BUILDING DIGEST

CENTRAL BUILDING RESEARCH INSTITUTE, INDIA

DAMP PROOFING OF EXISTING BUILDINGS BY LATEX-SILICONATE

Introduction

Dampness in building spoils its interior decoration and external appearance and affects the health and comfort of occupants. It may be caused due to direct penetration of rain water or entry of water from other sources or by the capillary suction of ground-water through porous materials of walls and floors. Faulty design and use of poor materials of construction, cracks and failure to provide water-proofing are the causes of dampness of the first type. The latter type is known as the "rising dampness" and is caused when a damp-proof course (d.p.c.) has either not been provided or it has become ineffective.

The usual remedial measure to control rising dampness is to insert a d.p.c. after cutting the wall in stages at a mortar joint above the plinth level. In another method, a chemical d.p.c. is provided which obviates the necessity of cutting the wall. In this, holes are drilled in the mortar joint just above the floor at suitable intervals. A specially formulated chemical composition in the form of liquid is injected into the holes. The solution spreads into the masonry through the holes and forms a continuous horizontal damp-proof layer in the wall above the floor. This digest deals with the chemical method.

Materials Required

The damp proofing composition is a mixture of pore-blocking and water-repellent compounds and its essential ingredients are :

1. *Natural Rubber Latex*

It is a milky-white liquid containing rubber particles dispersed in water in the emulsified form. Since natural rubber latex undergoes acid putrefaction during storage and forms clots, it is preserved with liquor ammonia. It should be stored in a cool place and a periodic check of the presence of ammonia should be carried out by smelling. If needed, small amounts of ammonia may be added from time to time.

2. *Sodium Methyl Siliconate*

It is available as an aqueous solution of silicone resin prepared by the digestion of the resin in sodium hydroxide solution. As it contains appreciable amount of caustic soda, its contact with skin should be avoided.

Preparation of the Damp-Proofing Composition

The composition is prepared on the spot from the two solutions mentioned earlier. Both the solutions are diluted with water before mixing in suitable proportions so that the final composition contains 9 percent rubber and 3 percent siliconate solids. For preparing 10 kg of the composition, the following quantities are required :

Sodium methyl siliconate (30 percent concentration)	1.0 kg
Rubber latex (60 percent concentration)	1.5 kg
Water	7.5 kg

The rubber latex is diluted with nearly half the total amount of water to be used. The remaining water is added to the siliconate solution. The two solutions are intermixed by pouring siliconate into the latex in small quantities at a time with constant stirring. Any scum appearing over the surface of the mixture is removed, preferably by filtration through a piece of muslin cloth. The pot-life of the composition is about 8 to 10 hours. It is suitable for normal use on moderately damp masonry. In a dripping wet condition of the wall, the concentration of the liquid is raised to 11 percent rubber and 4 percent siliconate solids.

Injection of the Damp-Proofing Composition

A horizontal mortar joint just above the floor is selected and sufficient plaster over it is removed in order to expose it along the length. Marks are put on it at regular intervals of 8 to 10 cm throughout its length and holes of 19 mm dia. are then drilled over these marks (Fig. 1) to reach upto within 2 to 4 cm of the other face of the wall. In case the hole goes right

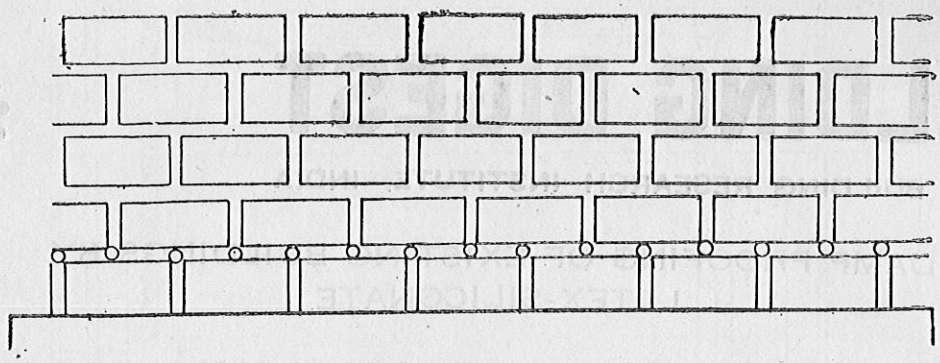


Fig. 1 Wall showing holes drilled at 10 cm distance in a mortar joint above the floor level

