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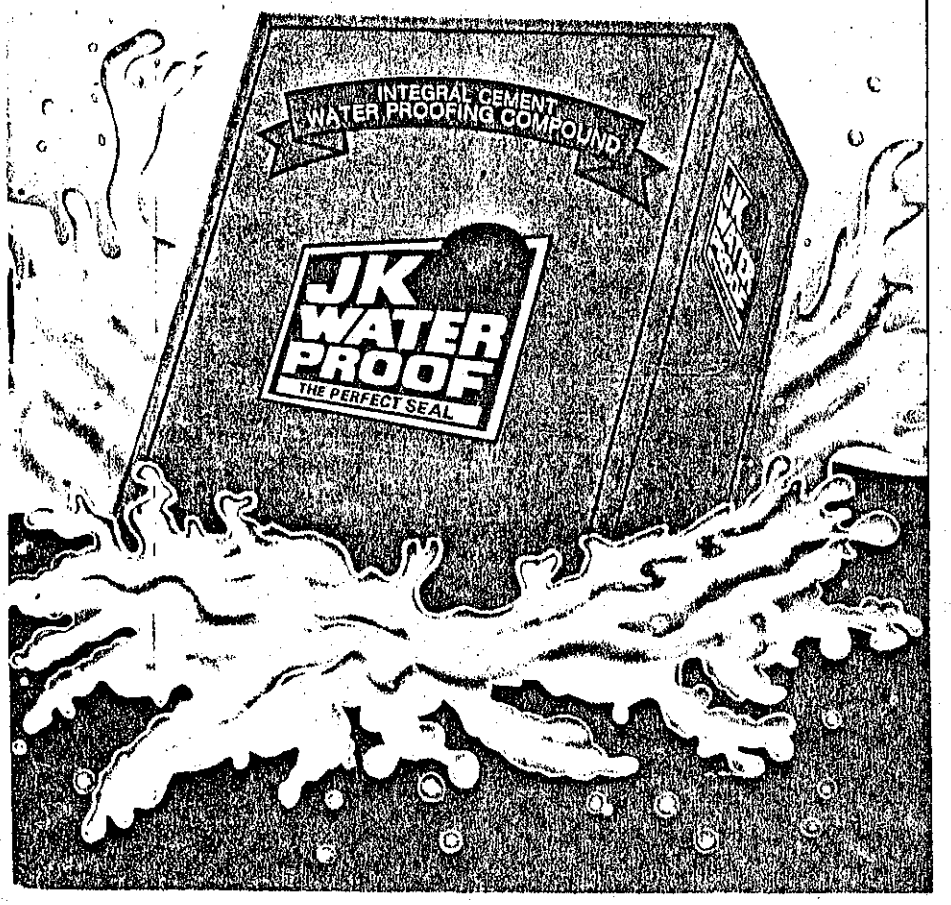
INTEGRAL CEMENT WATER PROOFING COMPOUND



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Waterproofing of buildings — Choice and selection of innovative materials and techniques

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Introduction :

Waterproofing has been an essential part in buildings, since the time construction technologies for buildings are known to exist. Waterproofing systems have been changing with time, which were dependent upon the locally available materials of waterproofing and the skill to use them. With the recent developments in the field of building materials and technologies a variety of new products for waterproofing have come in the market, each claiming its merits. In such a situation it becomes difficult for the users to select the proper material and technique to overcome the problem of dampness and seepage in buildings. Somehow the traditional methods of lime terracing, mud-phuska with clay tiles, tarfelt treatment and bituminous coatings etc. are slowly giving way to newly developed epoxy and polyurethane based coatings and sealants. A judicious selection of right type of treatment thus becomes a difficult task. An effort has been made to list out various factors which need consideration, before selecting proper material/technology for waterproofing of buildings.

Need for waterproofing :

Before tackling any problem and arriving at an appropriate solution it is utmost essential to know the basic reasons responsible for the problem. Probable reasons responsible for any leakage or dampness/seepage may be all or few of the following :

(a) Cracks in the structure
(b) Porosity of the structural member
(c) Capillarity of the member; and
(d) Weather conditions of the area where the structure exists.

