Precautions ***(2 x 4 marks).***	**8**

Total. = 50 marks

Question 5.

(a)

Placing fiberglass in an attic space.

Precautions to be observed when placing fiberglass in an attic space are as follows:

- Wear gloves and long sleeves.
- Wear a face mask.
- Insulate pipes and storage tank to prevent freezing.
- Do not place insulation under the storage tank.
- Do not stand directly on the ceiling material below the joists.

Reasons:

- It is important that fibres are not inhaled.
- The fibres should not come in contact with the skin.
- Pipes and tanks should be protected from frost as attics become very cold in winter.
- Standing on the plasterboard or ceiling material is extremely dangerous!!.

Wiring a three-pin plug.

- Remove the plug cover and fuse.
- Remove one flex cramp screw and loosen the other one.
- Carefully cut away the outer sheath for a distance of about 50mm Use a sharp knife. Be careful not to cause damage to the inside wires.
- Fasten flex securely with the clamp.
- Cut the wires to extend 12mm beyond the appropriate screw.
- Use a wire strippers to cut about 10mm. of insulation off the ends of each cable.
- Ensure that the wires are directed to the correct terminals.
- Twist the wire ends and fit into the holes. Then tighten the screws firmly.
- Replace fuse and cap.

Reasons:

- Securing the flex firmly ensures that it will not detach from the plug during use.
- The earth, neutral and live must be fixed to the correct terminals.
- When cutting back the outer sheath, the insulation of the inner wires must be protected.
- The insulation must be retained in full to avoid a short circuit within the plug.

Erecting a scaffold.

Scaffolding is usually required when the working height is 1.5 m or more above ground level. Working at heights can be dangerous, and the following are some safety precautions that should be observed when using scaffolding on a construction site.

- Ensure a suitable base is prepared and checked before the erection of scaffold begins. The ground should be firm and solid capable of supporting the scaffold and any loads imposed. This will prevent sinking or slippage.
- Scaffold must be set level using a spirit level and adjustable jacks. This ensures that all parts fit together correctly firmly and squarely.
- Braces and ties must be fixed in place as the scaffold is being erected. This prevents collapse of the scaffold and keeps the whole framework rigid.
- Platforms should be fully boarded giving a level uninterrupted walking area. This prevents accidents as people walk and work.
- Guard- rails and toe-boards must be fitted at every side from which a person may fall when working height exceeds 2.0 Mts. Toe-boards min 150mm. high prevent loose material falling off the scaffold. Guard-rails prevent workers falling off the scaffold. They are fixed to the outside ledgers at a height of 950 – 1200 mm. above the working platform.
- Scaffold must be tied to the building at various points. It may be tied at window or door openings or special ring-bolts fixed to the wall. This prevents the total scaffold structure falling away from the building
- Use strong soft gloves when handling scaffold poles
- Do not stand beneath scaffold, as objects may fall
- Keep all waste materials clear of scaffold to allow uninterrupted safe movement
- Do not throw objects or let objects fall when on a scaffold.
- Always wear appropriate safety vest, boots and helmet and gloves.

Visiting a construction site when trenches are being excavated by machine:

- Wear a high visibility jacket and helmet.
- Ensure that the driver of the machine can see you.
- Make eye contract with the driver
- Keep well clear of the range of the excavator bucket.
- Observe site safety notices.
- Be careful of open, unprotected trenches.

Reasons:

- High visibility jackets alert drivers of machines.
- Excavating machines reach out over a wide radius and is important to stay well clear until the driver has eye contact with persons nearby.
- Site notices are for the safety of all people on site.
- Unprotected trenches are dangerous for obvious reasons - such as easy to fall into an open trench.

Question 5.

Marks.

Placing fiberglass in an attic.

Safety precaution 1.	**4**
Valid reason 1.	**3**
Safety precaution 2.	**4**
Valid reason 2.	**3**

Wiring a three-pin plug.

