AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA | DEPARTMENT OF EDUCATION AND SCIENCE

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Marking Schemes — *Leaving Certificate Examinations, 1999*

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LEAVING CERTIFICATE

CONSTRUCTION STUDIES

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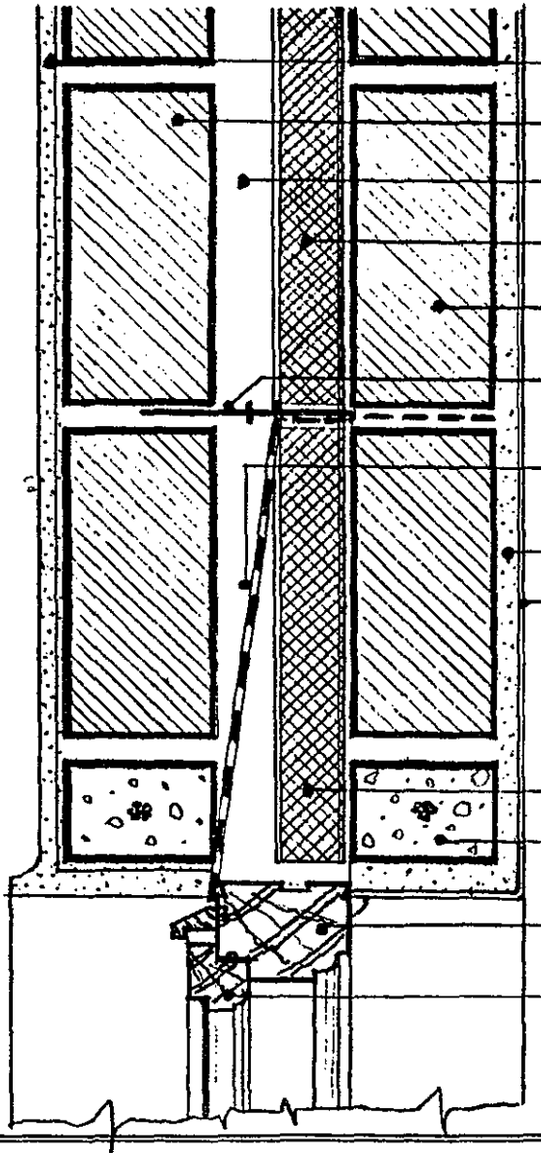
DETAIL AT LINTEL



EXTERNAL PLASTER 20 (2 COATS) 4

EXTERNAL CONC. BLOCK 100, 4" 4

CAVITY 44 4

AEROBORD INSULATION 56 5

INTERNAL CONC. BLOCK 100, 4" 4

AEROTIE 4

D.P.C. 5

SAND/CEMENT PLASTER 15 4

HARDWALL PLASTER 3-4

AEROBORD STUCK TO 4

PRESTRESSED LINTEL 100X70

WINDOW HEAD 4

SASH (OPENING OUT) 4

SCALE & MEASUREMENTS 4

2

ANY SKETCH OF A SYSTEM. 10 MARKS.

QUESTION 2

ANY 2 TYPES

Heating

Heating is a necessity in order to provide for the comfort, well-being and health of the family. The average temperature of the home should be between 14°C - 22°C.

Central Heating Systems:- Fuels for central heating systems include oil, solid fuel, and gas and electricity (electricity is not strictly a fuel but is included for convenience. The selection of the type of fuel is very much a personal one. All are expensive. Each fuel will have certain advantages over the others which inevitably help the consumer to make his or choice. 6

Oil Fired Boilers

Oil must be vaporised or atomised before it will burn, thus giving rise to two types of boilers:-

Vaporising boilers: Oil comes from the supple tank through a pipe to the bottom of a pot. Here the fuel is vaporised and burned. Air for combustion comes through holes in the side of the pot. The heat produced will heat water for both domestic hot water and for space heating. 9

Atomising boilers: The atomising burner forces the oil into a fine spray under high pressure. It then mixes with air and this mixture burns. Both boilers require a bulk storage of oil in a tank. They are completely automatic, and just need regular servicing. Time clocks and thermostats may be fitted and this enables use throughout the air.

Oil Fired Cookers:

These are basically the same construction as solid fuel cookers except an oil burner is placed in the fire box. The burner is fed from the main supply tank of oil.

Advantages of Oil

(1) An oil fired hot water system is fully automatic.
(2) Heat is instant: oil is an efficient fuel as there is very little waste. 5
(3) The individual Oil heaters can be moved from room to room.
(4) Oil is easy to store.

Disadvantages of Oil

(1) Oil burners are expensive to install because purpose built storage facilities must be provided.
(2) It is essential to use winter-grade oil during the winter months as otherwise it may turn waxy and clog up pipes when temperatures are under 0°C. 5

CONT.

(3) The portable oil heaters need very careful attention to reduce the risk of fire. They must be placed on level solid ground to prevent them being knocked over. Never move or refill a heater while it is still alight. Never leave it unattended when children are around. They must get regular cleaning to prevent unpleasant fumes.
(4) Regular maintenance is necessary, otherwise it is not efficient.

Solid Fuel

Various methods of heating with solid fuel – open fire, convector open fire, back boiler, solid fuel boilers and solid fuel cookers. 6

Solid Fuel Boilers

There two types of solid fuel boilers:-

(1) Hand Fired.
(2) Gravity fed or hopper fed. 9

The fuel in the hand fired boiler is fed through an opening at the top or in the front of the boiler. The fuel in the gravity fired boiler is fed from a hopper at the top of the boiler.

Advantages of Solid Fuel Systems

(1) They provide an attractive and cheerful feature in a room.
(2) They are probably the cheapest system to run
(3) They provide adequate ventilation due to chimney draughts. 5
(4) They do not dry the air.
(5) They can heat not only the room in which they are placed but also domestic hot water and other rooms by radiators.

Disadvantages of Solid Fuel Systems

(1) They are less efficient than other methods of heating.
(2) They require a large amount of fuel storage space.
(3) They require a lot of attention, cleaning and refuelling. 5
(4) They take a long time to build up heat.
(5) Solid fuel is dirty and creates a lot of dust.
(6) Fuels which are not smokeless, create pollution of the environment.