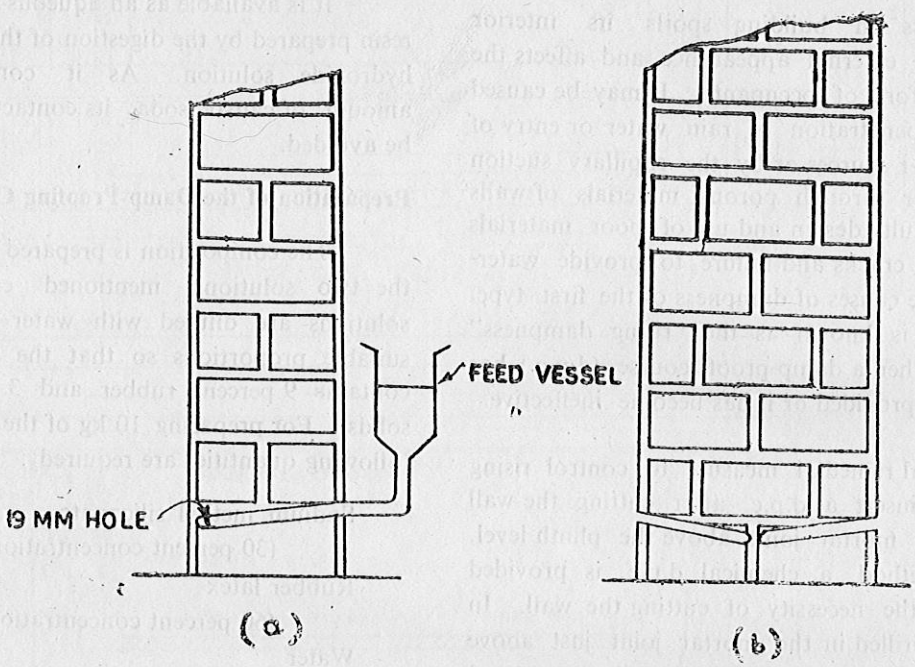
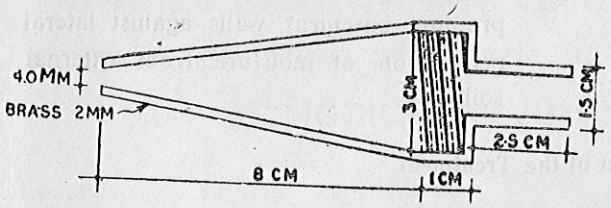


Fig. 2 Wall thickness with one side inclined hole (a) and both side holes if the thickness is more than 34 cm (b)

through the wall, its mouth should be plugged on the other side with cement or plaster of paris before injecting the liquid. If the total thickness of the wall is more than 34 cm, holes may be drilled from both sides so that they do not meet and at least 3 to 5 cm of wall separates their ends (Fig. 2b). The drilling can be done by means of a 19 mm carbide-tipped masonry drill. If the required length is not available, an extra length of mild steel rod of the same diameter may be added to the drill.

The damp-proofing liquid is injected into the holes under pressure. The liquid is contained in an airtight vessel of about 20 litre capacity, similar to that used in the spraying of paints. Compressed air at a pressure of 5 to 7 kg/cm^2 is introduced into the vessel and the liquid is forced out through a rubber tube to which a tapered nozzle is attached (Fig. 3 a). Before injecting the liquid, a piece of pressure rubber tubing about 3 cm long and of external diameter 19 such that it projects out of the hole by about 1 cm. While delivering the liquid, the nozzle is pressed into the rubber piece (Fig. 3 b) which not only checks the leakage of the liquid from the hole but also facilitates the recovery of the excess liquid coming out after the nozzle is withdrawn. The rubber tube is removed after every injection and used in the next hole. The liquid-feed into the hole is continued till the masonry around the hole gets saturated. In the absence of a pressure set-up, the alternative is to feed the liquid into the holes under gravity. The treatment is slow and time-consuming. Arrangement of this set-up is shown in Fig 4. Several feed vessels are fixed into the holes at a time. Delivery end of the vessel is inserted to about 2 cm inside the hole. The void between the vessel pipe and the hole is sealed by plaster of paris or plastic putty. Depending upon the suction of the wall, the liquid is maintained in the vessel for 2 to 8



Tapered nozzle
Fig. 3 (a)

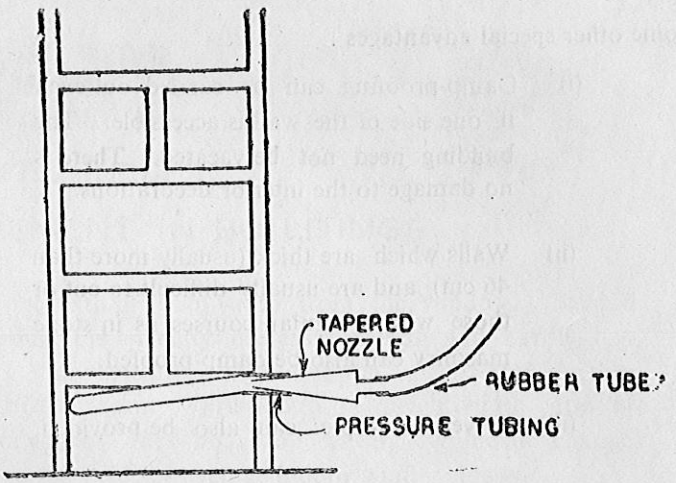


Fig. 3 (b)