Safety precaution 1.	**4**
Valid reason 1.	**2**
Safety precaution 2.	**4**
Valid reason 2.	**2**

Erecting a scaffold.

Safety precaution 1.	**4**
Valid reason 1.	**2**
Safety precaution 2.	**4**
Valid reason 2.	**2**

Visiting a construction site.

Safety precaution 1.	**4**
Valid reason 1.	**2**
Safety precaution 2.	**4**
Valid reason 2.	**2**

Question 6

(a) Fixing of dry lining.

Dry lining is a layer of plasterboard or insulated plasterboard fixed to the inside of an external wall. The plasterboard may be fixed as follows:

Timber battens:

- Timber battens, treated with preservative are fixed to the wall. The battens are spaced to suit the plasterboard, usually at 400mm centres.
- Insulation is placed between the battens.
- The thickness of the battens is governed by the thickness of the insulation.
- Foil-backed plasterboard is fixed to the battens.
- The surface is given a skim coat of gypsum plaster.
- The wall is finished using a suitable paint finish or wallpaper.

Plaster "dabs" or "dots".

- Bitumen fibreboard pieces are fitted to the wall at top and bottom and middle of each joint. These pieces are of size 80x50.
- Plaster dabs are then applied to the wall at 450mm. centres.
- The plasterboards are then fixed and pushed against the dabs.
- The dabs will then spread out behind the plasterboard.
- The boards with insulation fitted are then nailed to the fibreboard pads.
- The surface is given a skim coat of gypsum plaster.
- The wall is finished using a suitable paint finish or wallpaper.

Mechanical fixing:

- With this method special nails with a large plastic head fix the plasterboard to the wall.
- Plasterboard with insulation fitted is generally used for this method.
- The plasterboard is placed against the wall. Holes are then drilled through the plasterboard and into the wall.
- The special nails are then driven into the wall to hold the board in place.
- The nail head fits just below the surface and is filled flush with the surface using gypsum filler. The joints are also taped and finished flush.
- The surface is finished using a suitable paint finish or wallpaper.

(b) Reasons.

Dry lining is fixed to the inner surface of external for the following reasons:

- It provides a dry surface to the inner face of damp external walls.
- It improves the thermal insulation of an external wall.
- It reduces the risk of condensation.
- It provides a quick, effective finish to a poor quality wall surface especially in an old house.
- Dry lining is easy to put in place.

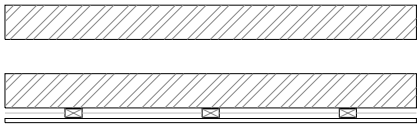
(c) Preparation:

The surface of the dry lined wall is normally finished with emulsion paint. The preparation of the surface is carried out as follows:

- The surface should be free of all surplus particles of plaster.
- The surface must be clean and free of all marks.
- Filler should be applied to cracks or nail holes. Sand smooth and remove the dust.
- The total area to be painted should be given a light sanding and all dust should be removed.
- Brush all grit and dust from the wall and surrounding areas.
- When dealing with a new surface the plaster should be primed before applying the finish coat. Priming is carried out using emulsion thinned with water.
- Paint may be applied using brush or roller.

Question 6.

EXISTING CAVITY WALL
NO INSULATION

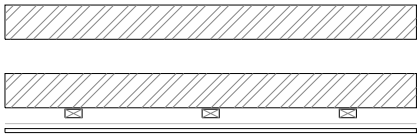


50 x 25 mm TREATED SOFTWOOD BATTENS FIXED TO WALL.

INSULATION FITTED BETWEEN BATTENS.

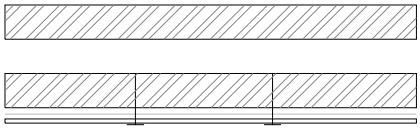
12.5 mm PLASTERBOARD SLAB FIXED TO BATTENS

EXISTING CAVITY WALL
NO INSULATION



12.5 mm PLASTERBOARD SLAB WITH INSULATION FITTED MECHCANICALLY FIXED TO TREATED SOFTWOOD BATTENS FIXED TO WALL.