Electricity

Electricity provides a very large range of heating appliances. Two categories:
(1) Plug in heaters
(2) Night storage heating 6

Plug in heaters consist of Bar Fires, Infra Red Heaters, Fan Heaters, Connector Heaters, Oil Filled Radiator.

Night Storage Heating The main difference between plug in heaters and night storage heaters are:-

(1) Plug in heaters are normally portable: they give almost instant heat when connected to the electricity supply.
(2) Night Storage heaters are not portable. They are permanently connected to the electricity supply and are especially metered for payment at the off peak rate. 9

Under Floor Heating
Electric elements are embedded into concrete floors. This operates also on the cheap night rate electricity. It can only be used on solid floors. The system takes up no floor or wall space whatever.

Advantages of Electricity
(1) Heat is instant and very efficient, so there is no waste.
(2) It is very clean and involves no work.
(3) It is easy to control. 5
(4) Storage space is not required.
(5) It is silent in operation.
(6) No routine maintenance is necessary.

Disadvantages of Electricity
(1) It is expensive to run. 5
(2) It dries the air and reduces humidity.
(3) It is subject to power failure and cuts.

Gas
Gas is widely used for heating houses and water and for cooking. There are three types of gas which can be used:-

(1) Natural Gas. This gas is associated with Kinsale and is found under the sea bed. It is composed of a high percentage of methane. It is carried in gas main underground, and then enters a service pipe to each house where consumption is recorded in a meter. 6
(2) Coal Gas is produced by burning coal in the absence of air. The gas is cooled, purified and stored in large gas holders called gasometers. This gas is also piped to households.
(3) Bottled Gas is a mixture of butane and propane. It provides gas for heating and cooking even when there are no gas mains. Some of the large gas companies e.g. Calor Gas provide installations of large tanks. These tanks are filled periodically.

Gas Fired Boilers
When the boiler is switched on, a pilot light ignites the burners. These heat up water for domestic hot water and for central heating. The boiler has a thermostat, and when the temperature of the water is high enough, the burners go out until the water cools slightly. These boilers need a flue to get rid of excess gases. 9

Question 2 cont.

Advantages of Gas

(1) Heat is immediate once the appliance is switched on.
(2) It is very clean, involves no cleaning, and is easy to control.
(3) Storage facilities are not required (except for bottled gas) as natural gas is piped direct.

5

Disadvantages of Gas

(1) Flues are required when larger heat outputs are needed.
(2) Flueless heaters such as Super Sers should be used only in well ventilated rooms. Can lead to condensation problems.
(3) Gas leaks can occur. These can be very dangerous and lead to explosions.
(4) It has an unpleasant odour.
(5) Bottled gas cylinders are heavy and awkward for moving.
(6) It must be regularly maintained.

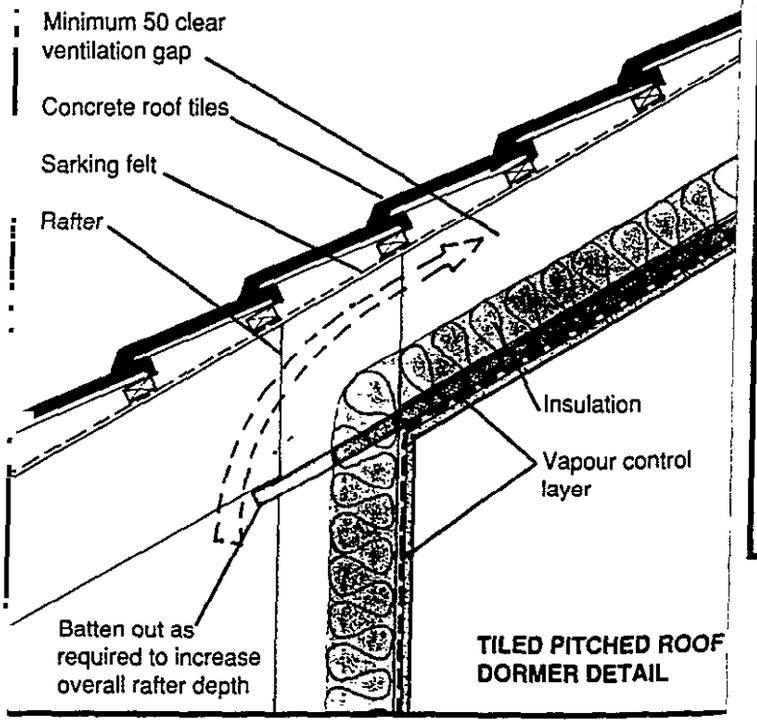
5

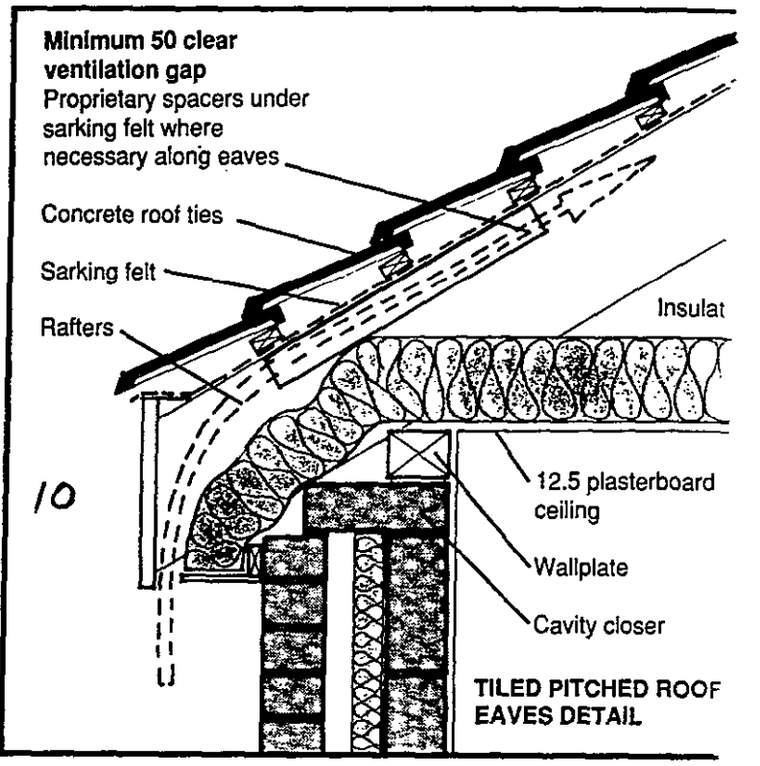
QUESTION 3

(a) To ensure a reasonable standard of comfort within a building, thermal insulation of roof, walls and floors is essential. This will reduce heat loss through roof, walls etc. and prevent excessive solar heat gains in hot weather. In practical thermal insulation is described as lagging, sound absorbent measures and substances as deadening. The conservation of heat in buildings has become more important in recent years because of the cost increase of all types of fuel.

