



Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scéimeanna Marcála

Scrúduithe Ardteistiméireachta, 2003

Staidéar Foirgníochta

Gnáthleibhéal

Marking Scheme

Leaving Certificate Examination, 2003

Construction Studies

Ordinary Level

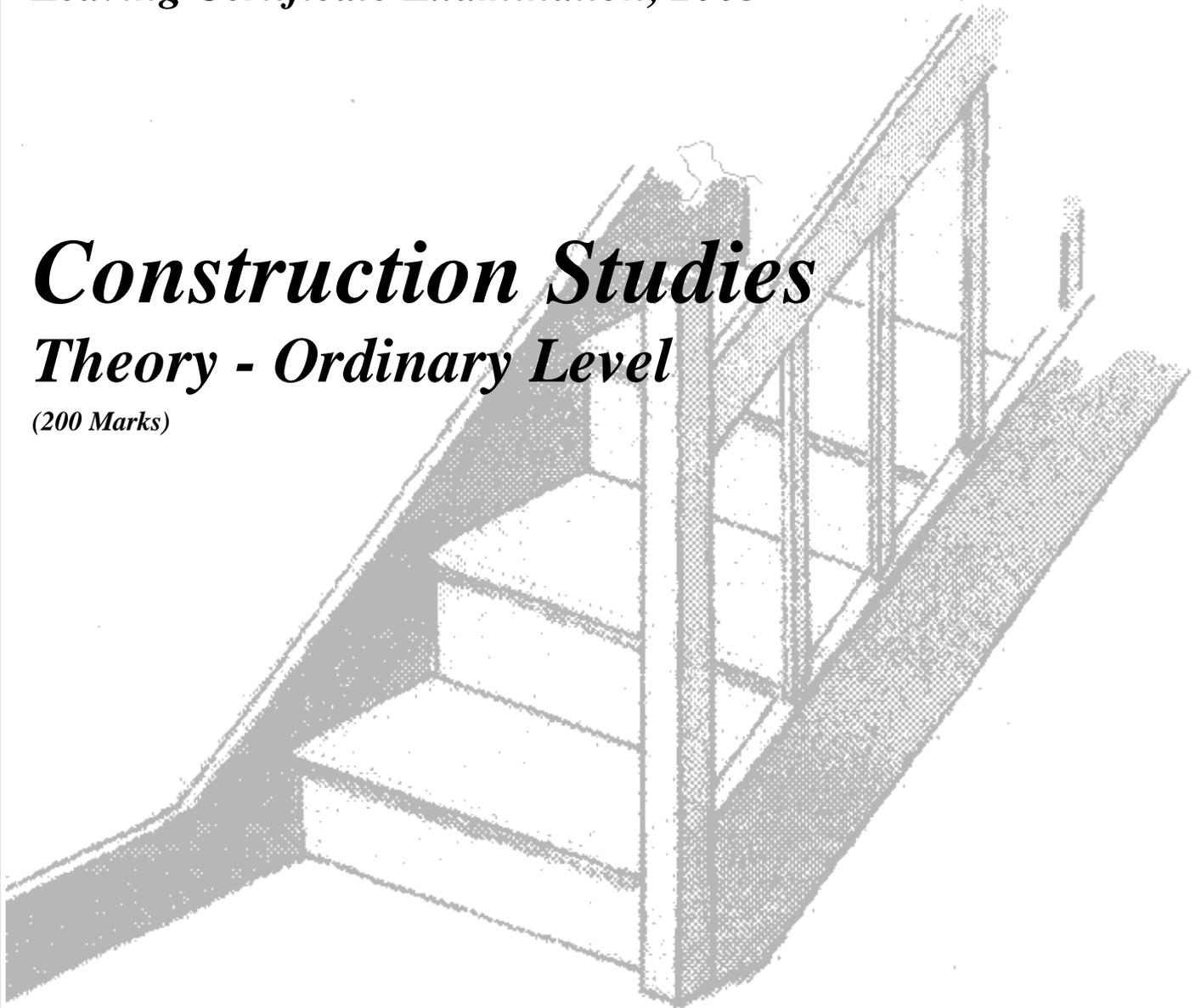


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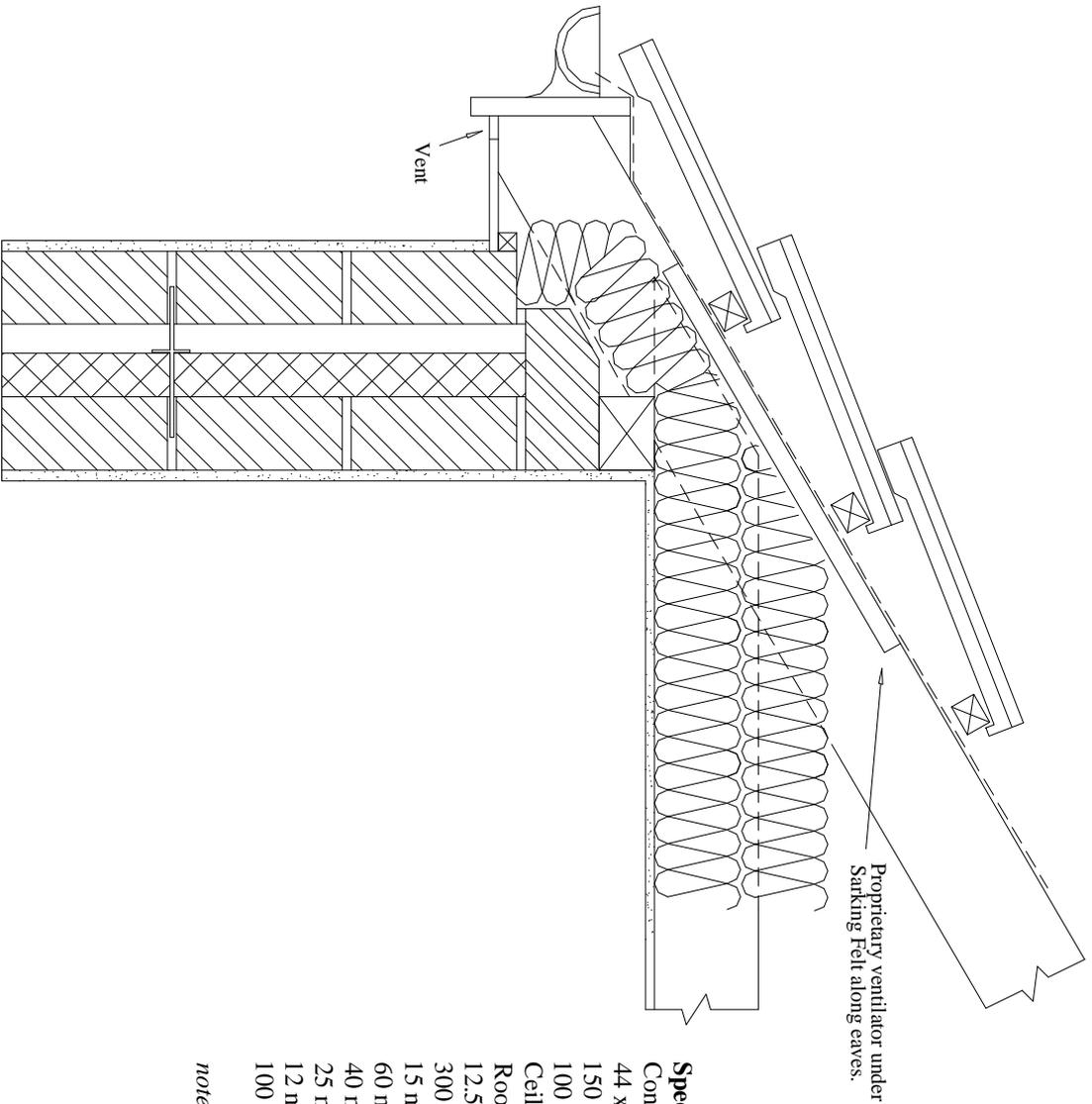
Leaving Certificate Examination, 2003

Construction Studies
Theory - Ordinary Level

(200 Marks)



Marking Scheme



Proprietary ventilator under
Sarking Felt along eaves.

Vent

Specification:

- Concrete Interlocking Tiles on,
- 44 x 35 or 50 x 25 softwood Battens on, Sarking Felt on,
- 150 x 50 Rafters on,
- 100 x 75 Wallplate.
- Ceiling Joists 150 x 50 or 175 x 50.
- Roof Insulation to comply with current Building Regulations.
- 12.5 mm Foil-backed Plasterboard ceiling with Skim Coat.
- 300 mm Insulated Cavity Block wall.
- 15 mm plaster to wall externally & internally.
- 60 mm Cavity Wall Insulation and Wall Ties.
- 40 mm residual cavity.
- 25 mm Facia.
- 12 mm Soffit.
- 100 mm Gutter.

note: alternative correct detailing is acceptable.

