

DAMP PROOFING

DAMPNESS IN STRUCTURES

- Structural **dampness** is the presence of unwanted moisture in the structure of a building, either the result of intrusion from outside or condensation from within the structure.
- A high proportion of damp problems in buildings are caused by ambient climate dependent factors of condensation and rain penetration.



CAUSES OF DAMPNESS

Causes of Dampness

Bad quality of materials



- Bad quality of materials can absorb moisture
- **BAD BRICKS:** Inadequate burning or inferior material lead to highly porous bricks. Excess salts can lead to efflorescence. If bricks are porous, water in mortar joint is absorbed instantaneously which leads to formation of channels in joints, which make joints permeable
- **CEMENT CONCRETE BLOCKS, TERRACOTA BLOCKS:** channels can be created between joint and unit.
- **MORTAR:** mortar should be neither too fluid, nor too harsh. Fluid mixes causes channels of water and on drying leaves porous spaces.
- Examples: Poor quality stones, soft, sandy bricks, loamy mortar



Bad workmanship



- Wrong workmanship can lead to dampness
- Water can penetrate
 - If joints of masonry are not filled properly with mortar
 - If copings and joints are not made properly
 - If water and sanitary fittings are not fixed properly

Trees, creepers



- If vegetation grows in contact with walls and other parts of buildings, water can get soaked up
- Certain weeds can absorb rain water and transfer it to building.
- Water collected on leaves and branches of adjacent trees can fall on buildings

Causes of Dampness



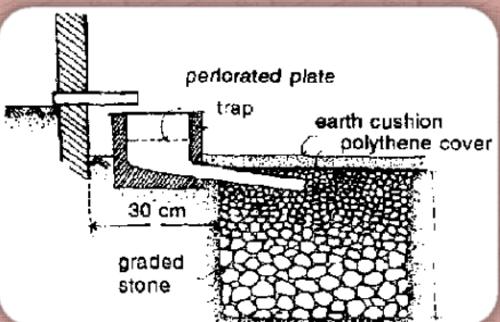
Earth banked against walls

- Earthen bank against a wall can allow water to rise in the wall.
- Soil retained must be provided below the water proof layer of wall



Defective Roof Gutters

- If waste pipes or gutters are leaking
- If joints of roof and walls not properly sealed
- Crack in roof



Soakage

- If waste water of building is not going in the public drain or sewer, soakage pits are used (as in septic tanks). If soak pits get near to building and become full, they can cause dampness

Causes of Dampness



Defective window frame and sill

- If window frame are not fixed properly, water can percolate through defective joints.
- If slope of sill is not correct, rain water can stagnate over the sill and cause dampness.



Splashing

- When the ground is paved around the building, rain water can get splashed on the wall.
- If broken gutter on the eaves above pours down water in streams, as the splashing is accentuates and wall will become saturated with water.



Defective parapet Wall

- If parapet wall is not protected from top, rain water will percolate in it.
- When outer walls are touching each other, there are open gaps, rain water can percolate

Causes of Dampness



Sloping grounds

- Proper slope of ground has to be provided specially in hilly slopes.

Condensation



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- Does not occur in Indian climate
- In cold countries, whole area of ceiling wall etc is directly effected by this
- Humidity in air in certain climatic conditions increase and reached its saturation point, and if at this stage temperature gets reduces, it becomes incapable of supporting burden and moisture immediately falls to ground, wall, roof etc.

Improper Orientation

- Due to improper orientation, sun rays to cannot reach inside buildings. No circulation of light and air can create dampness



Addition of water during construction

If water added for curing does not evaporate timely, it can cause dampness

Causes of Dampness



Expansion Joints

- Expansion joints should be treated and covered.



Defective Chajjas

- Chajjas without proper drain outlet causes stagnation of water over them.