Waterproofing is necessary to protect and check the ingress of water on account of any single factor or a combination of various factors mentioned above. As the causes of dampness differ from building to building and region to region, no universal methods can be applicable in all cases. Broadly speaking, sealants can be used for filling cracks, grouts and coatings can be suitable for fine cracks, heat reflecting coatings may be helpful in cases where cracks owe their occurrence to temperature variations, flexible sealants and coatings may prove useful where differential movements are high and integral compounds can help checking corrosion of steel reinforcement and reduction in shrinkages. Where dampness is related to capillary action, pore sealants and impervious barriers may be quite effective. Weather conditions are also to be considered while selecting waterproofing system.

Traditional practices of waterproofing :

Different practices had been in use in different regions of the country. The reason for adopting any particular practice in a particular region could be the local weather conditions and ease of availability of materials involved. In general the following practices have already been used in the country.

Mud-phuska with brick tiles :

Soil for mud-phuska should be good brick earth free from stones, kankar, grass roots not containing excessive clay or sand. Soil will be made damp by adding water atleast 12 hours before laying and turned over to break clods. The water for damping clay should be sufficient to achieve optimum moisture to achieve compaction with wooden rammers. The thickness of clay will be controlled to achieve slope for drainage of water. The mud-phuska (compacted clay) will be covered with mud plaster 25 mm thick, prepared by adding 35 kg. of bhusa (chopped straw) per cubic meter of clay, which is kept wet for a minimum period of 7 days after adding water and worked over with feet and spades to get a homogenous mass. After drying of mud plaster, the cracks appearing on surface will be filled with gobri leaping (50% sieved clay + 50% cow-dung added with water to make a paste). The surface after gobri leaping is then covered with brick-tiles leaving 12mm thick joints, grouted with cement sand mortar 1:3, and cured as per normal practice (Fig. 1).

Lime concrete terracing :

25 mm size brick aggregate with 50% by volume of lime (hydrated) and surkhi mortar is used for making concrete. The concrete is laid normally 10cm. thick on average to slope on the concrete slab, which is consolidated by continuously beating with wooden thappies for three to four days or till the mortar has set. During beating process the surface is liberally sprinkled with a mixture of gur and boiled solution of bael fruit. The surface is finally smoothed with a float or trowel to fine polish and cured as per normal practice. The minimum thickness of concrete especially near Khurras should not be less than 5 cm. (Fig. 1).

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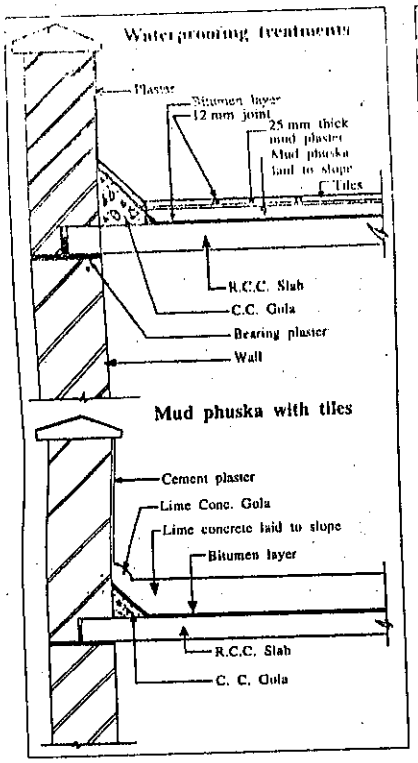

Fig. 1
Lime Conc. Terracing

Tarfelt treatment :

Self-finished felts of glass fibre base, vegetable or animal fibre base or hessian base are normally used in practice. They are laid on surface to be treated by using blown type bitumen 100 penetration for base coat and intermediate layers. Blown grade bitumen 85/25 can also be used for such treatment. The treatment is normally four course (bitumen, tarfelt, bitumen and gravel/coarse sand) or six course (bitumen, tarfelt, bitumen, tarfelt, bitumen and gravel/coarse sand) and normally bitumen consumption should be 1.45 kg/m^2 for each bitumen layer with the exception that consumption for intermediate bitumen coat in six course treatment will be 1.20 kg/m^2. Care should be taken that the gravel/coarse sand is sprinkled in sufficient quantity (8 to 6 dm^3/square meter of surface) to cover the area. (Fig. 2). Proper flashing should be used where necessary.