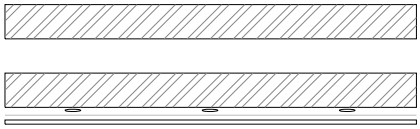
EXISTING CAVITY WALL
NO INSULATION



12.5 mm PLASTERBOARD SLAB WITH INSULATION FITTED TO BACK MECHCANICALLY FIXED TO WALL.

HOLES ARE DRILLED THROUGH THE PLASTER BOARD AND INTO THE WALL. SPECIAL FIXINGS ARE THEN USED TO SECURE THE PLASTER BOARD.

EXISTING CAVITY WALL
NO INSULATION



PLASTER DABS ON WALL
12.5 mm PLASTER BOARD WITH INSULATION FIXED.
THICKNESS OF INSULATION 16 - 25 mm.
VAPOUR BARRIER IS INCLUDED IN THE MANUFACTURE OF THE PLASTER BOARD.

THE METHODS SHOWN WILL APPLY TO ANY TYPE OF EXTERNAL WALL

Question 6.

(a)

Details. **Marks.**

Primary communication of relevant information	
Valid detail 1	4
Valid detail 2.	4
Valid detail 3.	4
Valid detail 4.	4
Other communication of relevant information.	
Valid detail 1	4
Valid detail 2.	4
Valid detail 3.	4

(b)

Reasons:

Valid reason 1.	5
Valid reason 2.	5

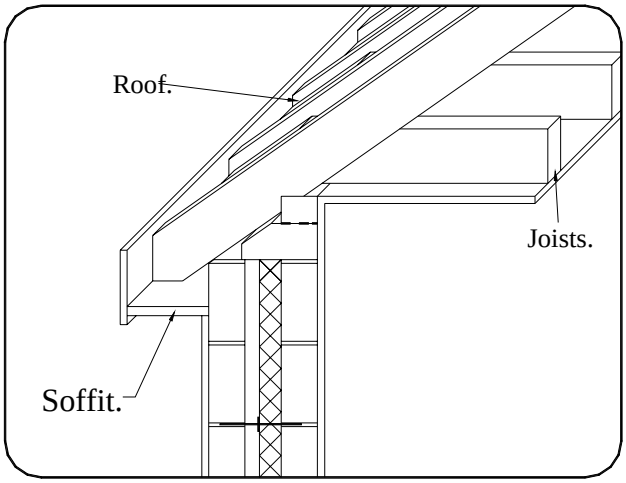
(c)

Preparation of the surface:

Valid point 1.	4
Valid point 2.	4
Valid point 3.	4

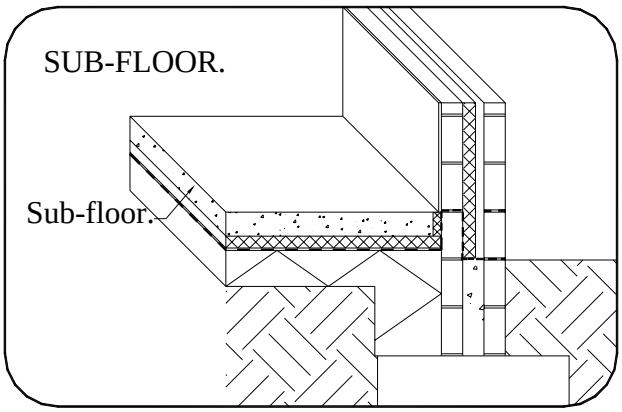
Total Marks = 50.