10

Insulation material	Conductivity	Min. Thickn
Polyurethane board	0.022	77mm
Extruded polystyrene board	0.025	87mm
Expanded polystyrene board	0.037	129mr
Glass fibre quilt	0.040	139mr





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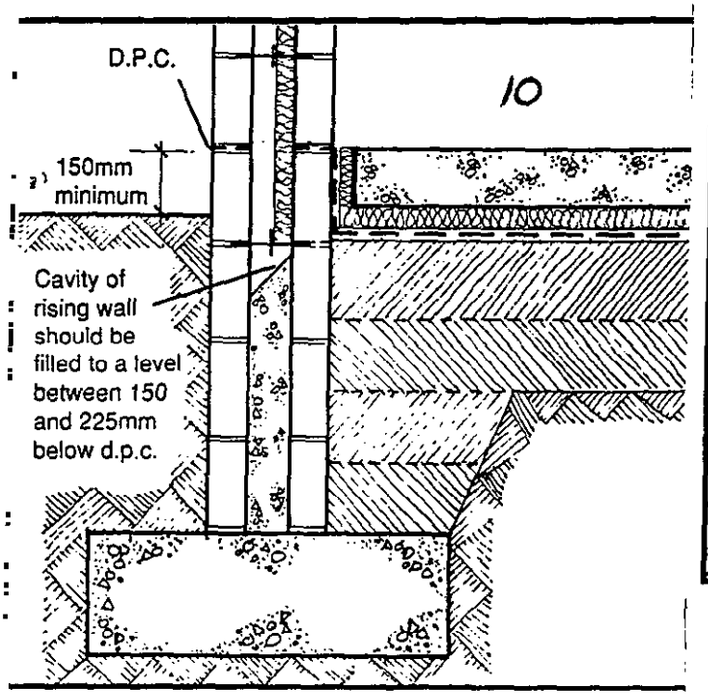

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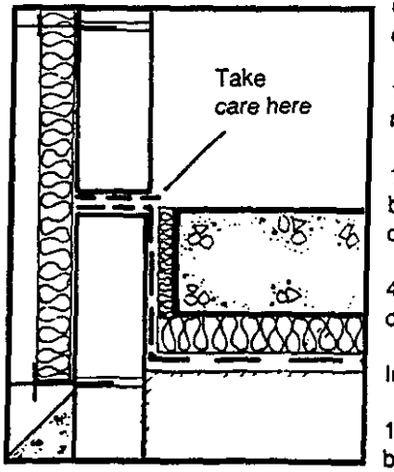

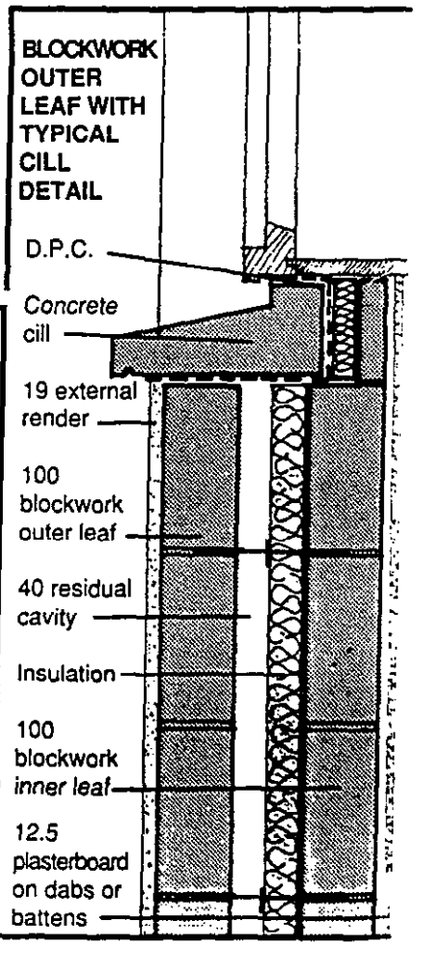

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(b) Main factors influencing the choice of thickness of insulation

(1) U Value: the lower the U value required, the greater the thickness of insulation must be inserted. 2

(2) Conductivity Value (K) of insulation material 2

The lower this value is for the insulation material, the greater is its insulation performance.

(3) Thickness:- The greater the thickness of insulation, the greater is the reduction of heat loss through it. 2

(4) Cost: This will increase with thickness of insulation. 2

(5) Space Required: (i.e.) Internal insulation such as dry lining will reduce the room space. Also in cavity wall construction there is only a limited space. 2