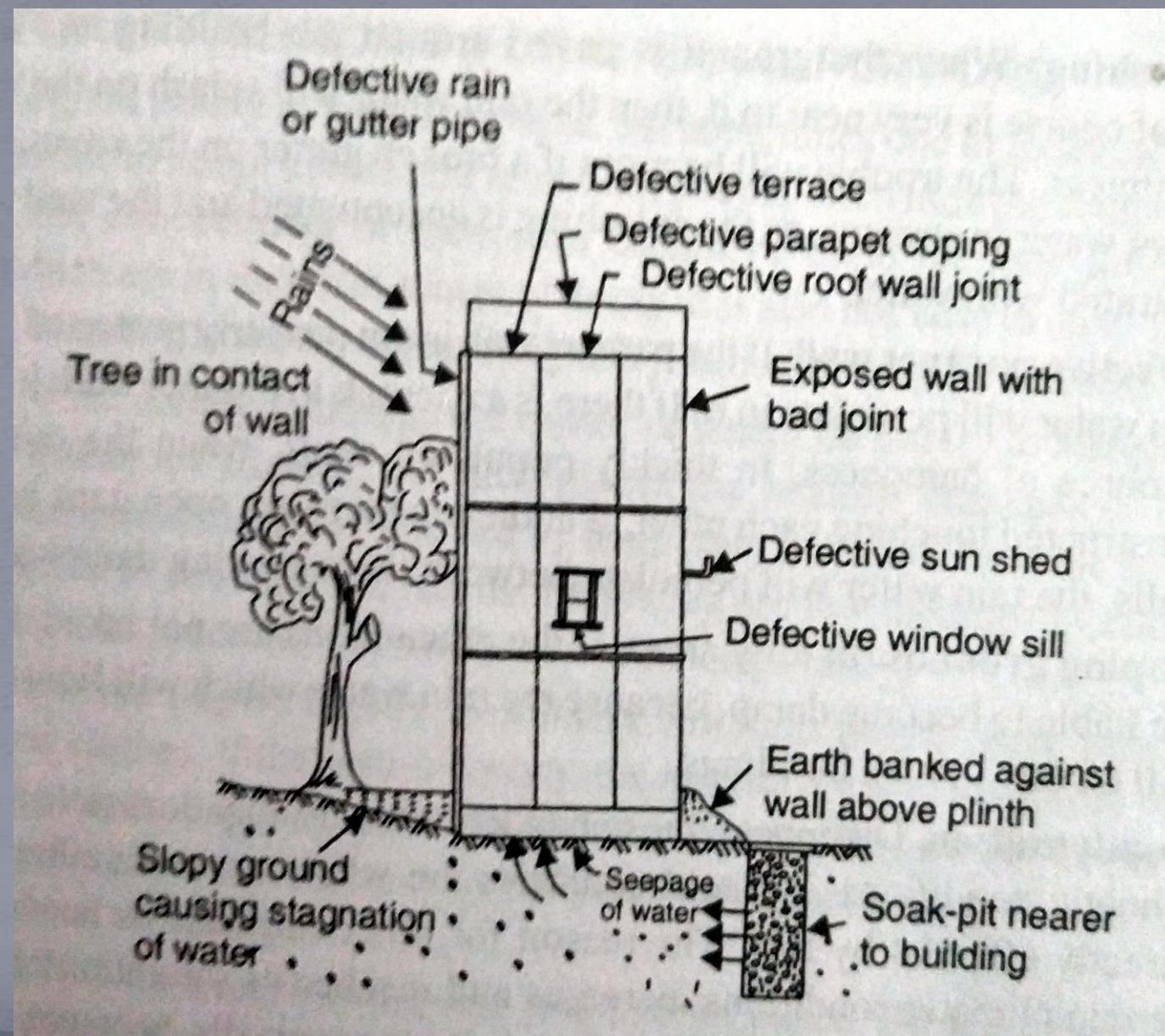
Breathing of walls

- Walls should be allowed to breathe. If both faces are plastered with water proof cement plaster or render, moisture inside the wall will be trapped



Overhead Water Storage Tanks

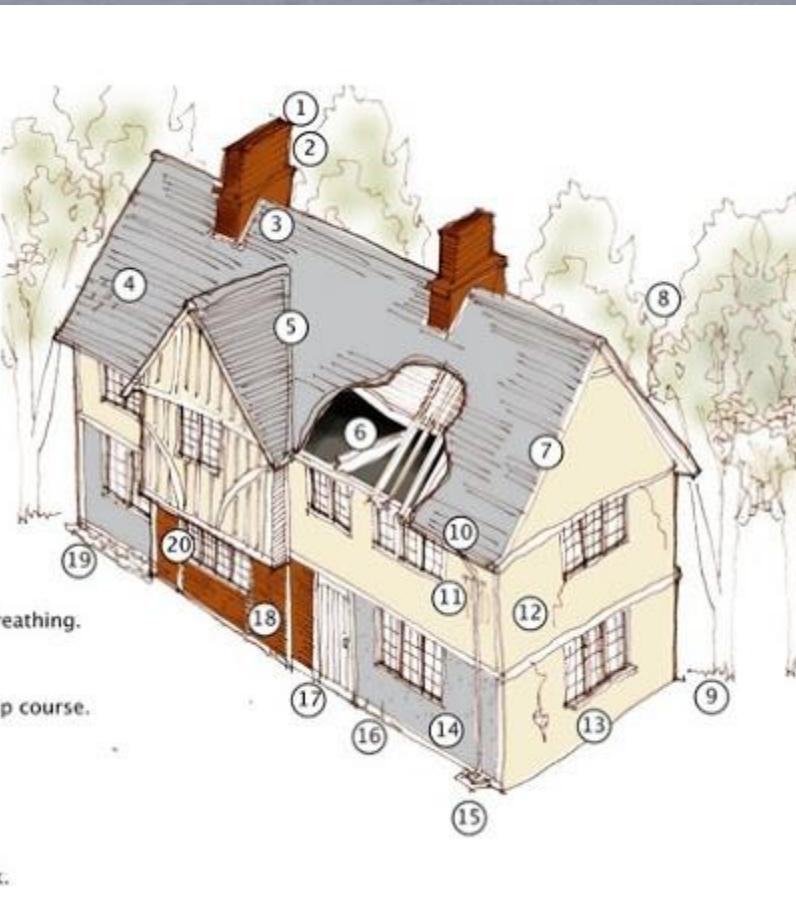
If not constructed properly, tanks causes dampness thorough supporting walls



Causes of dampness

20 KEY CAUSES OF DAMP

- ① Coping missing.
- ② Open joints in brickwork.
- ③ Cement mortar cracked, replace with lead.
- ④ Tiles lose or missing.
- ⑤ Defective or blocked valley.
- ⑥ Decayed bearings cause damaged purlins.
- ⑦ Verge tiles missing.
- ⑧ Leaves may block gutters.
- ⑨ Tree roots may damage foundations.
- ⑩ Damaged gutters.
- ⑪ Blocked or damaged rainwater pipe.
- ⑫ Hairline cracks in render.
- ⑬ Defective window cill.
- ⑭ Cement render preventing the wall from breathing.
- ⑮ Blocked gulleys.
- ⑯ Wallplate resting on ground without a damp course.
- ⑰ Floor below ground level.
- ⑱ Brick nogging require repointing.
- ⑲ Vegetation encouraging damp.
- ⑳ Timber frame decay at joint with brickwork.