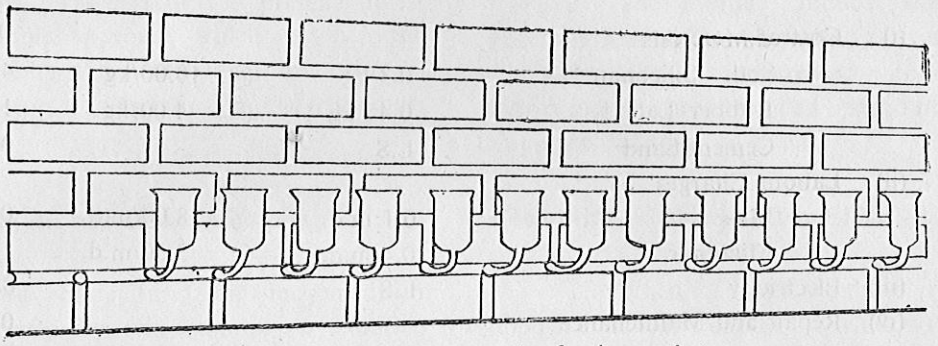


Fig. 4 Latex-siliconate treatment by feed vessels in progress

back-filled by rodding in semi-dry cement-sand mortar (1:4.). A coat of damp-proofing liquid is applied over the surface of the joint with a brush before the final repair with cement-sand plaster in the usual way.

The effectiveness of this treatment depends mainly on the extent to which the damp-proofing solution has spread horizontally into the mortar joint and has lost water by evaporation. The effect of siliconate increases with the degree of drying. Although it is difficult to ascertain complete spreading of the liquid in the mortar bed, a simple test may be carried out. In between two holes, a small test hole 5 cm deep and about 5 mm dia. should be drilled. When the liquid is injected into the main holes, its flow from the test hole will indicate its percolating to the side of the hole. If the liquid comes out of the hole too quickly, the latter should be closed and the feeding continued, as it shows that conditions for spreading exist inside. As regards drying, the evaporation of water from the walls is the only way to achieve it. As evaporation by natural means is the most practical method of drying, efforts should be made to subject the walls to maximum ventilation soon after the treatment. It is recommended that the latex siliconate treatment operations should be carried out after the rainy season is over, preferably in the beginning of summer. Artificial drying e.g. by blowing hot air from blowers together with proper ventilation can also be resorted to where necessary.

After carrying out the damp-proofing treatment, there is sometimes a need for the renewal of the old plaster above it specially if the latter is seriously affected by efflorescence. In such cases, the entire plaster should be removed at least upto 30 cm above the existing marks of dampness. The exposed brick work, before giving a fresh coat of plaster, should be kept open to atmosphere for sufficient time till it dries out by ventilation.

Chemical damp-proof course remedies rising dampness completely or reduces it to such an extent that it is not externally visible in the walls built in bricks or stone with cement or lime based mortars. The treatment has been found to be less effective for walls in mud mortar although appreciable reduction in dampness is effected there also. The time required for chemical treatment is much less than that for conventional methods. A three-room house of about 50 m running wall length can be treated in six days with the help of one mason (or skilled labourer) and four mazdoors by putting in two drilling machines in operation. Besides, there are

some other special advantages :

(i) Damp-proofing can be carried out even if one side of the wall is accessible. The building need not be vacated. There is no damage to the interior decorations.

(ii) Walls which are thick (usually more than 46 cm) and are usually difficult to cut or those with irregular courses as in stone masonry can also be damp-proofed.

(iii) A vertical d.p.c. can also be provided. This is usually needed in (a) isolating the walls from abutting structures if the latter are the sources of dampness and (b) damp-proofing basement walls against lateral penetration of moisture from external soil.

Cost of the Treatment

Estimated cost of the treatment for 1 m length of a 23 cm thick brick wall made in lime-surkhi or cement-sand masonry mortar is as follows :

				Rs.
(i)	Cost of Materials			
	Sod. Siliconate*	0.3 kg.	@ 16.00/kg	4.80
	Rubber Latex†	0.45 kg	@ 4.00/kg.	1.80
	Cement Sand	L.S.		0.50
(ii)	Labour Charges			
	Mason	0.1 m.d.	@ 8.00/m.d.	0.80
	Mazdoor	0.4 m.d.	@ 3.50/m.d.	1.40
(iii)	Electricity	L.S.		0.10
(iv)	Repair and Maintenance			0.10
(v)	Depreciation on Machinery			0.65
(vi)	Supervision and Overheads			0.20
			Total :	Rs. 10.35

*Sodium methyl siliconate can be obtained, amongst others, from :

1. M/s. Metro-ark Pvt. Ltd.,
   12, Dharamtalla Street, Calcutta–13.

†Rubber latex can be obtained, amongst others, from:

1. M/s. Heveatex Rubber Co.,
   Kottayam-2 (Kerala)
2. The Padinjarekara Agencies (Pvt.) Ltd.,
   P.O. Box No. 22,
   Kottayam–1 (Kerala)

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