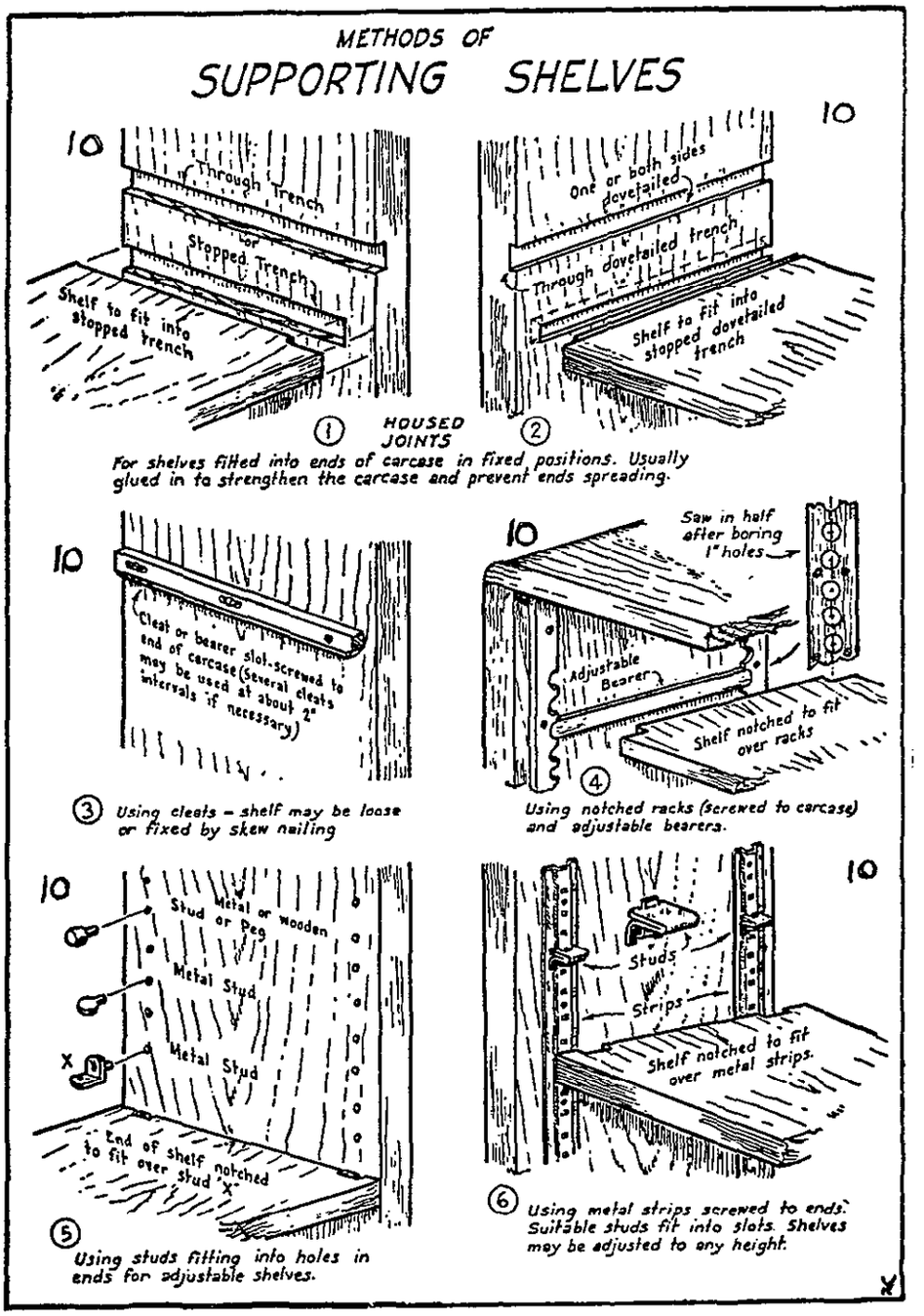
QUESTION 4

ANY 2 METHODS

(i) Permanent Shelves:

These are shelves, which are housed into end of carcass usually glued in to prevent ends spreading as in figure (I) and (ii) 10

Using cleats or bearer slot screwed to end of carcass shelve may be loose or skew nailed.



(ii) Adjustable Shelves:

(a) Using notched racks screwed to carcass and adjustable bearers, adjustable bearers to fit into notches on racks. Shelve notched to fit over racks as in figure (iv) 10

(b) Using studs fitting into holes in ends for adjustable shelves as in figure (v)

(c) Using steel proprietary strips as shown in fig (vi).

Advantages of adjustable shelves.

They can be easily removed for decoration etc. Being adjustable different sizes of books can be catered for, as they can be adjusted up or down. This shelving can be used in Libraries to great effect. 5

Advantages of Permanent Shelves

Very strong type of shelving; able to take heavy books. Less costly than adjustable shelves. 5

QUESTION 5

The usual paint system applied to unpainted timber surfaces consist of a primer, undercoat, and finish coat normally applied by brush. 2

Primer: Must adhere to the surface at all times and provide a foundation for the subsequent coats. However, in order to ensure that there is adequate adhesion, a certain amount of surface preparation is necessary. The timber must be sanded down to a smooth finish. Knots and resin may stain or bleed through if left untreated, but aluminium primer can prevent this action or alternatively two coats of a special knotting varnish can be applied. The primer colour should be compatible with subsequent coats. 8 8

After the primer has been applied and allowed to harden, any cracks indentations or nail holes should be stopped and filled with an appropriate filler, allowed to harden, sanded smooth and dusted off. 12

Undercoat: Undercoat can then be applied providing a protective coating and obliterating the original surface, colour. Any filling or stopping necessary should be completed and again the entire surface to be well sanded down. The colour of the undercoat should be slightly lighter or darker than that of the final or finishing coat. 12

Final Coat: The finishing or final coat provides the final surface texture and colour and is the most important coat in the defence against damage caused by weather, moisture or chemicals. 8

The gloss and eggshell finishes weather well without collecting dust and dirt to the same extent as the Matt finish.

QUESTION 6

The comfort of a floor surface depends partly on whether it is hard or soft, resilient or dead and partly on its thermal properties coupled with its dryness. Thermal properties are particularly important where people stand at work and where young children sit about and play on the floor. The floor surface also has a general effect on the warmth of a kitchen. Floor surfaces and shoes are the source of most impact noises in a building. This should influence the choice of floor finishes especially in the kitchen where the need for durability and ease of maintenance is great. 6

Slipperiness Slippery floor surfaces are a major cause of accidents in a kitchen. Resistance to slip can derive either from the frictional properties of the material (e.g.) cement based floors with non-slip aggregates) the frequency of joints (e.g. mosaic) or the slight indentation of the material under pressure from the foot (Soft floors such as cork. 8

Maintenance The effective life of most floor materials depends very much on how well they are cleaned and maintained. It is important to have a clear idea of what can be expected of the users in this respect before choosing a floor finish and to make sure that the user knows the correct cleaning treatment for the floor. 8

In general, concrete floor slabs and wood sub-floors are covered with wearing surfaces. When choosing any form of floor finish, consideration should be given to the following properties:- Appearance, durability, comfort, noiselessness, fire resistance, ease of cleaning and maintenance, and resistance to acid, alkali, grease, oil and dampness. Cost of course is also very important. Materials used for floor finishes may be divided into rigid and resilient types. 8

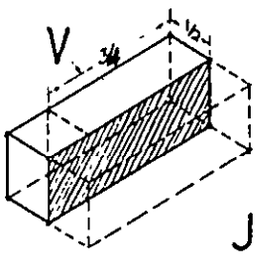
Rigid materials include concrete, terazzo, clay tile, marble, and flagstone. Resilient types include carpet, linoleum, cork tiles, rubber tile, vinyl plastic tile and wood.