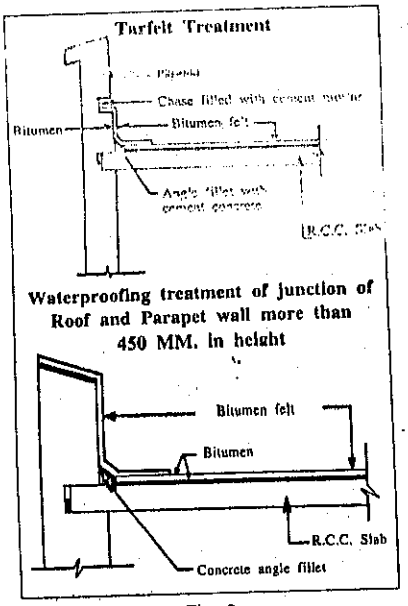

Fig. 2
Details for parapet below 450 M.M. in height

The effectiveness of these traditional techniques is getting poorer either due to deterioration in the quality of materials or the time involved in adoption of these techniques i.e. tamping of lime terraces involving beating of surface for compaction and slurry to come on surface to give an impervious layer and time involved for preparation of mud plaster a component of mud-phuska tile treatment. Tarfelt too has a limited life needing replacements at intervals. Hence the need was felt for new techniques which may by quick and less time-consuming.

Some of the drawbacks and limitations with traditional techniques are listed below :

Mud-phuska :

- ✓ Adds heavy loads
- ✓ Mud layer once saturated cannot withstand point loads
- ✓ Water entered in mud layer does not evaporate easily
- ✓ If infested with termite, hidden nesting takes place and remains unchecked.

Lime terracing :

- ✓ Adds to super imposed loads
- ✓ Beating of layer is a slow process
- ✓ [illegible]
- ✓ Interspacing of lime and surkhi not possible in small works
- ✓ Setting time much higher

Tarfelts :

- ✓ Low life 5 to 7 years
- ✓ Cannot be used for approachable terrace
- ✓ Defects below cannot be identified
- ✓ Black surface absorbs heat

Bitumen paints :

- ✓ Lose volatile oils and become flakey if exposed to weather
- ✓ Surface not fit for use
- ✓ Black colour absorbs heat and 4increases A.C. loads
- ✓ Specially trained labour is required.

Limitations in selection of treatment :

The causes for leakage/dampness is one factor which will decide and help in selection of treatment. Apart from the causes certain other factors limit the choice of waterproofing material/treatment. Other than from economy considerations against traditional practices, some of the factors which will help in deciding the treatment are :

- ☞ Whether it would be permissible to change the colour and texture of treatment surface.
- ☞ Whether the treatment needs protection from the effects of direct heat, abrasion and radiations etc.
- ☞ Whether the surface after treatment could be put for normal use or some restrictions need to

be imposed for direct use of treated surface.

- The life cycle of treatment for which it will remain effective.
- Cost of renewal of treatment if it has limited life of short duration.

The more the number of parameters needing consideration in selection, the more difficult it is to arrive at a decision. However, considering all points some treatment is finalised, which is judged as the best after all considerations on technical grounds.

A closer look at the newly developed materials which are available in the market would reveal that they are mostly organic materials based on bitumen, tar, epoxy, acrylic, polyurethane, rubber and similar polymeric compounds. Tar and bitumen based products are most popular so far on account of their low cost, but suffer from the inherent property of black colour and quick or easy degradation under the exposed conditions. Epoxy based products give strong usable surface and have high strength. Acrylic based products are also generally rigid and hard, whereas polyurethane based products are very durable, flexible and unaffected by common chemicals. They however emit toxic gases in the event of fire and at high temperatures. Most of the products except bituminous ones can be made transparent, translucent and in pleasant colors. They are normally costlier and are suitable for important works.

Inorganic products based on cement and silicon are also popular. Cement based products are used as an integral compound during construction or later on as a grouting or guniting admixture. Some of these compounds can also be used as coatings and waterproofing paints in different colours. Silicon has the property of repelling water and is used as a transparent coating and sometimes as an admixture for waterproofing purposes. The surface treated with silicon repels water coming in its contact, thus reducing the chances of water entering the body considerably.