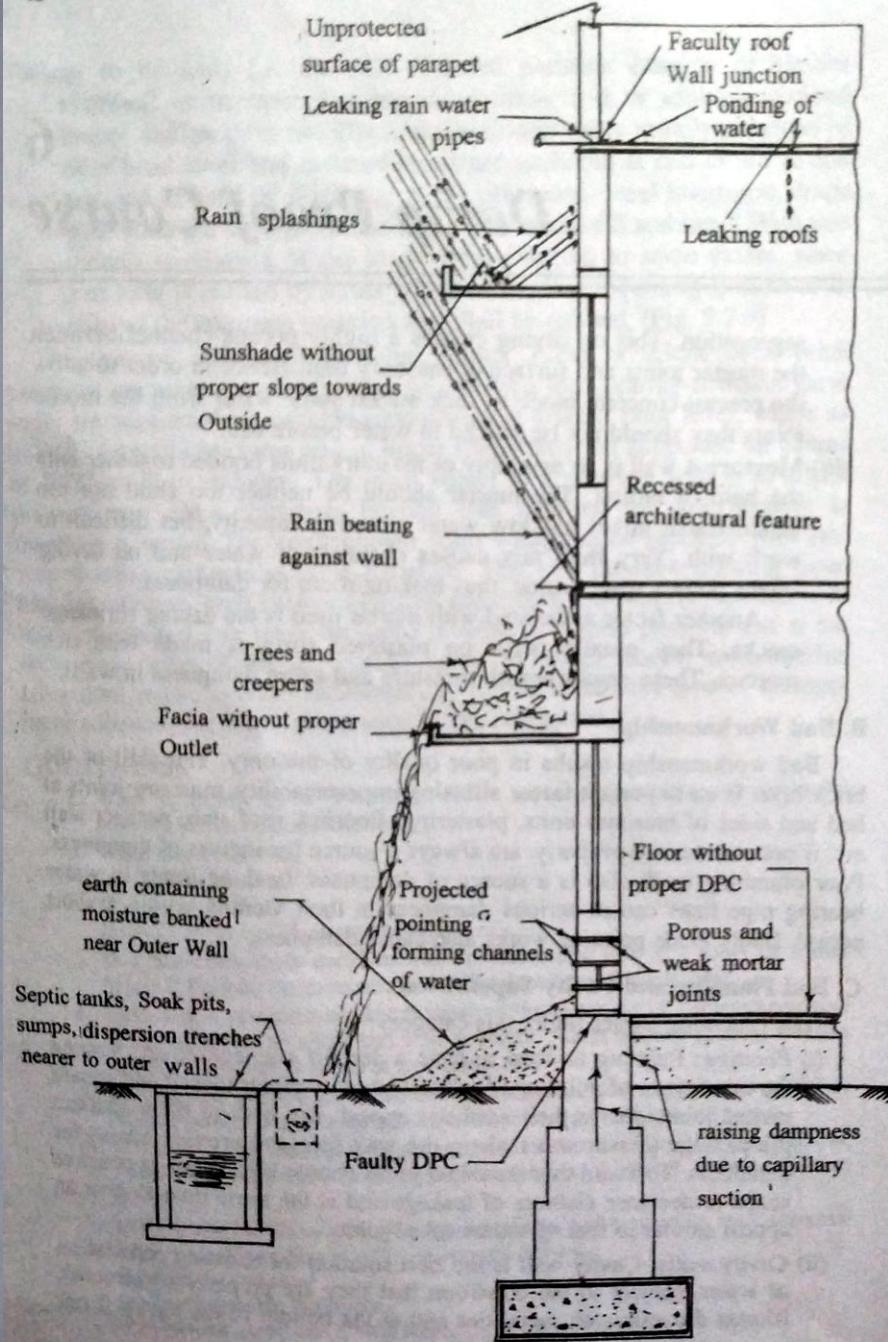


Fig. 6.1. Causes of Dampness

EFFECTS OF DAMPNESS

EFFECTS OF DAMPNESS

Disease/Unhealthy Condition

- Bacteria originate in damp humid conditions which can lead to tuberculosis, typhoid, cholera etc

Decay

- Continuous presence moisture can lead to decay and disintegration of bricks, stones, timber, steel etc.
- Moss and fungi can grow inside which lead to absorption of more water

Dry Rot

- Dry rot is a virulent fungus which originates in moisture and ill-ventilated situation. Timber can get reduced to powdery condition

Disintegration

- Dampness can cause disintegration of brickwork, tiles, stones etc. Pointing gets washed away leaving the joints open and unprotected. Plaster work softens and starts crumbling

Efflorescence

- These are large irregular shaped patches of whitish moulds formed on wall surface due to presence of moisture and various salts

Furnishings

- Dampness can cause destruction of carpets, pictures, clothes, furniture and other articles which come in contact with moisture.
- Doors and windows get swollen which leads to problem in closing and opening
- Drawers and cupboards also get swollen
- Metal finishing can get corroded
- White washed can get disfigured.
- Electrical fittings can start deteriorating
- Heavy currents in naked wires can lead to electric shocks and fire

Efficiency of Work

- Efficiency of occupants can get reduced due to suffocation and stale environment.
- People living in proper ventilated and moisture free environment feel fresh and active

Danger against Electric Shocks

- In damp walls or floors if a naked live electric wire comes in contact with the wet portion it is charged with electricity and may give shocks to inhabitants causing serious accidents.

REMEDIES OF DAMPNESS

TEMPORARY REMEDIES
PERMANENT REMEDIES

TEMPORARY REMEDIES

TEMPORARY REMEDIES (INTERNAL WALLS)

- BITUMINISED PAPER:

- Bituminised waterproof wall paper pasted on damped wall to prevent decay due to moisture
- Normal wallpaper can absorb moisture
- It is tough and partially non-absorbent
- This remedy has short life



TEMPORARY REMEDIES (INTERNAL WALLS)

- TIN FOIL:

- Tin foils are pasted with strong adhesive on the walls at damp portions.
- It is absolutely water proof and will totally prevent moisture.



TEMPORARY REMEDIES (INTERNAL WALLS)

- DAMP PROOF WHITE WASH:

- White wash of proper composition can make walls damp proof temporarily.
- Best whitening is soaked in 4.5 litre of boiling water until it can be beaten into semi-liquid consistency. 150 gm phosphate of soda is added to small quantity of boiling water. 300 gm white glue is added after dissolving in boiling water. All are stirred together to obtain smooth paste for white washing.