(1) Cork Tiles: Compressed granulated cork bonded with natural bark resins under heat, very hard wearing, very resilient, quiet and warm, very good sound insulating properties. Surface is finished by fine sanding and wax polish. Cleaning is by sweeping and polishing. 10

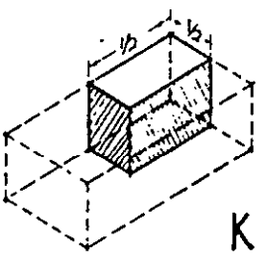
(2) Slate: Cut from natural material, mostly from North Wales, extremely hard-wearing. Rather cold hard and noisy, impervious to water but stained by oils. Combines good appearance with very hard wearing properties and minimum of upkeep. Cleaning is with warm clear water. Dirt cannot penetrate the surface. 10

QUESTION 7

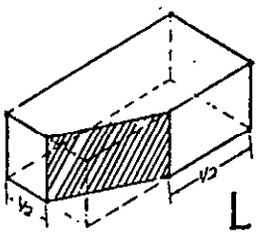
Where windows and door opening are formed in brick walls, it is necessary to use closers. King, Queen or bevelled closers or half, three-quarter or bevelled bats re employed in order to prevent continuous vertical joints and to obtain the correct face appearance. Any half bats and header queen closers are placed on the inner face at least 100mm from the sides of the openings in order to prevent their displacement and to provide a strong support for the ends of the lintels. 10



QUEEN CLOSER - HALF



QUEEN CLOSER - QUARTER



KING CLOSER

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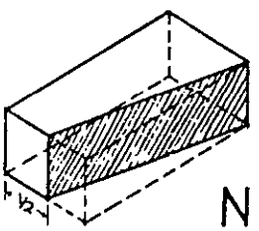
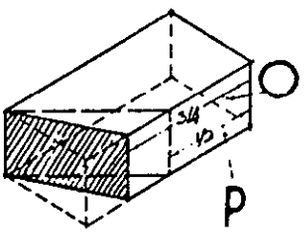


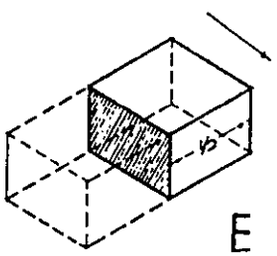
BEVELLED CLOSER



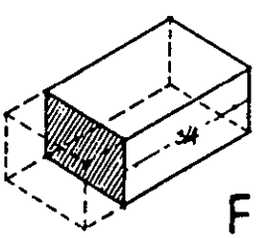
MITRED CLOSERS

Closer:- A portion of an ordinary brick with the cut made longitudinally and usually having one uncut stretcher face; seven forms are shown at J, K, L, N, O, P and V,

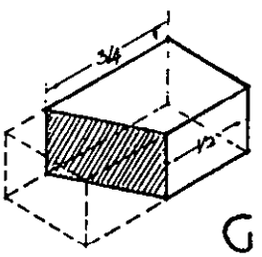
The Queen closer (J) is usually placed next to the first brick in a header course.
The King closer (L) formed by removing a corner and leaving half-header and half stretcher faces.
The Bevelled closer (N) has one stretcher face bevelled splayed or slanted.
Mitred Closers (O and P) are only used in exceptional cases as when the ends are required to be mitred (quoins of bay windows) 10



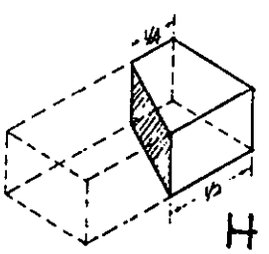
HALF BAT



THREE QUARTER BAT



BEVELLED BAT - LARGE



BEVELLED BAT - SMALL

10

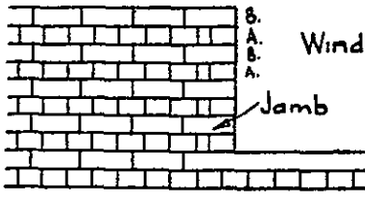
Bat: A portion of an ordinary brick with the cut made across the width of the brick; four different sizes are shown at E, F, G and H fig. 2.

Question 7 cont.

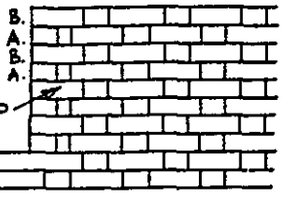
ANY 1 SKETCH

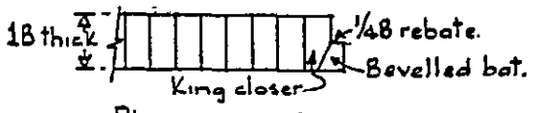
Bonding at Rebated Jambs.

English bond:

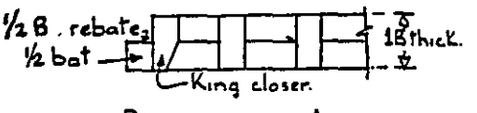


Flemish bond:





Plan course A.



Plan course A.

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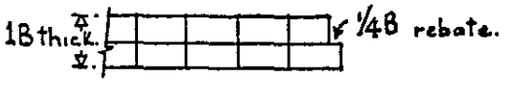

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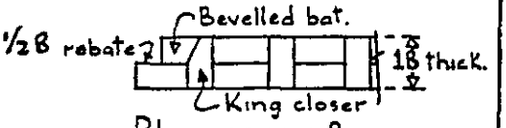

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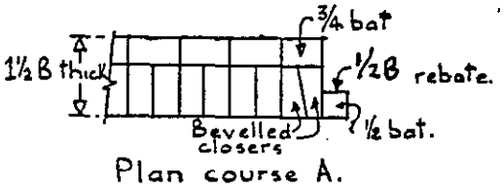

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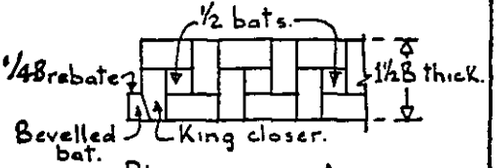

Plan course A.