For selection of an appropriate material/technique, the conditions of application like (a) working temperature, (b) conditions of surface to which it is to be applied (c) consistency of the product recommended for application, (d) integral compounds of the product, (e) using conditions for the coated surface, (f) curing time for the coating separately for each coat where more than one coat is recommended and change in colour of the existing surface and transparency of coating film, etc. need consideration for a particular situation and job. The product which satisfies most of the conditions as per manufacturer's recommendation is the most suited for use if there are no financial constraints which may compel for compromising, leading to selection of some other alternative. Following this approach the suitability of various products available in the market should be assessed, but before going in for the final selection, the component of labour involved in application in each case should also be considered to arrive at the complete cost when more than one product is short listed for selection and use.

Points favouring use of innovative techniques :

While considering the points which go in favour of switching over to the new materials over the traditional practices, they are :

- Good adhesion to the surface to be treated.
- Flexible to withstand expansion/ contraction of structures.
- Withstand severe atmospheric conditions.
- Resistant to ultraviolet rays of the sun.
- Resistant to normal abrasion.
- Do not add weight to the structures.
- Durable and easy to apply.

For application of epoxy/polyurethane coatings following steps may be followed, which are quite simple :

(i) Clean the surface with wire-brush and wash with water to make it dust-free.

(ii) Remove any existing treatment which has failed before cleaning.

(iii) Ensure that surface is bone-dry before application of treatment.

(iv) Round the junctions of slabs and walls if not done earlier (Fig. 3). This may be done with epoxy concrete to save time.

(v) If cracks and pot-holes are there in the surface to be treated, these should be properly sealed.

(vi) Take special care at the points

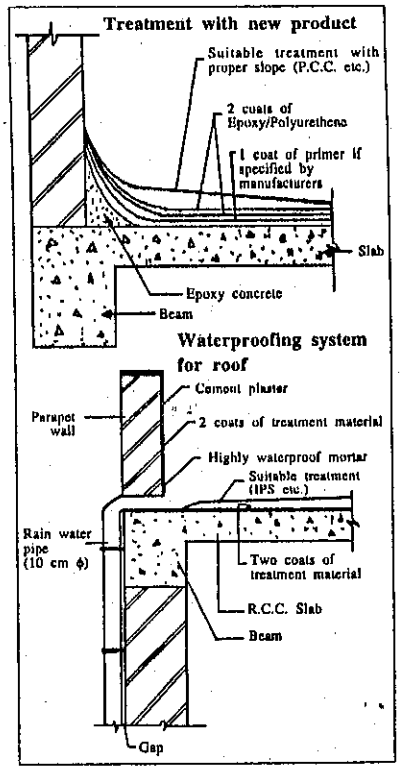

Fig. 3
Terrace waterproofing

where rain water pipes are provided (Fig. 3).

(vii) Apply treatment/coating as per recommendations of manufacturer whose product has been selected.

Conclusion :

As per the claims of the new product manufacturers, they are quite effective for waterproofing in buildings. Due to the difficulties being faced with the use of traditional practices there is no choice but to accept new products. Due care is necessary while selecting the treatment/material, involving various parameters for trouble-free service from the treated surface/component of the building. However there is a need to have a data-base of various new products for convenience of selection.

Acknowledgement :

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References :

1. Trade literature on waterproofing system of M/s. MC-Bauchemie (India) Private Ltd., Bombay.
2. Trade literature — OMIPLAS Waterproofing Coating of M/s. Om Agro Industrial Plastics Pvt. Ltd., Bombay.
3. C.P.W.D. specifications.

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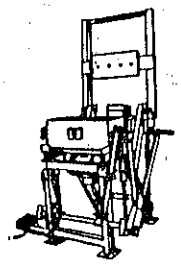

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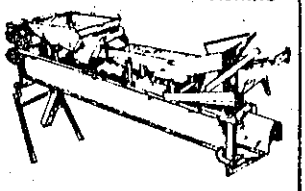

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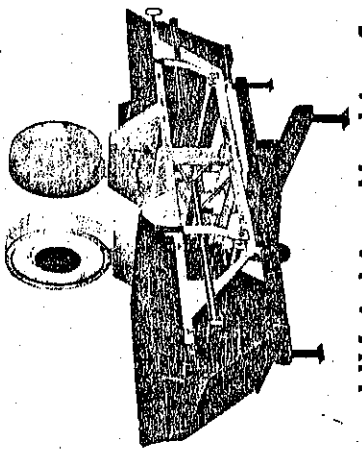

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