TEMPORARY REMEDIES (INTERNAL WALLS)

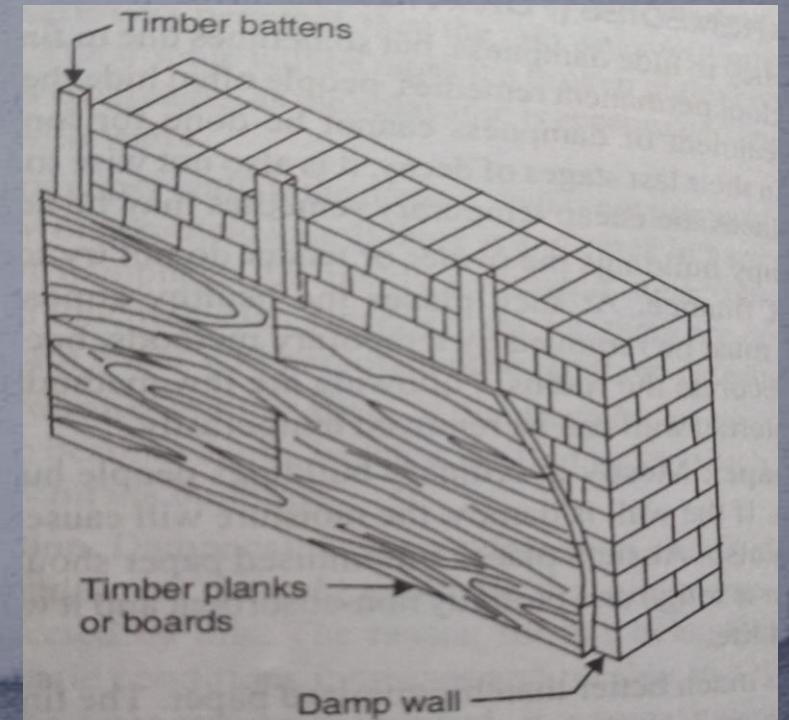
- WATER PROOFING SOLUTION:

- Water proofing solutions available in market are mixed with cement mortar before plastering or applied with the help of brush on damped surface.
- These solutions are of oily nature , so damp walls must be dried by air blower before applying

TEMPORARY REMEDIES (INTERNAL WALLS)

- WALL LINING:

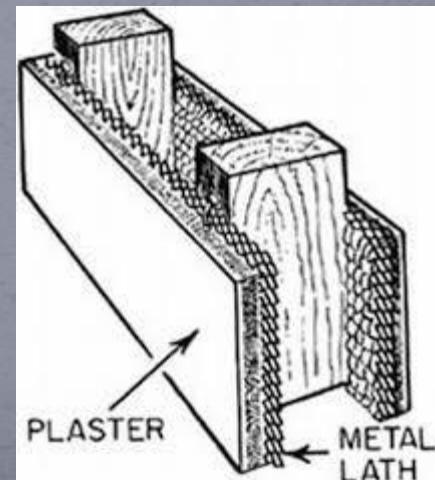
- Walls are covered with boards or planks fixed on timber framework.
- Lining materials can be AC Sheets, plywood, thermocole, hard board, GI Sheets, tiles.



TEMPORARY REMEDIES (INTERNAL WALLS)

- LATHES:

- Battens are fixed on the wall at about 30 cm apart, over which metal lathes are fixed which are then plastered by cement mortar



TEMPORARY REMEDIES (INTERNAL WALLS)

- CANVAS:

- Canvas is fixed on timber frame fixed to the wall.
- Cheap method
- After sometime, canvas becomes loose



TEMPORARY REMEDIES (INTERNAL WALLS)

- **GLAZED TILES:**

- Glazed tiles are fixed with walls by cement paste
- Suitable for bathrooms, kitchens, halls



TEMPORARY REMEDIES (EXTERNAL WALLS)

- WATER PROOFING SOLUTIONS:

- Required for protection from rain water
- Water proofing solution applied on exterior surface of wall
- Renewed every 3-4 years



TEMPORARY REMEDIES (EXTERNAL WALLS)

• WATER PROOF CEMENT WASHES:

- Colored cement washes are applied on the surface after dissolving them in water (SNOWCEM) and liquid paste is prepared
- Highly impermeable.
- Improves appearance also
- Three coats of liquid paste are done on the surface



TEMPORARY REMEDIES (EXTERNAL WALLS)

- LEAD PAINTS:

- Lead paints are applied on plastered walls.
- Improves appearance and makes damp proof
- Zinc paints can also be used



TEMPORARY REMEDIES (EXTERNAL WALLS)

- BOILED LINSEED OIL:

- Surface is completely dried.
- Boiled linseed oil is coated on the surface.
- 2-3 coats applied



TEMPORARY REMEDIES (EXTERNAL WALLS)

- PARRAFIN WAX:

- Paraffin wax is dissolved in kerosene oil.
- Mixture is applied on the surface.
- After application, kerosene oil evaporates.



PERMANENT REMEDIES

PERMANENT REMEDIES

- SURFACE TREATMENT:

- For areas having excess rainfall.
- Two types :
 - Pores of exposed walls and materials are filled by providing a thin film of water repellent material over the surface. water repellent materials are: sodium or potassium silicate, coaltar or bitumen, snowcem (waterproof cement), waxes, resins, linseed oils
 - Weather tiles, slates, corrugated GI Sheets are fixed on the wall which protect them from direct rain



PERMANENT REMEDIES

- INTEGRAL WATER-PROOFING:

- Materials like talc, fuller's earth, chalk are added to cement or concrete which makes them denser and moisture cannot pass through them.
- Calcium, sodium, ammonium stearates and oleates are also added to make concrete water repellent.
- These chemicals make materials water proof by reaction.
- Certain compounds are also available in market by trade names such as Impermo, Ironite, Water Lock, Dampro, Novoid etc.

PERMANENT REMEDIES

- **DAMP PROOF COURSE:**

- Water can penetrate through capillary action, unprotected parapets, bad workmanship etc.
- A layer of water repellent material is introduced while construction which act as barrier against travel of damp, called as Damp Proof Course.