CONSTRUCTION STUDIES
ORDINARY LEVEL
2003
QUESTION No. 1

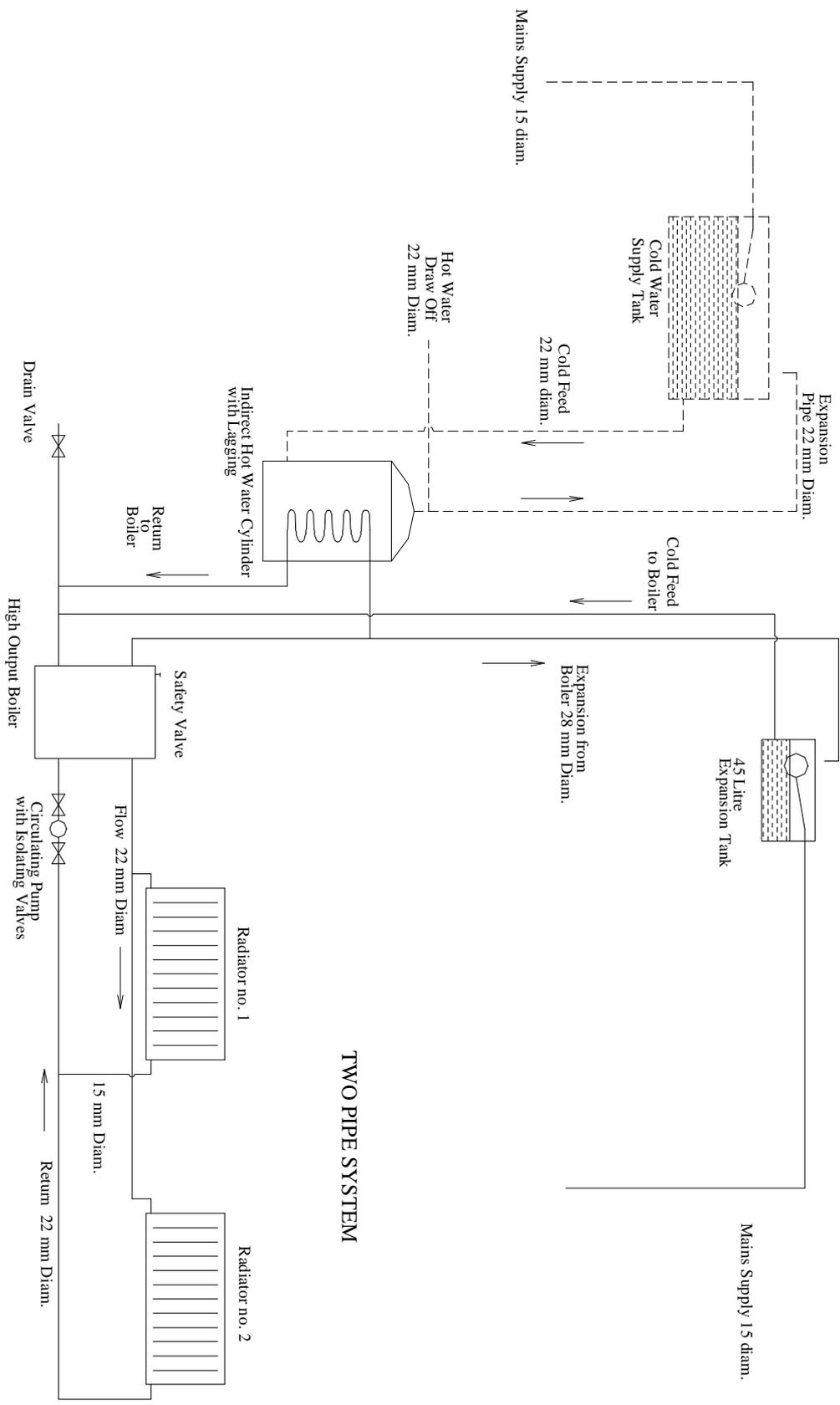
Question No.1.

Details:	Marks.
Tiles with lap.	4
Battens 50 x 25 or 44x35.	4
Felt.	4
Rafter 150 x 50.	4
Wall Plate 100 x 75.	4
Joist 150 x 50 or 175 x 50.	4
Insulation to wall & roof to comply with current Building Regulations.	4
Fascia 25 Thickness, Soffit 15 Thickness.	4
Cavity Wall 300.	4
Residual Cavity 40.	4
Wall ties.	4
Plasterboard 12.5, foil – backed.	4
Plaster Internal and External.	4
Suitable Pitch.	4
Ventilation.	4
Gutter.	4

Any 11 of the above (4 Marks each).

Drafting and scale.	6
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Total Marks. = 50



TWO PIPE SYSTEM

**CONSTRUCTION STUDIES
ORDINARY LEVEL
2003
QUESTION No. 2**

Question No.2.

Part (a).

Details:

Marks.

Cylinder with coil.	4
Boiler with safety valve.	4
Radiator No.1 with connections.	4
Radiator No.2 with connections.	4
Expansion tank with mains supply and overflow.	4
Expansion from the boiler to the cylinder.	4
Return from the cylinder to the boiler.	4
Drain valve.	4
Circulating pump.	4
Flow pipe to the radiators.	4
Return pipe from the radiators.	4
Two – pipe or One – pipe system.	4
Insulation indicated for pipes and cylinder.	4

Any 8 of the above (4 Marks each).

Quality of sketch.	8
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Part (b).

Any 5 arrows.	10
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Total Marks. = 50

Question No. 3

Part (a)

Removal of gloss paint from an external wooden door.

Two methods are used to remove gloss paint from an external wooden door.

1. Use of a heatgun.
2. Use of a special chemical.

1 Heatgun.

The heatgun is the modern version of the blowtorch. It is similar to a hairdryer. A selection of nozzles may be fitted at the end for use in different situations. It is electrically operated with temperature adjustment. The gun reaches very high temperatures during operation, so care is needed at all times.

Method.

- Cover the floor and surrounding area with a suitable material.
- Set a high air temperature on the gun.
- Switch on the heatgun.
- Direct the hot air onto the paint to be removed.
- When the paint softens, use a paint scraper to carefully scrape away the peelings.
- Do not burn the paint. Keep the nozzle at least 25mm away from the painted surface. Do not concentrate on the same spot for too long.
- Work downwards, to prevent paint falling onto and into the heatgun. This could damage the gun or even catch fire.
- Continue with this process until all paint has been removed and the surface is ready for sanding.
- Dispose of all paint debris safely.

2 Use of a chemical.

Method.

- Cover the floor and surrounding area with a suitable material.
- Apply a liberal coat of the chemical to the surface using an old paintbrush. Use a dabbing action. Do not brush out.
- Leave for a few minutes while it reacts with the paint. Do not allow to dry out.
- Scrape off the paint using a paint scraper. Be careful not to damage the surface of the door.
- Work on small areas at any one time.
- Continue until all paint is removed.
- Finish by wiping down the surface with fine wire wool soaked in methylated spirits. This neutralizes the chemical.
- Dispose of all paint debris carefully.

Question No. 3 Cont.

Part (b)

Safety precautions to be observed when removing paint / varnish.

- ❑ Wear suitable protective clothing, gloves and eye/face protection.
- ❑ Work in a well ventilated area.
- ❑ If using a paint/varnish remover, follow the instructions on the container.
- ❑ Protect floor coverings with a suitable material.
- ❑ When using a heatgun be careful of the hot nozzle at the end of the gun. The nozzle can reach very high temperatures during operation. (Up to 600 °C at the nozzle)
- ❑ Be careful with the paint as it is burned off, the particles are hot and could cause a serious burns.
- ❑ The heatgun should be allowed cool down completely before it is stored away.
- ❑ Do not allow young children within the vicinity of the work being carried out.

Part (c)

Surface preparation:

- ❑ All nails and pins to be punched below the surface.
- ❑ The holes are then filled with a suitable filler.
- ❑ The surface is then sanded with a medium glasspaper working down to a fine grade.
- ❑ Remove the dust from the surface using a hand brush.
- ❑ Wipe the surface with white spirits using a lint free cloth.
- ❑ A final sanding may be carried out before applying the paint.

Application of a gloss paint finish:

- ❑ A suitable Primer is applied to the surface. It should be worked well into the surface. One coat is usually applied. Allow to dry completely.
- ❑ Two coats of undercoat are applied, and allowed to dry. The undercoat should be similar in colour to the final coat.
- ❑ Sand the painted surface with a fine glasspaper.
- ❑ Finally apply one coat of gloss paint and allow it to dry to a perfect finish. Use a good quality brush always.
- ❑ Apply paint lightly and work well into the surface. Avoid drips.

Question No. 3.

Details:

Marks.

Part (a).

Method.

Valid Procedure 1.	5
Valid Procedure 2.	5
Valid Procedure 3.	5
Valid Procedure 4.	5
Valid Procedure 5.	5

Part (b).

Safety precautions.

Safety precaution 1.	3
Safety precaution 2.	3
Safety precaution 3.	3

Part (c).