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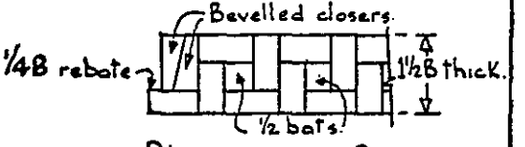
Plan course B.



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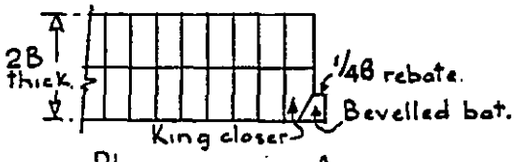

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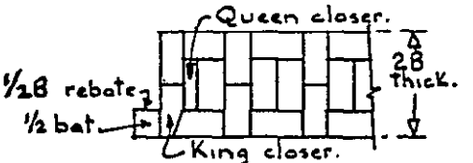

Plan course A.

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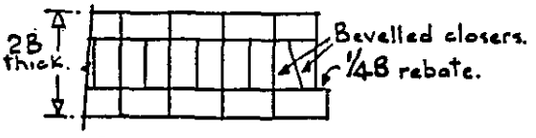

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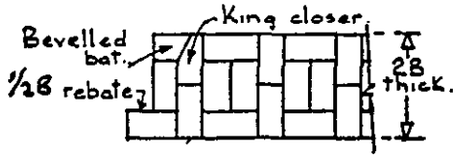


Plan course B.

QUESTION 8

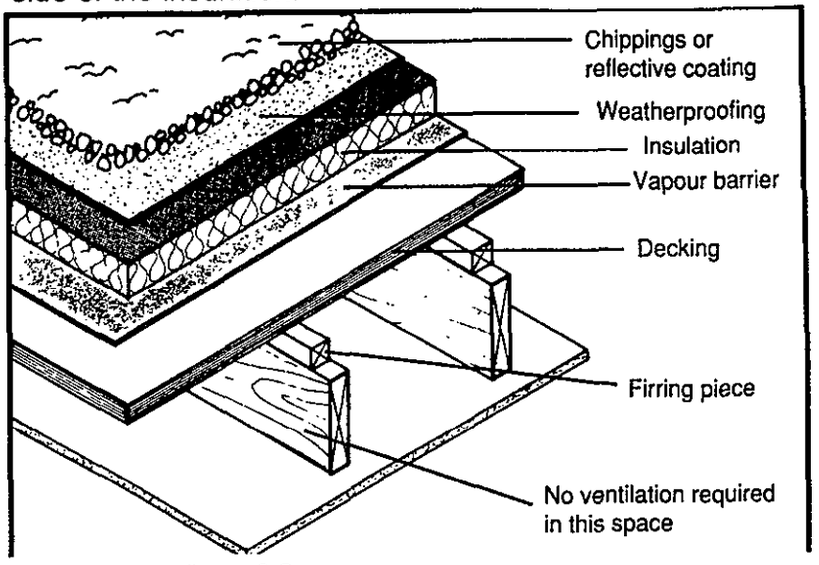
ANY FOUR

QUALITY OF SKETCHES 2 MARKS

(i) Vapour Barrier

A vapour barrier is used to prevent water from a heated space percolating into a thermal insulation material and wetting it, thereby reducing its effectiveness. 6

A vapour barrier can take several forms, eg. Polythene sheet, aluminium foil, mineral felt, gloss paint, ceramic tiles, etc. It should be placed on the heated side of the insulation.



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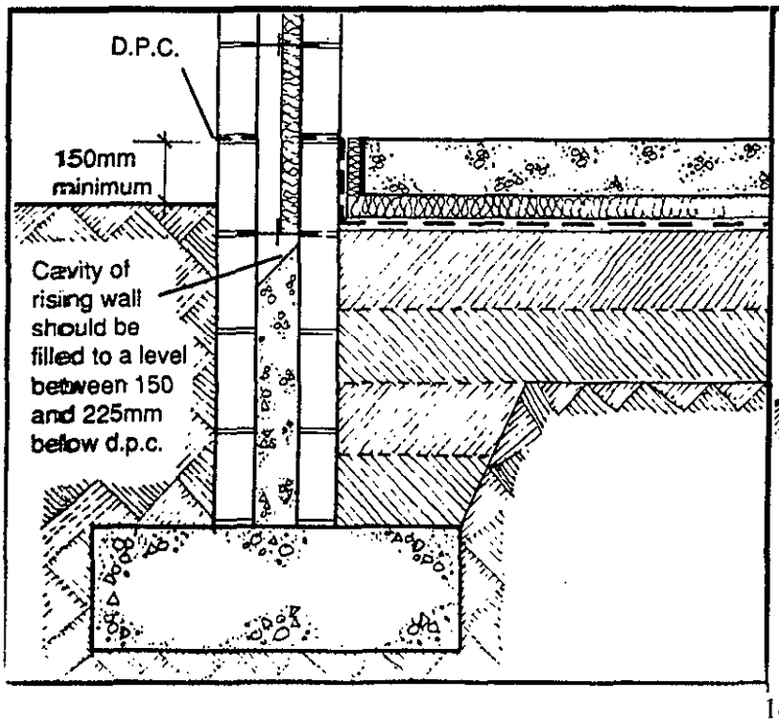
(ii) Damp Proof Course

These are layers of impervious materials incorporated into a structure at various places to prevent the passage of water. There are many materials suitable for use as D.P.C.s, the more common ones are:-

(a) Hessian, fibre and asbestos bases impregnated with bitumen.
(b) Polythene, (c) Pitch Polymer, (d) Mastic Asphalt, (e) Copper, (f) lead, (g) Slate, (h) Engineering Bricks.