Question 7



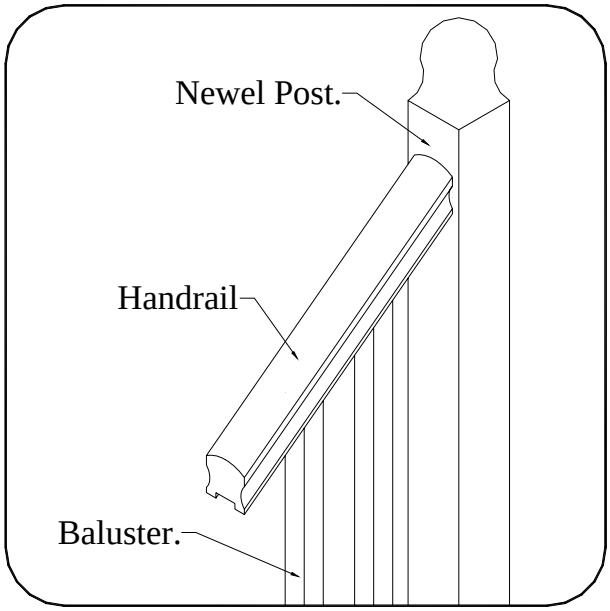
Soffit:

- The soffit board is placed between the fascia and the outer face of the external wall.
- The board runs horizontally along the top of the wall at eaves level.
- The soffit covers up the ends of the rafters and the underside of the roof.
- It contains vents to allow ventilation into the roof space
- The soffit protects the wall from the weather.
- The under-surface of any overhanging part of a building is called a soffit.



Sub – floor:

- This is generally a concrete slab, sometimes mesh reinforced, poured over the insulation or D.P.M.
- The surface of the sub-floor should be level and clean.
- It acts as a good base for putting down the final screed
- The sub-floor adds strength to the floor.

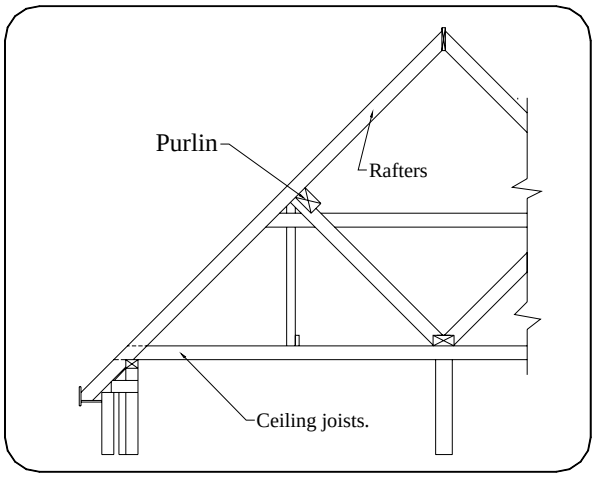


Handrail:

- A handrail is placed at hand height above the ground.
- In the case of stairs it is fixed to the top of the balustrade or supported on brackets from a wall.
- It is also fixed to the newel posts and gives assistance in ascending and descending the stairs.
- It is usually made of timber, metal or plastic.

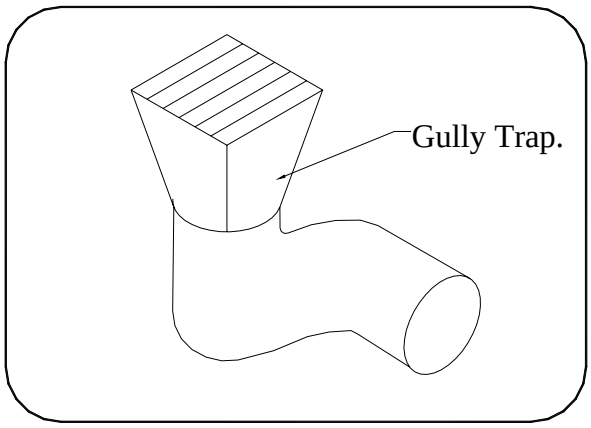
Newel post:

- This is the post at the end of a flight of stairs supporting the handrail and string.
- The newel post sometimes carries the weight of the stairs to a lower level.