Surface preparation and Gloss paint finish :

Any 4 valid points

4 Marks each.

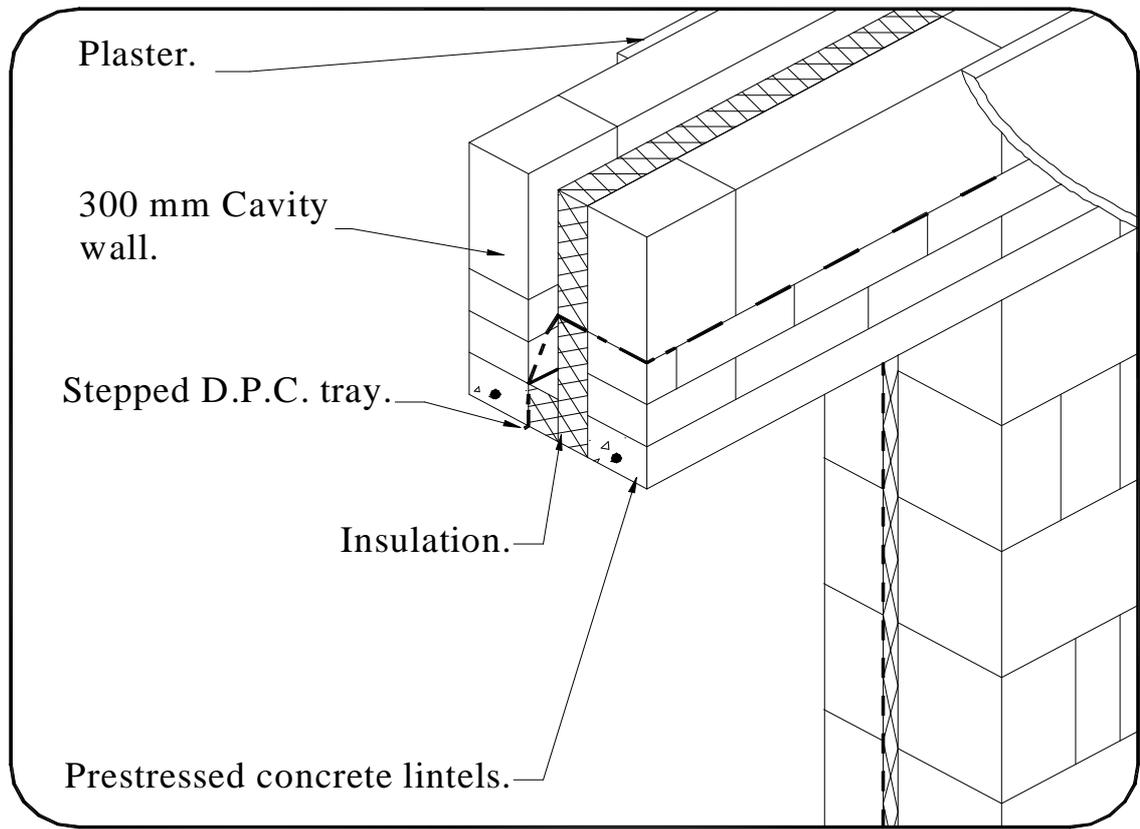
Total.

50 Marks.

Question 4.

Q 4 (a).

Lintels



Precast lintels (Similar to cast in-situ):

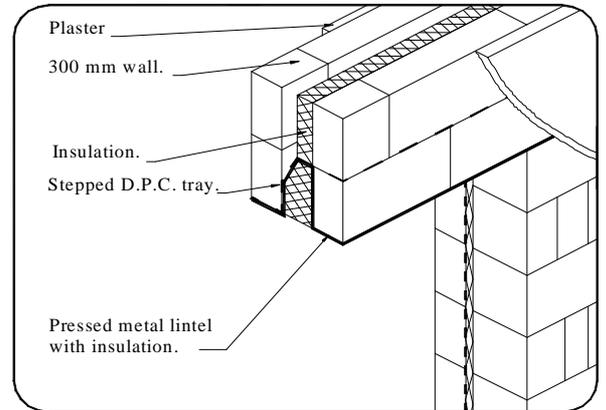
- ❑ A beam, called a lintel, is placed over the opening.
- ❑ Two lintels are used with a cavity made between them.
- ❑ The two lintels avoid a cold bridge, which a single lintel would create.
- ❑ The lintels are bedded in mortar at both ends and should rest on whole blocks.
- ❑ The lintels are propped until the block work above them has matured.
- ❑ The lintels and an area above them act together and give the lintels their full strength.
- ❑ A stepped D.P.C. tray is placed above the lintels. This prevents dampness penetrating the wall.
- ❑ Insulation is placed in the cavity to prevent 'cold bridging'.

Question 4 contd.

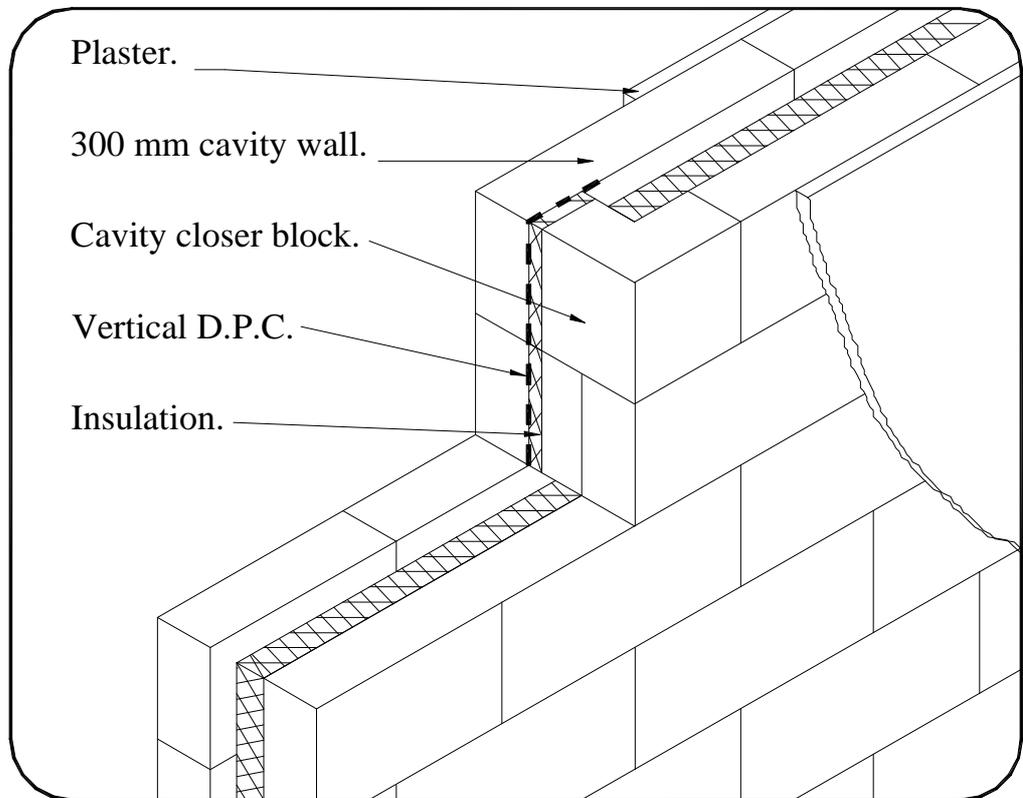
(Alternative lintel)

Pressed metal lintels:

- ❑ Galvanised or stainless steel is used in this lintel.
- ❑ It is folded or pressed to the shape in the sketch and carries the weight of the blocks overhead.
- ❑ The lintel should incorporate insulation.



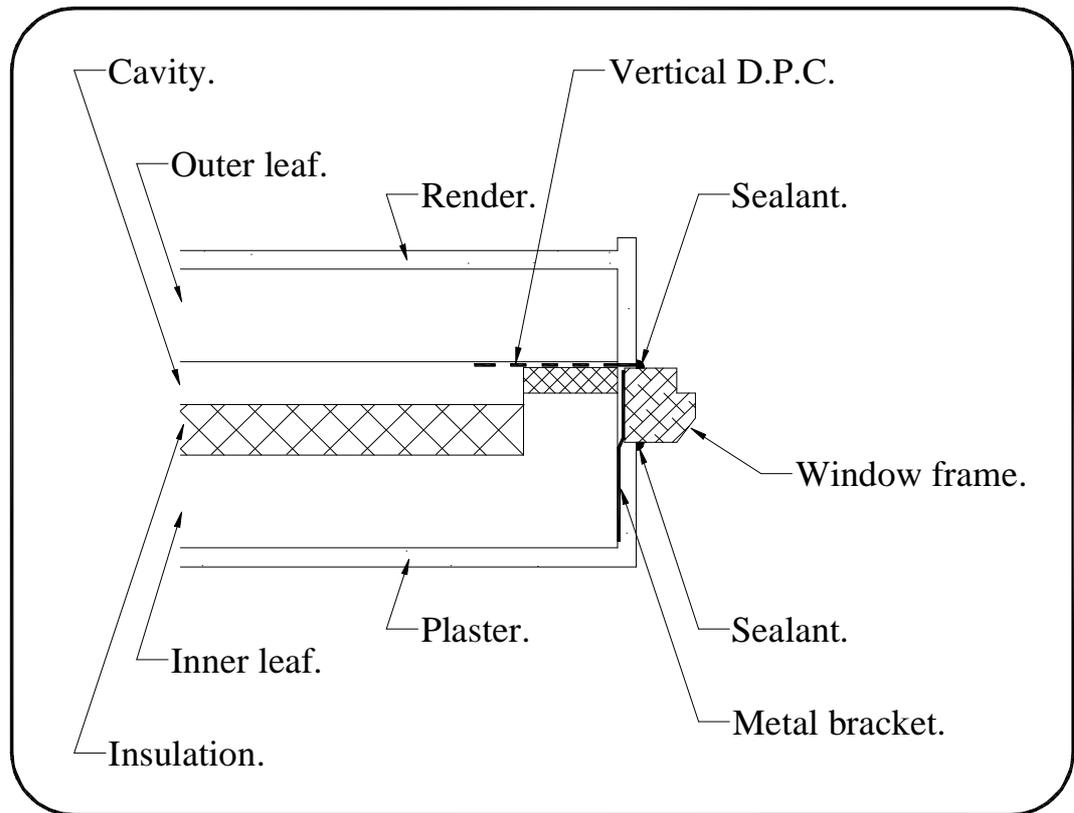
Sides:



- ❑ The cavity in the sides of a window should be closed by means of cavity closer block.
- ❑ Vertical D.P.C. should be placed between the outer leaf and the closer block to prevent dampness reaching the inner leaf.
- ❑ Insulation should be placed in the joint to reduce the 'cold bridge' effect.
- ❑ The sides of a window opening should be plumbed vertical.