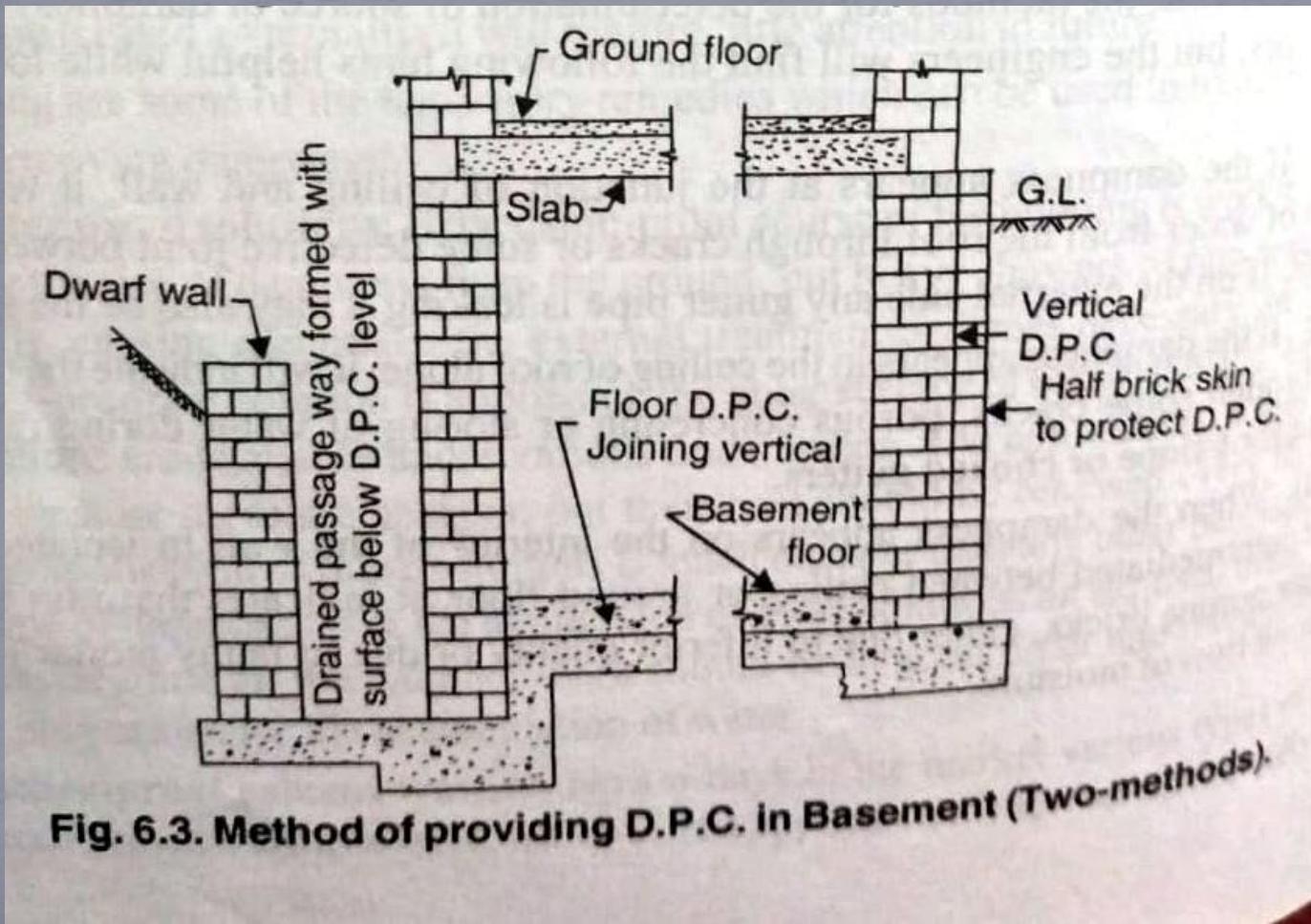
- REQUIREMENTS OF GOOD DPC:

- Totally impervious
- Durable
- Capable to bear load which will come over it without cracking or disintegration
- Prevent movement
- Economical and easy in laying
- Leak proof