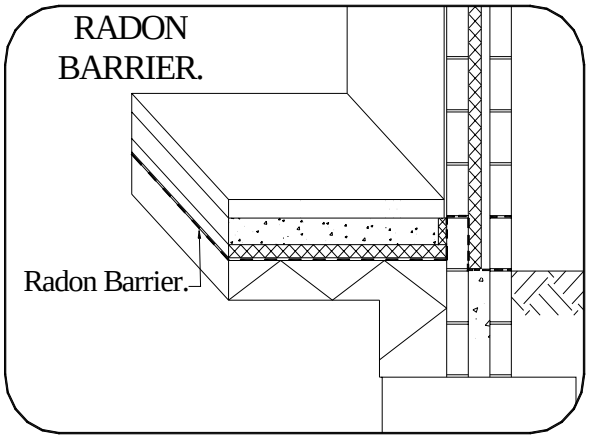
Purlin:

- A beam put into the roof to support rafters between the ridge and the eaves.
- The purlin reduces the rafter span and this allows smaller rafter section to be used.
- The purlin runs longitudinally along the roof and helps the rafters carry the weight of the roof.
- It is placed in the middle of the rafter.
- The purlin is supported by struts or built-up internal walls.
- Sizes vary from 175 mm to 225 mm x 75 mm
- Steel may also be used.



Gully trap:

- A gully trap is fitted to the head of a drain to take waste or rainwater.
- It is fitted with a trap to form a water seal. this acts as a barrier to foul gases and vermin.
- They are made with round or square inlets and can have a ‘P’ or ‘S’ trap outlet.
- They are generally used for rainwater and are sometimes fitted with a back inlet.



Radon barrier:

- Radon is a naturally occurring radioactive gas.
- Radon barrier is a fully sealed membrane covering the total floor and wall sections.
- When used it takes the place of the D.P.M.
- The radon barrier must be strong and durable.
- The radon barrier must comply with current Building Regulations.

Question 7.

Details:	**Marks.**
Primary communication of relevant information on first term.	**6**
Other communication of relevant information on first term.	**4**

Primary communication of relevant information on second term.	**6**
Other communication of relevant information on second term.	**4**

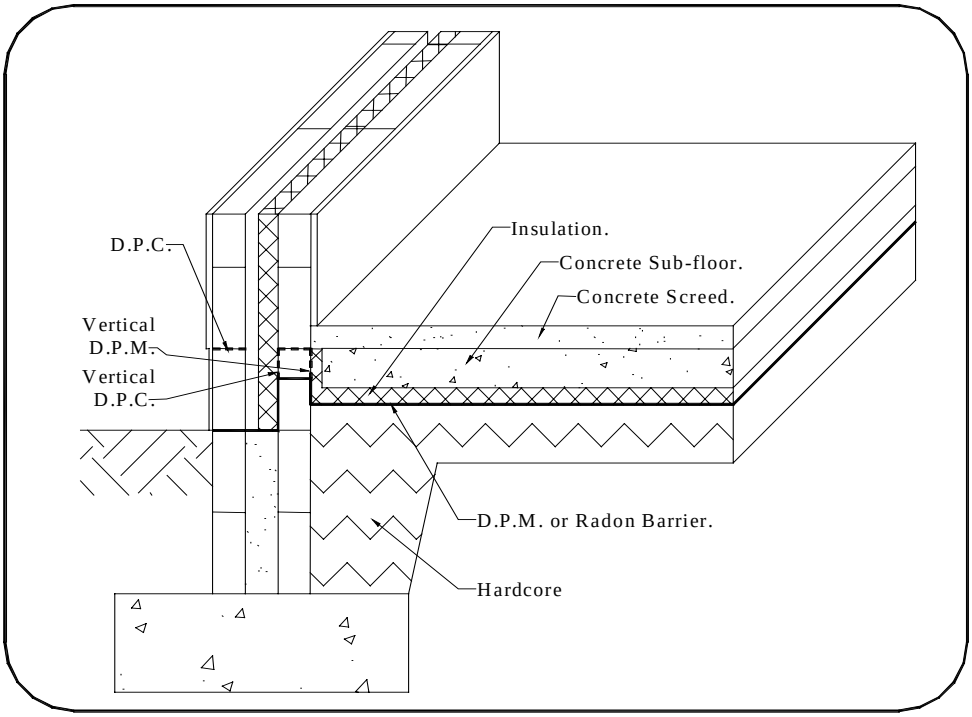
Primary communication of relevant information on third term.	**6**
Other communication of relevant information on third term.	**4**