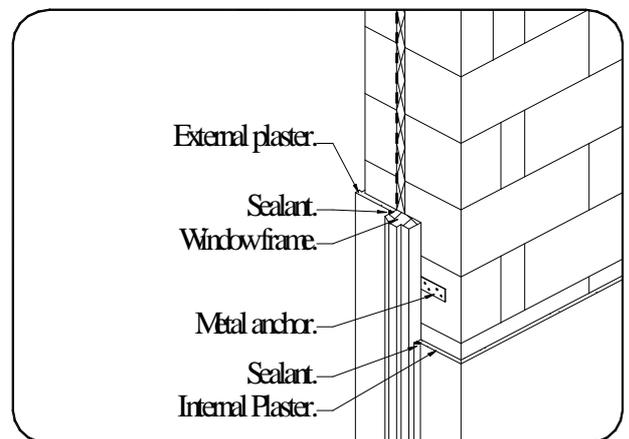
Question 4 contd.

Q 4 (b).



- ❑ The window frame is placed against the wall with the outer edge close to the vertical D.P.C.
- ❑ The window frame and the D.P.C. combine to stop dampness reaching the inner leaf
- ❑ A metal strap, galvanized or stainless steel is fixed to the window frame and the wall. The strap holds the window in place.
- ❑ The wall is plastered on both sides also securing the window.
- ❑ A sealant is placed between the window and the plaster to improve insulation.

(Alternative sketch)



Question No 4.

Details:

Marks.

Part (a).

Lintel.

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

Sides of Window.

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

Part (b).

Shown on sketch.

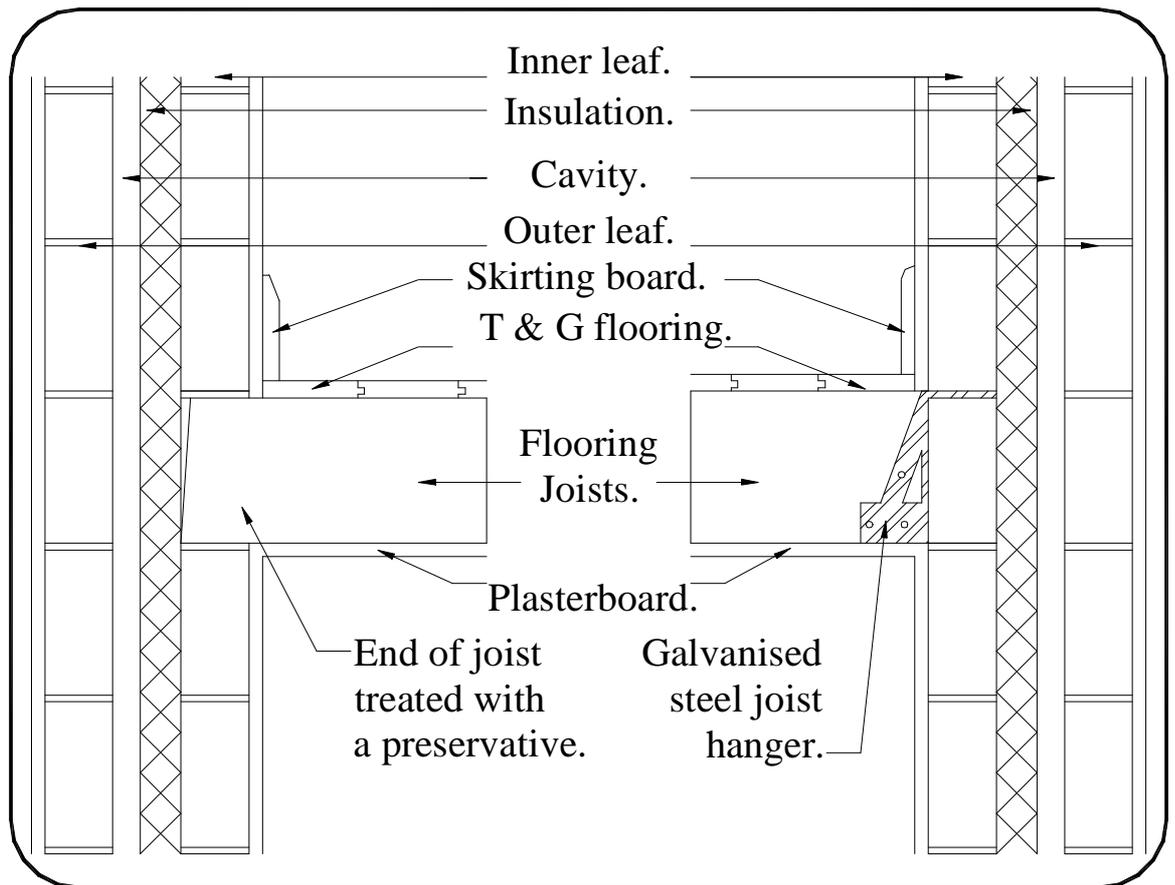
Window frame in correct place.	3
Method of securing window.	3
Any other relevant information.	3
Presentation / Sketch.	5

Total Marks. =

50

Question 5.

Q 5 (a).



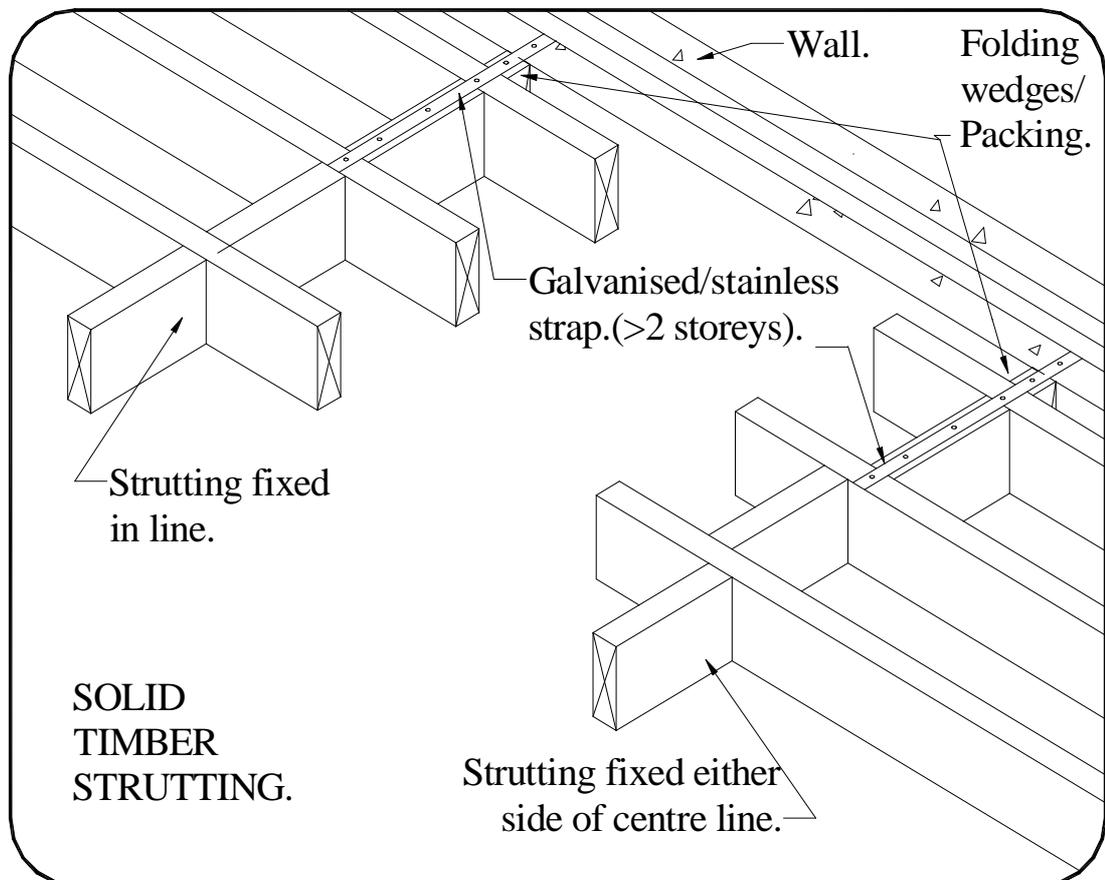
- The joists are built into the inner leaf of the cavity wall only.
- The space between the joist and the block work should be packed with mortar.
- The joists may sit on a slate on the inner leaf.
- The ends of the joists are treated with a preservative.
- Alternatively, the joists sit on joist hangers.
- The joist hangers are made from galvanized steel.
- The hangers are built into the inner leaf and the joists are fixed to the metal hangers.