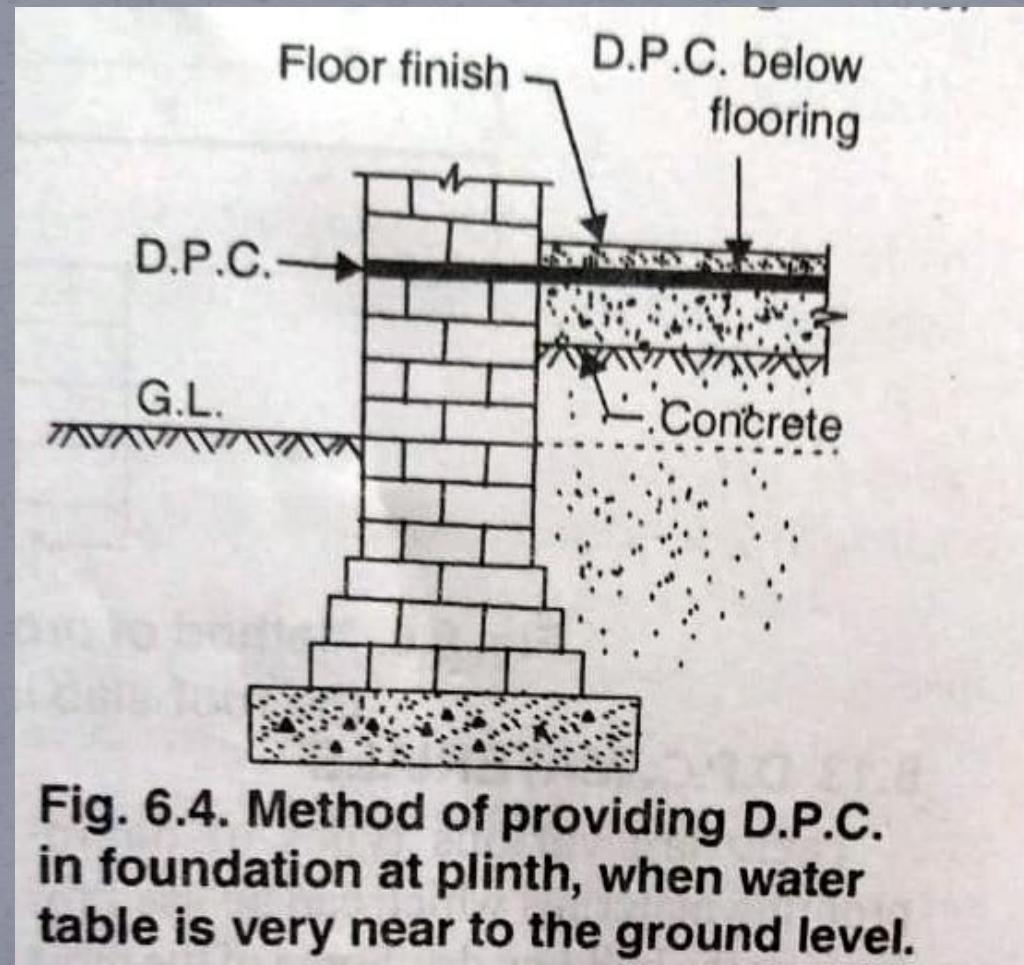
- DPC MATERIALS
 - STONES: Dense stones like granite provided in atleast two layers laid in rich cement mortar
 - SLATES: Provided in atleast two-three layers laid in rich cement mortar. Prevent movement of moisture.
 - SPECIAL BRICKS: Good quality compact bricks
 - CEMENT CONCRETE BLOCKS: If used at plinth level with cement mortar, acts a good DPC layer
 - DENSE CEMENT CONCRETE: Dense concrete used between source of dampness and concrete wall and pillar

- TERRACOTTA BLOCKS: Glazed terra-cotta blocks used as DPC. very brittle.
Generally not preferred
- HOLLOW TILES: Well burnt hollow tiles from very good quality of clay are good quality DPC material
- METAL SHEETS: copper, aluminum, lead, GI, stainless steel and alloy sheets glued with bitumen or other suitable cementing materials are laid as DPC
- PLASTIC SHEETS: Plastic or PVC sheets can be used as DPC. Non corrosive and durable.
- BITUMEN SHEETS: Used in hot molten condition. Cheap and good type of DPC