6

D.P.C.'s are used in walls near ground level, under sills over lintels, at reveals of openings, in chimneys and parapet walls, also in floors where it is referred to as a damp proof membrane (D.P.M.).



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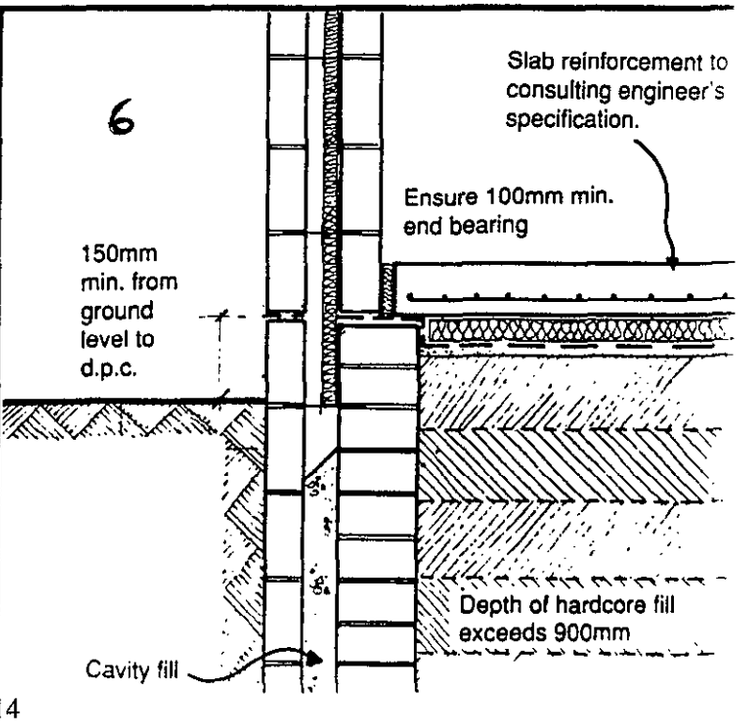
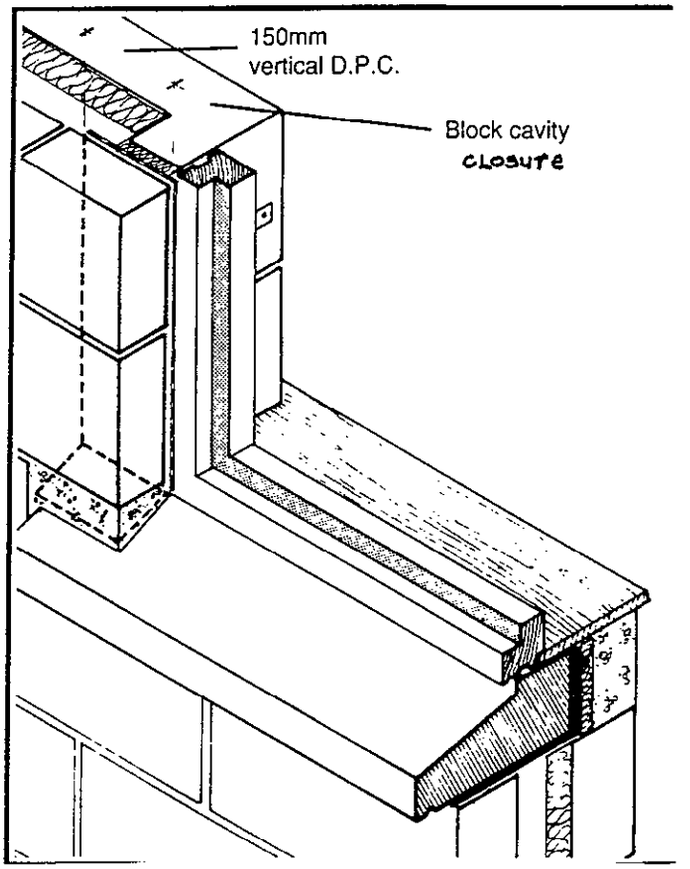


(iii) **Cavity Closure:-**

The width of the cavity must not be less than 50mm and not greater than 75mm. If the air in the cavity is kept static, the thermal resistance of the wall is increased. This is achieved by closing all openings that might contribute to the circulation of air in the cavity. The inclusion of an insulating material in the cavity will further increase the thermal resistance of the wall, therefore improving the U-value. 6



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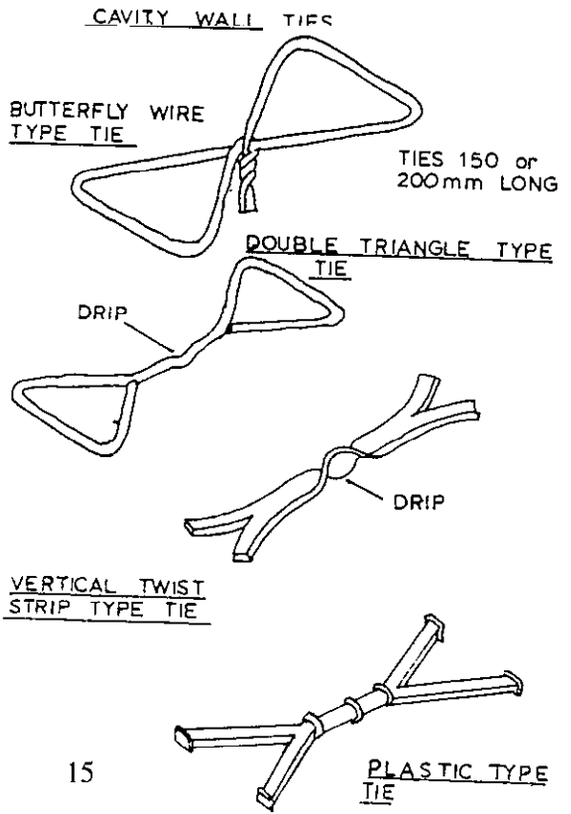
(iv) **Wall tie:-**

Wall ties are available in a number of materials and types. Ties may be made from wire, metal or polypropylene plastic, and are inserted every 900mm horizontally and 450mm vertically and staggered. Additional ties are used where openings occur. 6