Question 5 contd.

Q 5 (b).

- ❑ Strutting is used in timber suspended floors to minimize the movement of joists.
- ❑ Strutting usually occurs at mid-span of the joists or more frequently depending on the span of the floor joists.
- ❑ Packing or folding wedges are placed in line with the strutting and between the last joist and the wall in order to secure the bridging.
- ❑ In certain instances metal straps are fixed to the wall and the bridging.

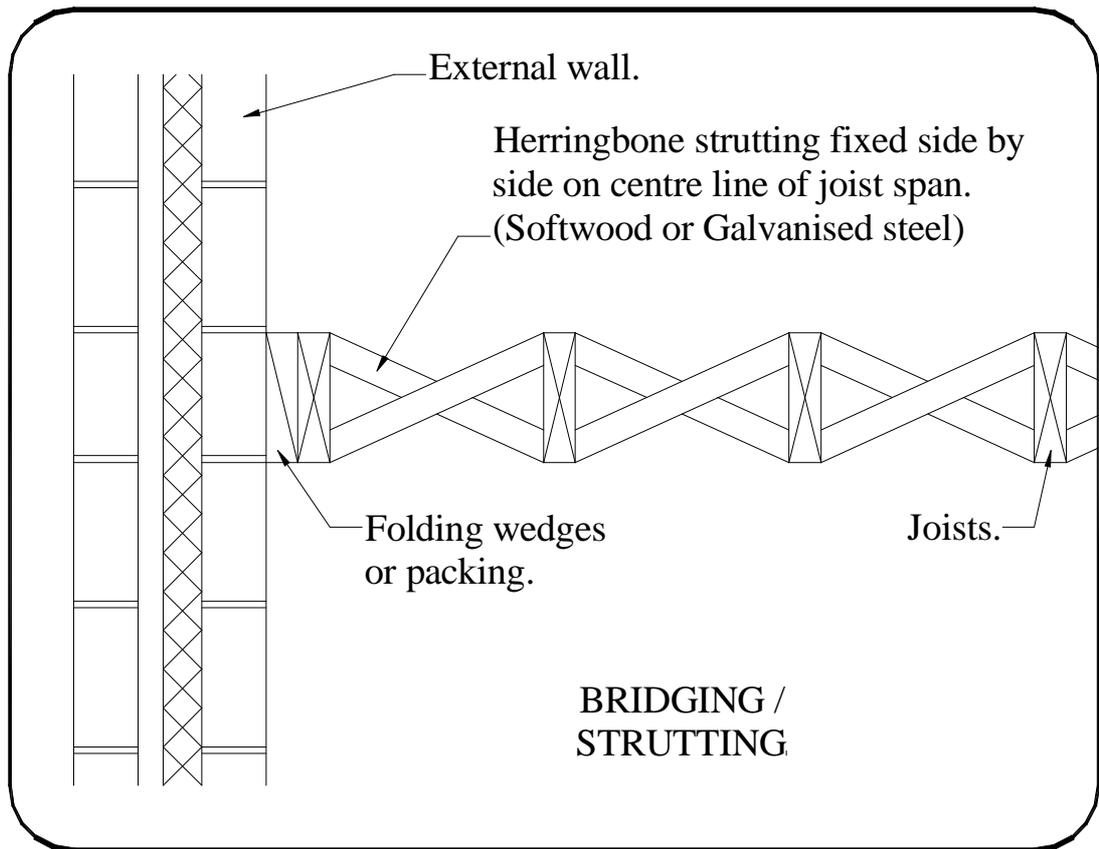
Solid bridging:



- ❑ Consists of short boards fixed vertically between floor or roof joists.
- ❑ Struts are either staggered to allow for end nailing or in line, in which case skew nailing is used.
- ❑ Strutting should be the same depth as the joist.

Question 5 contd

Herringbone strutting :



- ❑ Consists of light softwood struts (30 x30 min.) fixed from the bottom of one joist to the top of the next.
- ❑ The struts cross in the middle.
- ❑ The ends are nailed to the joists.
- ❑ The spacing of the joist may sometimes restrict the use of herringbone strutting.
- ❑ Sometimes galvanized steel struts are used instead of softwood.

Question No 5.

Details:

Marks.

Part (a).

Details shown on sketch.

Joist / Hanger.	3
Tongued and grooved flooring boards.	3
Plasterboard ceiling.	3
Any other relevant detail.	3
Any other relevant detail.	3
Presentation / sketch.	5

Note.

Valid explanation 1.	2

Part (b).

Details shown on sketch.

Joists.	3
Strutting / bridging.	3
Any other relevant detail.	3
Presentation / sketch.	5

Note.

Valid explanation 1.	2

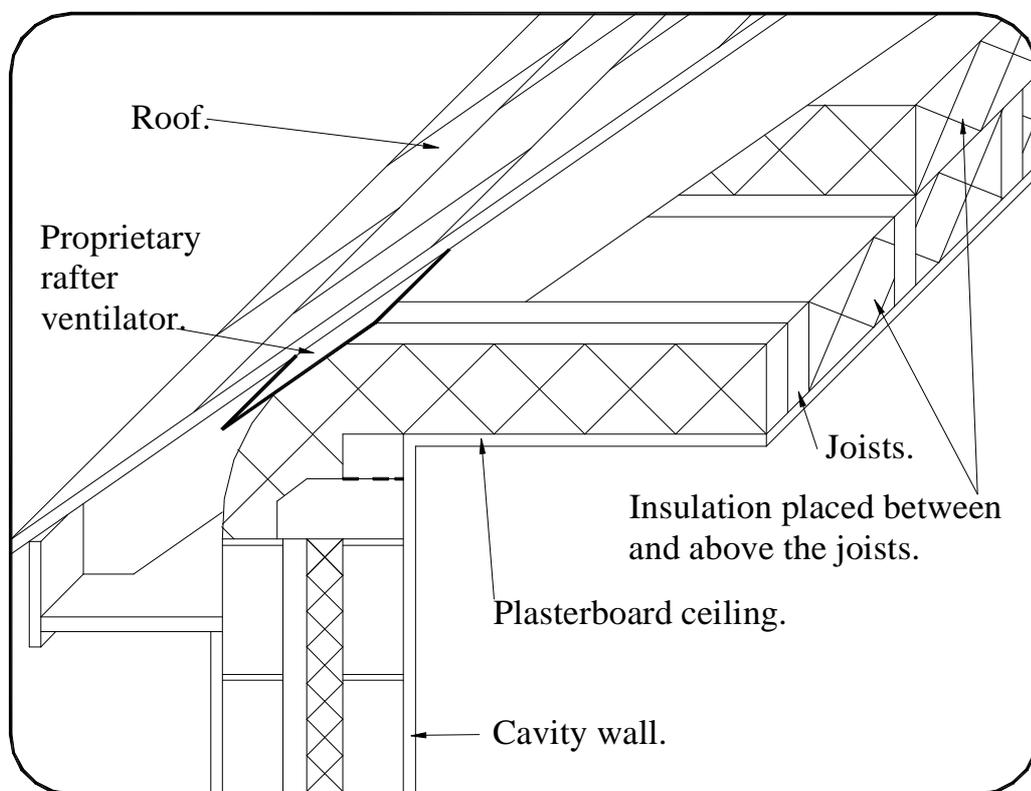
Total Marks. = 50

Question 6.

Q 6 (a).

- ❑ Thermal insulation keeps heat inside a building for as long as possible.
- ❑ It conserves energy and reduces heating costs.
- ❑ Insulation helps to maintain a constant temperature inside a building.
- ❑ The cost of installing insulation is quickly paid for by the reduction in the fuel bill.
- ❑ Condensation is reduced inside the building because of warmer surfaces.
- ❑ It provides a comfortable living space.
- ❑ The time taken to heat up a building is greatly reduced when it is unoccupied during the day.
- ❑ It reduces the flow of heat in the building – out of the building in the winter and into the building in the summer.
- ❑ Insulation is mandatory under current Building Regulations.