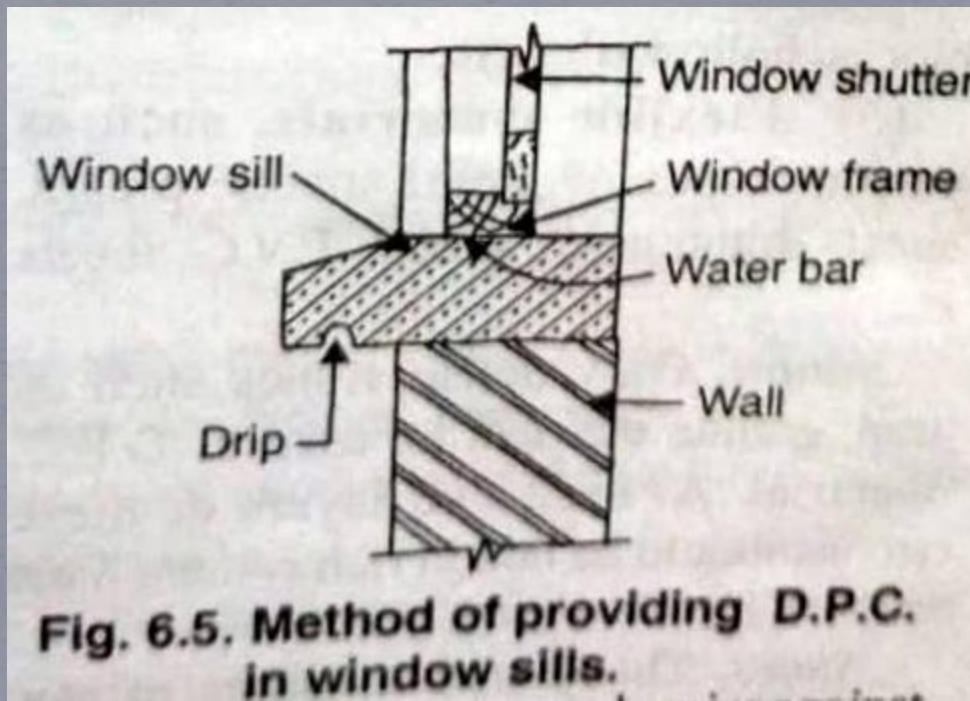
METHODS OF PROVIDING DPC



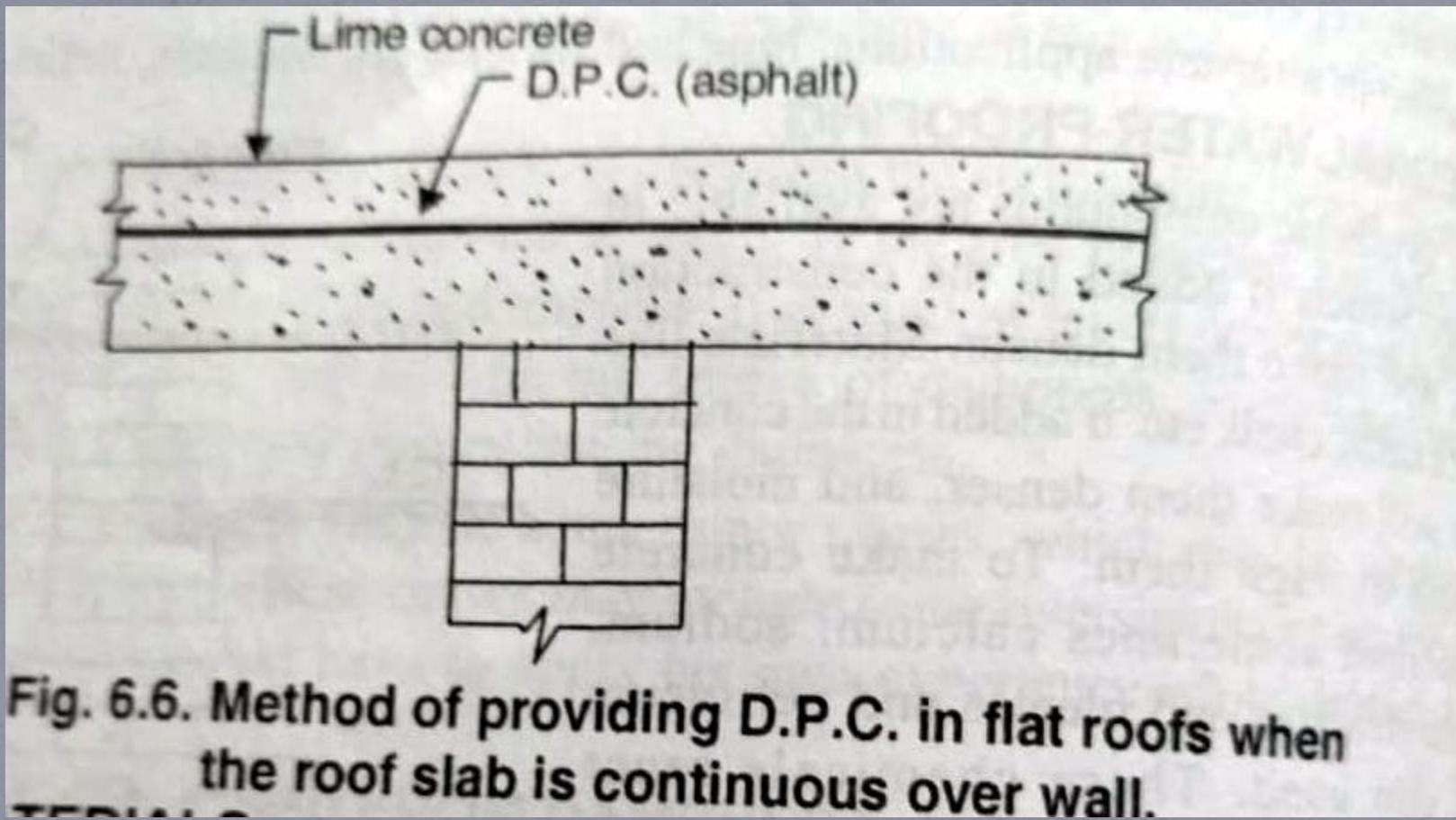
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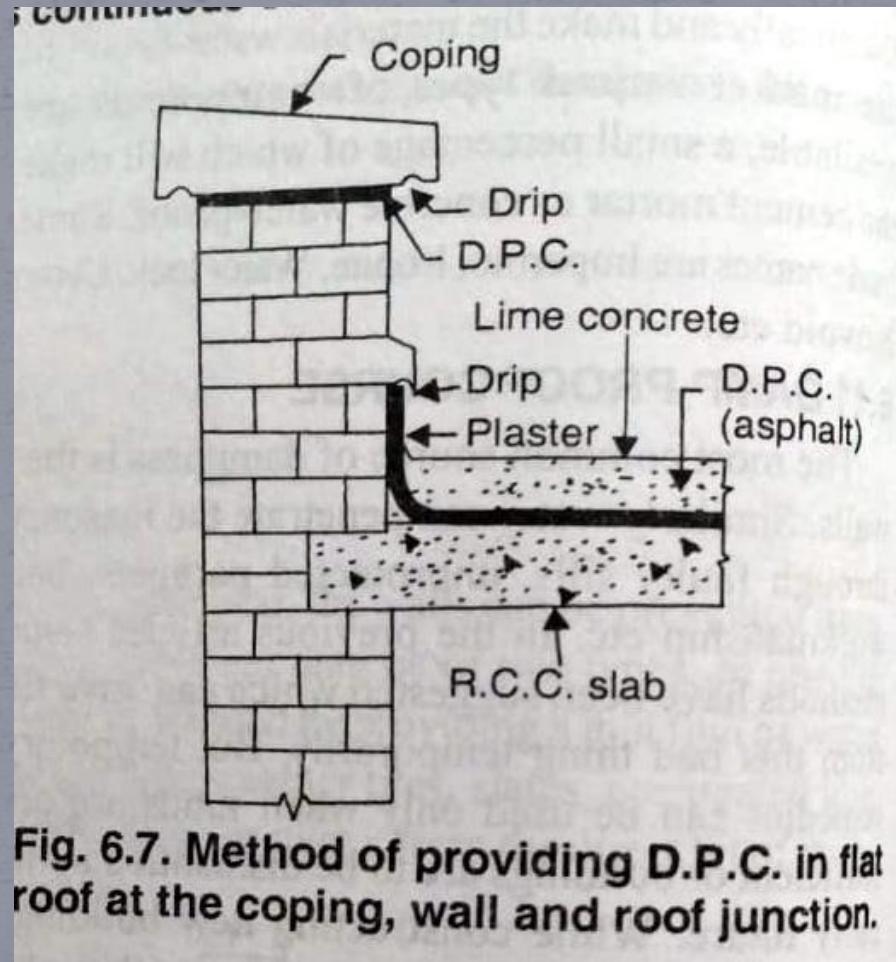
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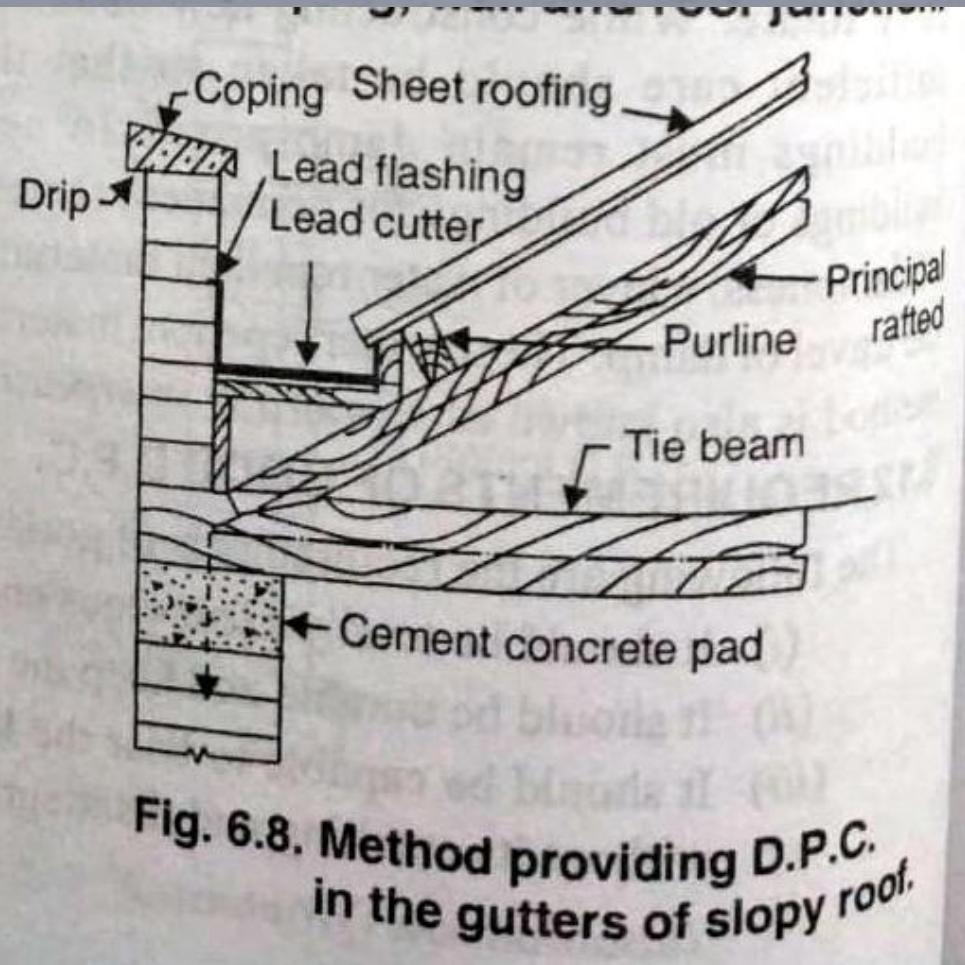
METHODS OF PROVIDING DPC