Primary communication of relevant information on fourth term.	**6**
Other communication of relevant information on fourth term.	**4**

Primary communication of relevant information on fifth term.	**6**
Other communication of relevant information on fifth term.	**4**

Question 8.

(a)



- The topsoil is removed and stored elsewhere on site.
- Hardcore, made up of clean, well-graded broken stone, free from gravel, clay or mud is placed in layers of between 150mm and 225mm.
- Each layer must be consolidated.
- Sand blinding is spread lightly over the hardcore to fill surface voids.
- D.P.M or radon barrier is placed over the blinding and up over the walls to meet the D.P.C.
- A radon barrier may be required and is placed over the blinding extending across the cavity to the outside. All joints are sealed.
- Insulation material is placed over the D.P.M. or radon barrier and carried up along the walls.
- Concrete is placed on the insulation and finished level.
- A screed mixture of sand and cement is sometimes incorporated into the concrete subfloor or put over the subfloor later on.

(b) Design detail.

- The D.P.M or Radon barrier prevents rising damp.
- The cavity prevents water getting to the inner leaf.
- The hardcore helps prevent the movement of moisture from the ground.

(c) Recommended Floor covering such as:

- Natural stone.
- Tiles: quarry; baked clay; cork, ceramic, thermoplastic etc
- Wood: solid and laminated
- Sheet flooring: Linoleums; vinyl etc

Reasons.

- Hardwearing
- Durable
- Moisture resistant
- Low maintenance
- Hygienic.

Question 8

Part (a).

Details shown on sketch.	**Marks**
Concrete floor	**4**
Insulation.	**4**
Hardcore	**4**
Any other relevant detail.	**4**
Notes describing the construction of the floor:	
Valid description 1	**4**
Valid description 2	**4**
Valid description 3	**4**
Presentation / Quality of sketching.	**4**

Subtotal 32

Part (b)
Design detail, indicated on sketch, to prevent moisture reaching the inside of the building.

DPC, DPM / Radon Barrier or Hardcore.	**6**

Part (c).

Recommended Flooring covering.

Covering	**4**

Reasons for recommending flooring covering.

Valid reason 1.	**4**
Valid reason 2.	**4**

Total = 50 marks

Question 9

Aggregates:

- Aggregates are gravels, crushed stone and sand, mixed with cement and water to produce concrete.
- Aggregates must be clean and durable.
- As aggregates form the bulk of concrete the selection of suitable materials is very important.
- Aggregates can be fine, coarse or lightweight.
- Fine aggregates are natural sand or crushed stone that pass through a 5mm sieve.
- Coarse aggregate is natural gravel or crushed stone retained by a 5mm sieve.
- Lightweight aggregates are used to reduce weight in structural elements or to give improved thermal insulation.

Batching:

- This is the process of measuring the correct proportions of the constituent materials before they are mixed together to produce concrete.
- Weight batching is where the materials are each weighed before being mixed. This is the most accurate method and is used on all ready-mix production systems.
- Batching by volume is generally used for small amounts of concrete mixed by hand or in a small mixer. It is not a very accurate method and may not produce an accurate concrete mix.

Formwork:

- Formwork or shuttering is the boarding or sheeting put in place to contain and mould the wet concrete during placing and the initial setting.
- Formwork is generally made from timber or steel. Plywood is widely used with solid wood or on its own to give a good finish to concrete.
- As formwork should be re-used it is important that it can be easily put in place and removed when concrete is set.
- The formwork must be rigid and firm. It must remain stable when the concrete is being placed.
- The formwork should produce concrete with a good surface finish.
- It must permit removal of side forms prior to removal of the soffit.