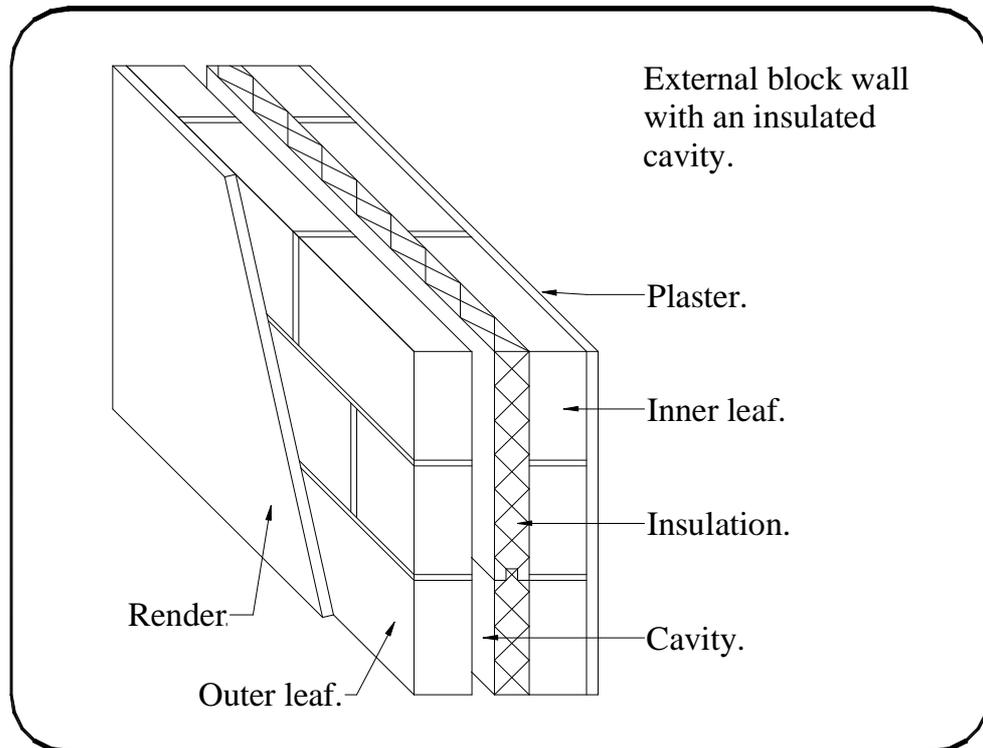
Q 6 (b) (i) Pitched Roof.



- ❑ The insulation is placed between the joists and rests on the ceiling slab. It may also be placed over the joists if necessary.
- ❑ Care should be taken when putting the insulation down at the eaves to allow for through ventilation into the attic space.
- ❑ A ventilator is fixed above the insulation at the eaves giving a 50mm gap and allowing for air to circulate freely in the roof space.
- ❑ The thickness of the insulation must comply with current Building Regulations.

Question 6. Contd.

Q 6 (b) (ii) External Wall.

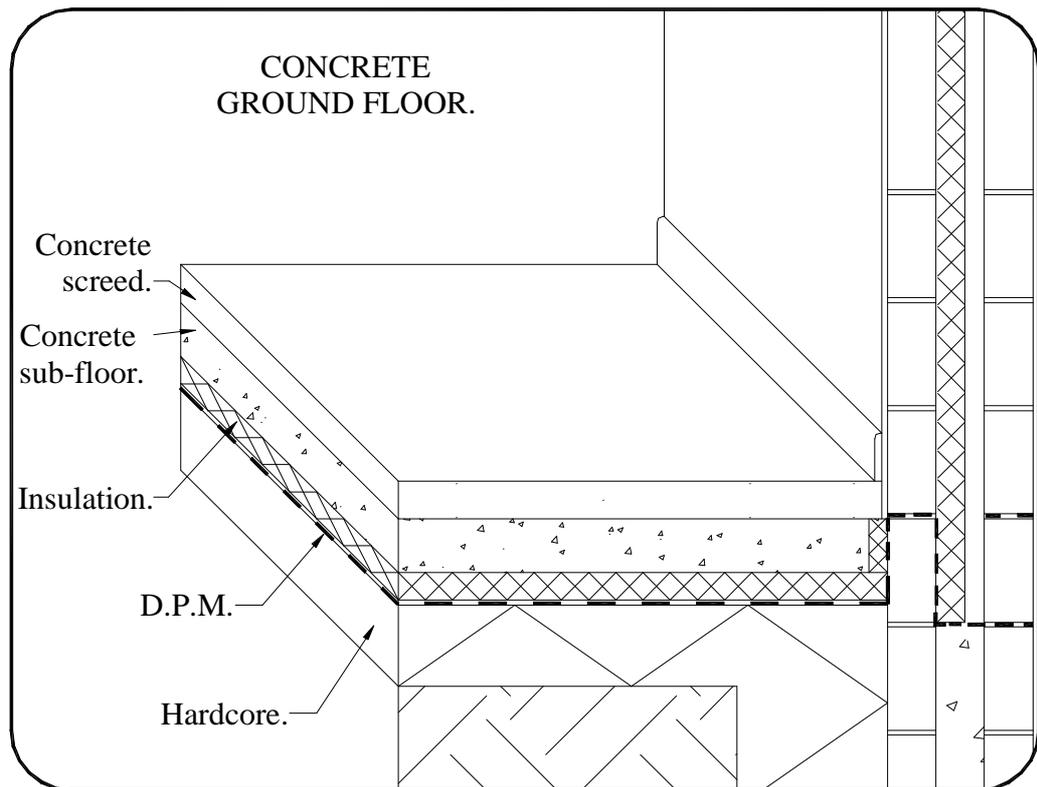


- ❑ Solid slabs of insulation are fitted into the cavity as the wall progresses.
- ❑ The insulation is fitted in the cavity and to the inner leaf using special wall ties, thus leaving a cavity.
- ❑ Polystyrene particles may also be used on an existing cavity wall. This material is pumped into the cavity at various points along the wall. It completely fills the cavity.
- ❑ An existing cavity wall may also be dry lined by fixing battens, insulation and foil-backed plasterboard to the inside of the wall.
- ❑ The thickness of the insulation must comply with current Building Regulations.

Q 6 (b) (iii) Concrete ground floor.

- ❑ The insulation is placed on the D.P.M. or the radon barrier and under the concrete slab.
- ❑ The insulation should be strong enough to support the floor.
- ❑ Hardcore with blinding is placed below the insulation.
- ❑ The thickness of the insulation should be uniform for the entire floor.
- ❑ Care should be taken where the floor meets an external wall to avoid a thermal bridge.
- ❑ The thickness of the insulation must comply with current Building Regulations.

Question 6. contd.



Q 6 (c). Pitched Roof:

- Glass fibre quilt.
- Expanded Polystyrene Board.
- Extruded Polystyrene Board.
- Polyurethane board.

External Wall:

- Expanded Polystyrene board.
- Glass fibre batt.
- Extruded Polystyrene Board.
- Polyurethane board.
- Glass fibre quilt.
- Phenolic board.

Concrete Ground Floor.

- Expanded polystyrene Board.
- Extruded polystyrene.

Question No 6.

Details:

Marks.

Part (a).

Reasons.

Reason 1.	4
Reason 2.	4

Part (b).

(i) Pitched roof.

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

(ii) External wall.

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

(iii) Concrete ground floor.

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

Part (c).

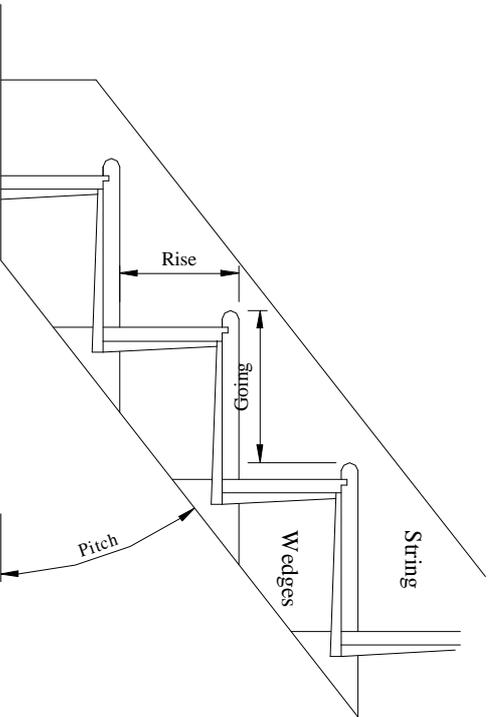
Type of insulation.

Pitched roof.	4
External wall.	4
Concrete ground floor.	4

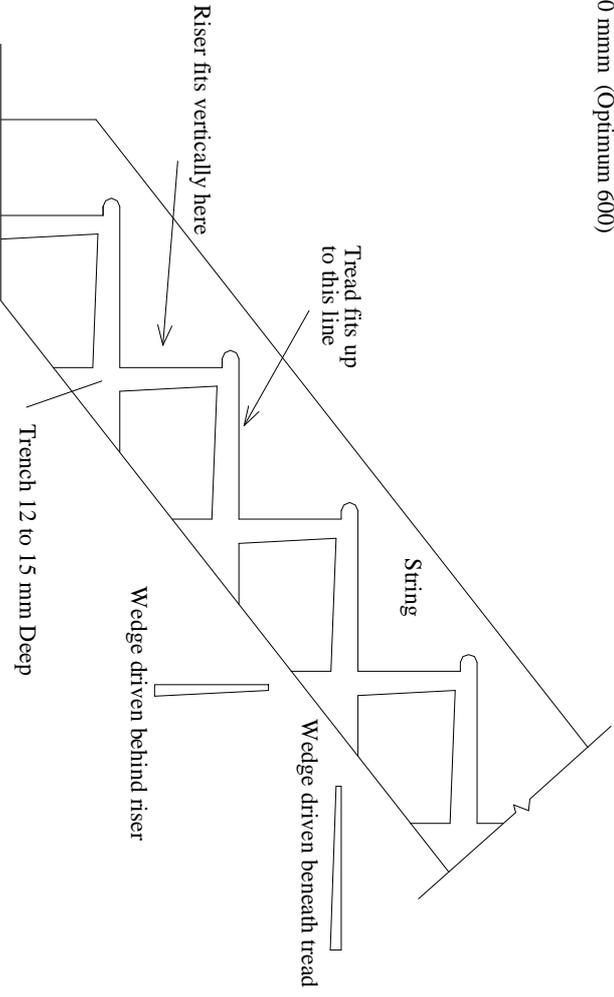
Total Marks. =

50

String 275 mm x 50 mm Hardwood or Softwood
 Tread 25 mm Hardwood or Softwood
 Riser 20 mm thick Hardwood or Softwood
 Rise & Going calculated to conform with the formula $2R + G = 550 - 700$ mm (Optimum 600)
 Going 220 mm Minimum (Optimum 250)
 Rise 220 Maximum (Optimum 175)
 Pitch = 42 Degrees Maximum (Optimum 35 Degrees)