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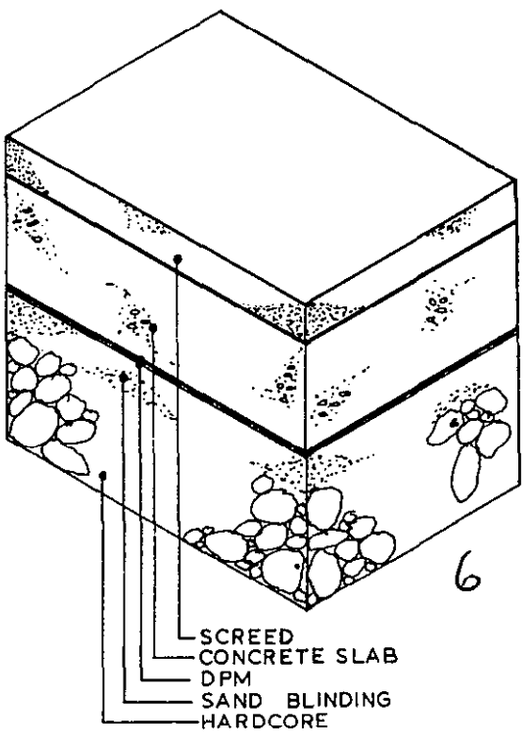
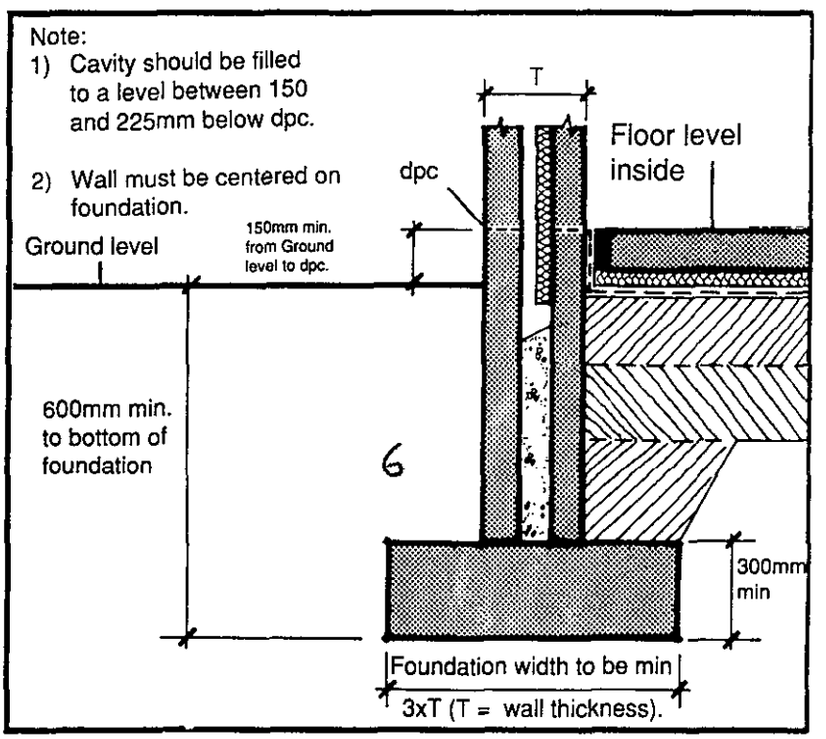
(v) Hardcore

Hardcore material should be crushed, graded stone free from shale 100mm size. Demolition material and site rubbish should not be used.

Excavated material must not be placed inside the line of perimeter walls. Hardcore must be consolidated in layers not exceeding 225mm in thickness. Depth of hardcore should not exceed 900mm except where a suspended floor is being used.

The top surface of the hardcore may be covered (blinded) with sand or building paper to prevent any of the concrete being forced through the hardcore or to prevent the damp proof membrane being damaged due to sharp edges in the filling.





(vi) Concrete Foundation

Most low rise buildings are constructed so that external walls carry the structural loads to the foundations. The loading is usually distributed evenly along the length of wall which in turn, is supported by a continuous concrete strip. The width and thicknesses of strip foundations are determined by regulation.

Depth: Minimum depth of foundation excavation below finished ground level to 600mm.

Width: Minimum width of foundation to be three times the thickness of wall it is supporting.

Thickness: Minimum concrete thickness to be 300mm.

These are minimum figures. Site conditions may dictate greater dimensions or special foundation design such as rafts, piles or foundations on rock, etc.

QUESTION 9

Inspection under the following headings: -

1. Roof
2. External Walls
3. Attic Space
4. All Interior Spaces
5. Kitchens & Bathrooms etc.
6. Connection and testing of services

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(1) Roof- Inspect to see if roof tiles or slate are complete – bedding mortar at verges, ridges, hips and valley free from cracks. No slipped tiles or slate. Chimneystack flashings are correctly installed. Fascias and Soffits need to be checked. Rainwater drainage to be inspected – gutters, brackets and stop ends to be checked.

4

(2) External Walls- Inspect brickwork and see that pointing is complete
Inspect rendering – any loose or hollow patches
Inspect downpipes and Waste pipes – replace if broken.
Inspect Overflow pipes; check so that overflows can be readily seen.
Check all window frames and doors.

4

(3) Attic Spaces- Check purlin ends, binders etc. are properly supported and built into masonry where required. If garage attached and under main roof, check that blockwork is made good up to roofline. Underfelt is complete and undamaged. Insulation is complete and to the required thickness. Inspect tank and pipe insulation in roof space.

4

(4) Interior Spaces- Inspect all ceilings, walls – plasterwork, windows, doors and frames, skirtings, architraves, floor decking if timber, services, fireplaces, cupboards, etc.

4

(5) Kitchens and bathrooms – Inspect all sanitary fittings, kitchen units, plumbing, drainage, electrical appliances, etc.

4

(6) Connection and Testing of Services – Inspect Mains connection to water, drainage, electricity. See that all drains are free of obstructions etc.

4

Problems:- (1) Water seeping in at eaves
(2) Some slate or tiles missing
(3) Flashing around chimney letting in water
(4) Water seeping in around window and door openings
(5) Timber floors near windows rotten – no D.P.C.'s under sill
(6) Plastering in bad condition letting in water.
(7) No D.P.C.'s in walls etc.

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