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METHODS OF PROVIDING DPC



STEPS FOR PROVIDING DPC

(A) Specifications for laying 38 mm thick D.P.C. with cement concrete 1 : 2 : 4 at plinth.

The various construction steps which are to be followed are as follows :

1st Step. Before providing D.P.C., the base of plinth should be thoroughly cleaned from all dust, projections, oily substances and other materials which may damage or decrease the efficiency of the D.P.C.

2nd Step. Side shuttering shall be fixed so that D.P.C. can be laid only in the required full thickness of the wall. The shuttering should be strong enough and should not get disturbed while laying and compacting D.P.C.

3rd Step. The required concrete of 1 : 2 : 4 shall be prepared of required workable consistency, laid and compacted in the shuttering in the required 38 mm. thickness.

4th Step. The laid concrete shall be cured for seven days. After curing the surface will be again dried and cleaned.

5th Step. Over-cleaned dry concrete hot bitumen shall be applied by means of brush in the specified quantity.

Note. [In place of bitumen or coal tar, in the beginning water proofing compounds can be added while preparing concrete].

(B) Specifications for giving water-proofing treatment on the flat roofs of multi-storeyed buildings.

1st Step. The top of the roof slab is coated with hot bitumen at 1.71 kg/m² surface of the roof.

2nd Step. Immediately after painting with hot bitumen, coarse sand is spread at the rate of 0.6 cubic metre per 100 sq. m of roof surface.

3rd Step. Over sand 15 cm. cinder concrete in the ratio of 1 : 15 (cement : cinder) are laid with proper slope.

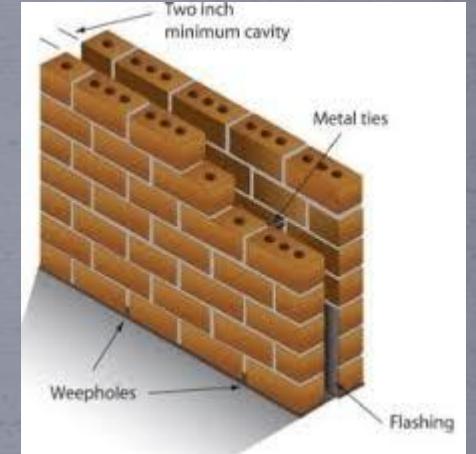
4th Step. 7.5 cm. thick lime terracing is done over the cinder concrete.

In some cases after second step 7.5 cm. mud puska is spread over which tile bricks are laid with cement mortar.

PERMANENT REMEDIES

- SPECIAL CONSTRUCTION METHODS:

- Hollow or cavity wall construction prevents transfer of water from exterior to interior
- Use of cement concrete blocks in place of bricks (CC blocks less absorbent)
- Use of glaze tiles in areas where water is being used frequently.
- Use of cornices, sills, large sunshades to prevent entry of rain water in openings.



PERMANENT REMEDIES

- **SPECIAL CONSTRUCTION METHODS:**

- Providing sufficient slopes on floor or roof so that water cannot stagnate
- Use of best quality sanitary and water fittings
- Proper construction of junctions of walls, roofs, parapet walls etc.
- Providing composite masonry walls . Superior impervious surface laid on outer face