(7a)



(7b)

CONSTRUCTION STUDIES
ORDINARY LEVEL
2003
QUESTION No. 7

Question No.7.**Details:****Marks.****Part (a).**

String with indication of size.	4
Tread with indication of size.	4
Riser with indication of size.	4
Slopes to accept wedges.	4
Wedges in place.	4
Correct pitch.	4
Margin.	4
Calculation of going and rise.	4
Glue blocks or plough groove.	4

Any 7 of the above (4 marks) each.

Drafting & scale.	7
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Part (b).

Formation of trench for tread and wedge.	2
Formation of trench for riser and wedge.	2
Use of glue.	2
Use of wedges to hold treads and risers in place.	2
Materials used.	2
Depth of trench.	2

Any 5 of the above (2 Marks each).

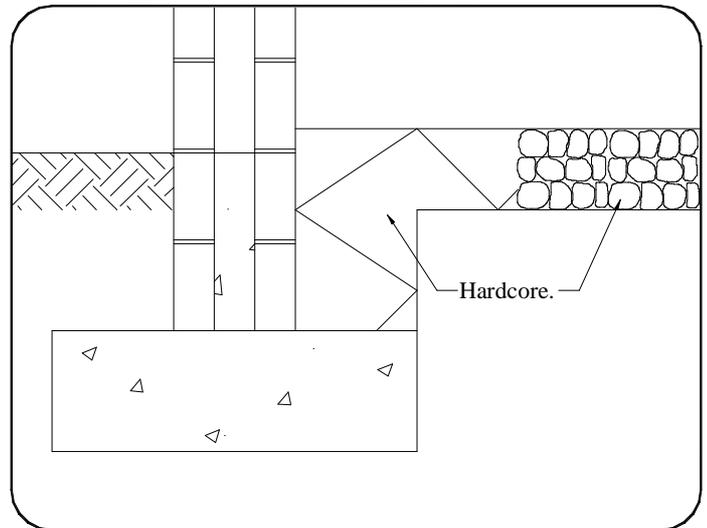
Quality of sketch.	5
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Total Marks. =**50**

Question 8.

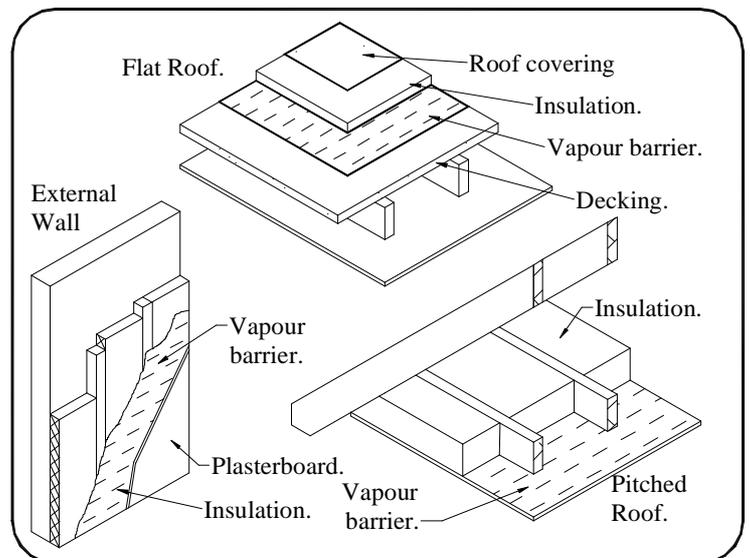
(i) Hardcore:

- ❑ Consists of well-graded, clean, broken stone, free from sand, gravel, clay or mud.
- ❑ Hardcore should be placed in layers. (Min 150 mm, max 225 mm.).
- ❑ Each layer must be consolidated.
- ❑ Hardcore forms the sound base on which to lay concrete ground floors.
- ❑ The hardcore can help to prevent movement of moisture from the ground.



(ii) Vapour Barrier:

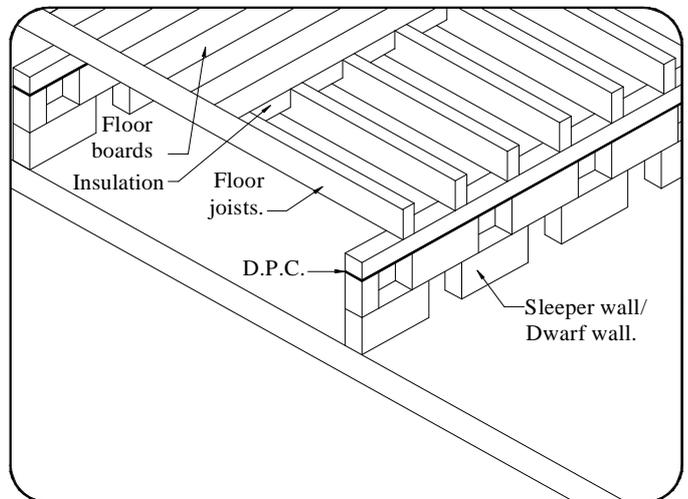
- ❑ Consists of a layer of material with a high resistance to the passage of vapour.
- ❑ It is mostly used on the warm side of insulation to prevent condensation.
- ❑ It can be used in external walls as part of dry lining.
- ❑ In flat roofs to reduce condensation occurring in the roof space.
- ❑ In ceilings to minimize warm air reaching the cold attic space.
- ❑ Polythene sheet, lapped and joined with tape is a common vapour barrier.
- ❑ Aluminium foil on the back of gypsum wallboard and bitumen felt are other examples.



Question 8 contd.

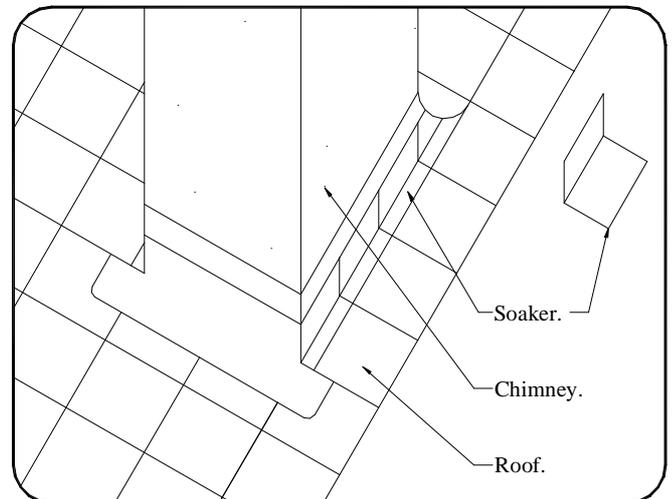
(iii) Sleeper Wall / Dwarf Wall.

- ❑ A low wall made of brick or block.
- ❑ It carries the joists of a timber ground floor.
- ❑ It is usually laid in honeycomb bond to allow ventilation.
- ❑ Sleeper walls are usually built on the concrete sub-floor.
- ❑ The area should be well ventilated to prevent the moisture content of the joists rising.



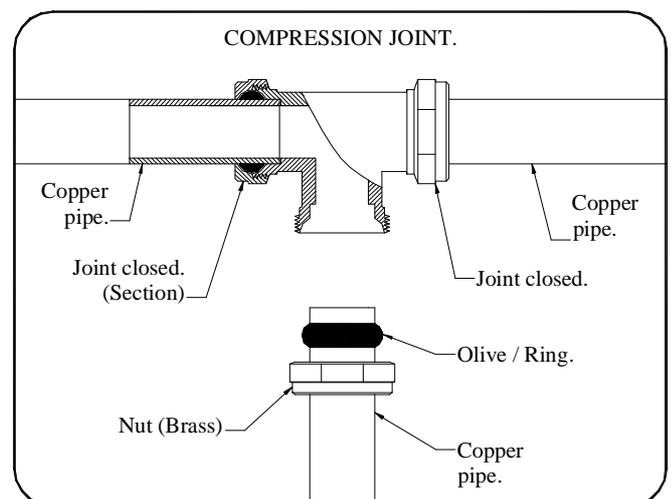
(iv) Soaker:

- ❑ Soakers are used when a roof abuts a parapet wall or a chimney.
- ❑ They are used to make a watertight joint in conjunction with a cover flashing.
- ❑ Usually made from coated sheet metal.
- ❑ They are roughly the same length as a tile.
- ❑ The width is generally 100 mm and the upstand a minimum of 75 mm.