Slump Test:

This is a site test used to check the workability of concrete. It also ensures that all mixes and water/cement ratio are consistent.

- The test is carried out on site using a special truncated hollow conical steel mould. The height of the mould is 300mm, with top diameter of 100mm and base diameter of 200mm.
- The inside of the mould should be clean and damp before each test. It should be placed on a smooth, horizontal, rigid and impervious surface.
- A sample of concrete is taken from the mix. The mould is filled in three layers while being held using the footrests.
- Each layer is tamped using a tamping rod; 25 strokes being applied evenly over the area of the concrete.
- When the mould is full the excess concrete should be cleaned off level with the top.
- The mould is then lifted carefully and placed in the inverted position next to the slumped concrete.
- The slump is the difference between the height of the cone and the highest point of the concrete being tested. The slump should be recorded to the nearest 5mm.
- Slump measurements may be as follows: Low Workability 0-50mm
  High Workability: 50-75mm.

Curing:

Curing is the process of preventing the loss of moisture from the concrete while maintaining a satisfactory temperature regime. Keeping the concrete damp for a period of time after placing minimizes any tendency to cracking and allows it to develop the strength necessary to resist such stresses as may arise during subsequent drying.
In winter the following precautions may be taken:

- Keep formwork in position for longer.
- Protect the top of the concrete with insulating material.
- Insulate steel formwork.
- Ensure that the temperature of the concrete is not less than 5°C during mixing, placing and early curing.
- Ensure that aggregates are not frozen.

In summer the following precautions may be taken:

- Formwork should be left in position for as long as possible. This prevents the concrete from drying out too quickly.
- Cover the formwork with a suitable material in order to insulate it from the heat of the sun.
- When the formwork has been struck the concrete may be covered for a further period as curing progresses.
- Keep the surface damp; do not allow it dry out too quickly.

(b)

Three locations where pre-cast concrete components are used in a dwelling house are:

1. Pre-cast concrete cills are used widely in the construction of a dwelling house. The concrete cill is located under the window. It projects out from the external wall. A damp-proof course is located at the back underneath and sides to prevent water penetration.
2. Pre-cast concrete lintels are used to span the opening over windows and doors. This eliminates the necessity for formwork and casting of concrete on site. Lintels as well as being pre-cast may also be prestressed.
3. Pre-cast flue gathering lintel is used in the construction of fireplaces. This unit is fitted over the fireplace. The unit acts as a lintel and a gathering for the smoke. A preformed opening allows easy fitting of flue-liners.
4. Pre-cast concrete kerbs are used for groundwork. These kerbs are available in different sizes and are generally used where concrete and tarmac is laid for drives and open areas.
5. In recent times upper floors and stairs are supplied in pre-cast form. Suspended upper and ground floors are now constructed using pre-cast concrete units.
6. Other examples of pre-cast concrete units are wall and pillar cappings, inspection chambers, chimney caps, septic tanks, drainpipes, bricks and blocks.

(c)

The advantages of using pre-cast concrete units are as follows:

- The units are ready made and may be put in place as the construction work proceeds. There is no delay and work can continue.
- Pre-cast sections reduce labour costs.
- No special formwork needed.
- Pre-cast units have consistent quality as they are produced under controlled conditions.
- Prestressed lintels and cills are particularly suitable for the construction of two storey houses. They are relatively light and make the best use of both concrete and steel.
- Pre-cast concrete is economical, labour saving, and consistent with a wide variety of uses.

Question No. 9

(a)

Term 1.

Valid point 1.	4
Valid point 2.	4

Term 2.

Valid point 1.	4
Valid point 2.	4

Term 3.

Valid point 1.	4
Valid point 2.	4

(b)

Locations

Location 1.	5
Location 2.	5
Location 3.	4

(c)

Advantages.

Advantage 1.	4
Advantage 2.	4
Advantage 3.	4

Total Marks = 50