(v) Compression Joint.

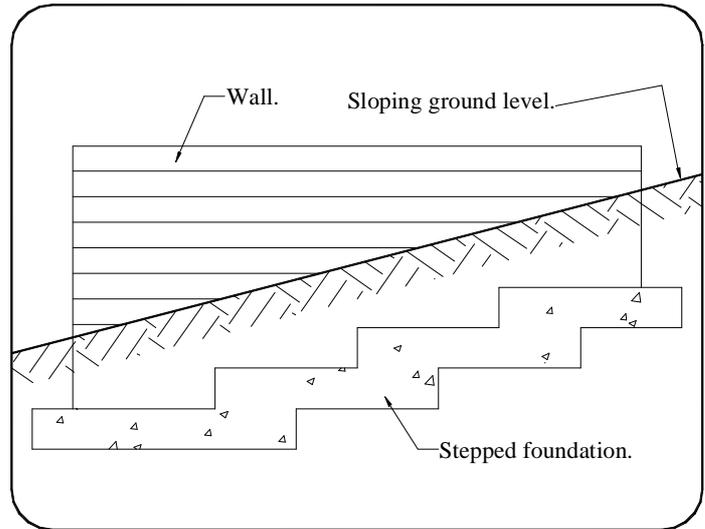
- ❑ The ends of the pipe must be cut square and the burr removed.
- ❑ The olive or ring fits over the pipe.
- ❑ P.T.F.E. or paste is wrapped around the olive or ring to improve the seal.
- ❑ When the nut is tightened the olive or ring is compressed.
- ❑ The compressed olive or ring grips the pipe thus sealing the joint.
- ❑ The joint can be used in light gauge copper or plastic piping.



Question 8 contd.

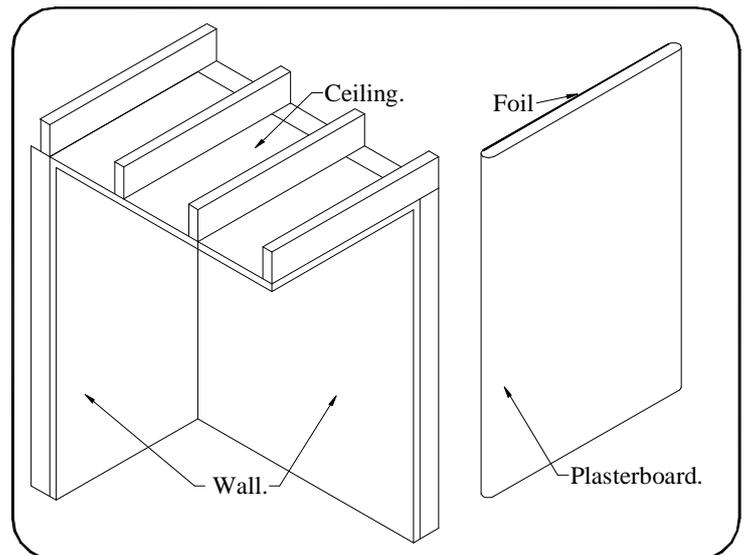
(vi) Stepped Foundation.

- ❑ Stepped foundations are used in sloping sites to avoid excessive excavation, timbering, backfill, etc.
- ❑ The height of each step should suit the height of the brickwork or blockwork.
- ❑ The lap in each step should not be less than the thickness of the foundation and not less than 300 mm.



(vii) Foil-backed Plasterboard.

- ❑ Plasterboard with foil attached to the back of it.
- ❑ Used in stud partitions and ceilings.
- ❑ The foil-backed plasterboard can be used as a vapour barrier.
- ❑ Joints between boards must be sealed with an aluminium strip.
- ❑ The plasterboard is non-combustible.
- ❑ The foil improves the thermal value of the board.



Question No 8.

Details:

Marks.

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

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

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

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

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

Total Marks. = 50

Question No.9

Part (a) Excavating a foundation.

Safety precautions to be observed when excavating a foundation trench for a dwelling house may include the following:

- ❑ Suitable access and egress to and from the trench. It is very important that workers should be able to enter a trench safely and that there is suitable exit as well.
- ❑ Check for underground services. A thorough check of the site should be carried out before work begins. Contact should be made with E.S.B., Eircom, and any service providers in the area who may have cables or ducting underground on the site. If excavating machinery damages cables or pipes it can be dangerous for operators and other personnel on the site.
- ❑ The material should be removed in layers rather than digging very deep holes at any one point. Trench collapse and the danger of a person falling in, or being trapped is always a concern.
- ❑ Suitable trench support should be used when deep excavation is necessary. Many fatal accidents are caused when proper care is not taken during this type of work.
- ❑ Ensure that heavy traffic is kept back from the edge of the trench. Traffic moving close to the edge may cause trench collapse.
- ❑ Correct boots and helmets should be worn by all personnel working on site. Reflective jackets should also be worn. Helmets offer protection from falling objects. Correct boots give protection to feet and reflective jackets ensure that workers are visible from a distance.
- ❑ Workers should always stay out of the danger zone of the machine. Do not climb on to the machine. Drivers should be suitably trained. If a person wishes to speak to the driver, ensure that eye contact is made before approaching the machine.

Part (b)

Using an extension ladder.

Safety precautions to be observed when using an extension ladder during the construction of a house may include the following:

- ❑ Personal protective equipment should be used at all times on construction sites. This is mandatory.
- ❑ Ladders should be used to gain access and egress to and from a scaffold. Ladders should not be used as a point from which to carry out work. Never lean sideways from a ladder.
- ❑ Ladders should be put in place at the correct angle. The angle is 75° or 1 : 4. If the ladder is at too steep an angle there is the danger it may fall away from the wall. If the angle is too low there is the danger that the ladder will slip away from the wall or scaffolding.
- ❑ A ladder should extend up beyond the scaffold for a distance of 1m. This gives a clear projection of the top of the ladder above the platform. It is safer for working.
- ❑ The ladder should not be over extended. A lap of at least 4 rungs should be allowed when the extension is pushed out. This will ensure that a proper bond exists between the extensions. This will make it safer for person using it.
- ❑ Beware of overhead power lines. The danger of overhead power lines must always be a priority on a construction site. A ladder making contact with a power line can be fatal.
- ❑ Check ladders for any defects. Rungs and fittings should be in good condition. Timber ladders should be checked for damage and should not be painted. Defective ladders can lead to serious injury on a building site.
- ❑ The ladder should always be secured at the top. This will prevent any dangerous movement along or away from the scaffold.

Part (c) Visiting a construction site.

Safety precautions to be observed when visiting a construction site may include the following :

- ❑ Obey all mandatory signs displayed at the entrance to the site. The signs normally state that correct footwear, helmets and reflective jackets must be worn while on the site. These are simple but important points and should always be obeyed to help prevent accidents on building sites.
- ❑ Report to the site office. This is to ensure that the person in charge knows who is on the site at all times.
- ❑ Visitor should be accompanied on site. While visiting a site a person should be accompanied by someone in authority. This will ensure safety for the visitor. It is also safer from the contractor's point of view.
- ❑ When visiting a construction site a person should have attended a one-day training course as part of the Safe Pass Programme run by FAS. This is mandatory and very important. It helps create an awareness of the dangers that are part of all building sites whether big or small.
- ❑ A visitor should be aware of hazards on a building site. Persons should be aware of machinery moving and operating. The visitor should exercise care when on or near scaffold. Beware of work and loads overhead. Look out for open trenches and excavation. Extension cables are also a danger for visitor and workers.

Part (d) Slating a pitched roof.

One in five deaths on sites arise from roof work. Many of these accidents happen in the course of routine maintenance. Most can be prevented very simply. Take care always.

Safety precautions to be observed may include the following:

- ❑ Use personal protective equipment. Correct boots helmet and reflective jackets must be worn at all times.
- ❑ Suitable scaffolding erected to the correct standards by a competent person. Good scaffolding correctly erected is very important for all building and especially roofing. Scaffolding should be inspected by a competent person on a regular basis.
- ❑ Use proper roofing ladders or crawling boards where necessary. This leads to safer working on pitched roofs. The roof is a risky place to be. Care must be taken at all times
- ❑ Slate should not be cut on the roof. This operation is best carried out at ground level.
- ❑ Never work on a roof when the weather is windy or wet. It is dangerous to carry out slating when the roof is wet, as a person may slip or fall. When the weather is windy it is not safe to be on a roof.

Question No 9.

Details:

Marks.

Part (a).

Excavating a foundation trench.

Safety precaution 1.	4
Valid explanation 1.	2
Safety precaution 2.	4
Valid explanation 2.	2

Part (b).

Using an extension ladder.

Safety precaution 1.	4
Valid explanation 1.	3
Safety precaution 2.	4
Valid explanation 2.	3

Part (c).

Visiting a construction site.

Safety precaution 1.	4
Valid explanation 1.	2
Safety precaution 2.	4
Valid explanation 2.	2

Part (d).

Slating a roof.

Safety precaution 1.	4
Valid explanation 1.	2
Safety precaution 2.	4
Valid explanation 2.	2

Total Marks. =

50