



## Building Maintenance

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With the continuous growth of the country's population the need for providing more and more number of dwellings at a comparatively lower cost and rapid rate was felt during the recent years. This requirement of enormous number of dwellings has already caught the attention of planners, designers and research workers. Steps are being taken to hasten the speed of construction through improved construction techniques and to curtail the cost by developing new and cheaper building materials. But the essential and long-term problem of building maintenance requires further attention.

The problem of maintenance is as challenging as those of design and construction but much has not been achieved in this direction though sufficient work has been done in the fields of design and construction of buildings. The generally accepted definition of maintenance is 'work undertaken in order to keep or restore every facility i.e. every part of a site, building and its contents to an acceptable standard'. The standard may be a functional relating to users' needs, structural, electrical or safety-related to safety aspects and preservation of the assets and their amenities in which the owner may be interested. The problem of maintenance is quite complex and will differ according to the variety, extent and complexity of the facilities involved. It is not possible to cover all the problems generally met in the maintenance of buildings and only a few like cracks in buildings in expansive soils, maintenance of wood work, metal work, cracks in plastered surfaces, cracks in RCC members, stains on concrete floors, efflorescence in brick work, dampness, termite control, and leakage in roofs are discussed in this article.

### Cracks in Buildings in Expansive Soils

Cracking of buildings in expansive soils is due to alternate swelling and shrinking of soil causing differential movements in the ground. Commonly adopted strip footings are subjected to these movements which in turn damage the superstructures. Such damaged houses pose a special maintenance problem in devising measures aiming at the stabilisation of soil moisture to avoid further damage to the building structure, by arresting the recurring cracks. This can be achieved by providing a flexible apron around the cracked building. The waterproof apron of 10 cm. thick and 2 metre wide concrete layer covered with tarlet or alkathene sheet (0.25 mm. thick) at a depth of 50 cm. from ground level forms a suitable remedial measure for cracked buildings. An outward slope of 1 in 30 should be provided in this apron, and the best season for providing such an apron is the end of monsoons.

### Painting of Wooden Members

Paints provide a protective layer on timber by checking the rate of moisture change from it. Unprotected timber exposed to weather gradually becomes porous soft, friable, is often infected with fungus, and as such the failure of paint film calls for repainting. Paint film showing signs of flaking or disintegration should be burnt off or removed completely and the surface painted as new wood. If the paint is in sound condition except for chalking and loss of colour, the dirt, soot, grease and other contaminants should be carefully removed using neutral detergents. Washing soda and alkaline detergents should not be used, because any trace of such detergents left on the surface may attack the new coating especially the oil paint. Painted surfaces which have

been wax polished and are to be repainted should be cleaned first with white spirit or any other suitable solvent to remove the waxy material.

The paint film is finally rubbed with sand paper to provide good adhesion to the new coat of paint. All bare patches should be touched up with a primer paint. Cracks and depressions should be made up with stopping or filler. One coat each of under-coating and finishing should then be applied. Information on repainting of wood has been briefly given in Table 1.

The following precautions may be taken in repainting or maintenance work :

- (i) Plastic emulsion paint should never be applied over a highly chalking or badly cracked oil or enamel paint film.
- (ii) While burning off the paint, do not scorch the timber. Scorching leaves behind a film of charcoal, which if not removed properly hinders the adhesion of paint film with wood.
- (iii) Do not apply clear finishes (varnish or stains) on exterior frame work. The life of such finishes is very short.

**Painting of Metallic Work in Buildings**

In normal residential buildings there are hardly any ferrous or non-ferrous metals which require maintenance, but in large factories and workshops there is sufficient use of metals which requires maintenance and care. To prevent corrosion of metals, paints are normally used to

cover them, which provides a barrier between the metal surface and corrosive agencies. The following points may be kept in mind in the maintenance of metals by the application of paints.

Repainting should not be delayed beyond the appearance of the first traces of rust, as this will help to avoid the costly work of removing all the rust and paint at a later stage. The repainting work should be undertaken as soon as the film starts showing defects such as excessive chalking and mild checking. If the old film is sound no surface preparation is necessary. The surface may be merely rubbed down to remove checked film, cleaned and the suitable finishing paint applied. The areas showing blisters or pimples of rust should be cleaned by thorough wire brushing, the bare metal wiped with a solvent and given a priming coat, before applying the finishing coat. When the rusted portion is more than 0.5 per cent of the total area it is advisable to remove the entire film and bare the metal by solvents, scraper or a wire brush and repainting done as for a new surface.

**Fine Cracks in Plastered Surface of Roofs**

Fine cracks in the roof surface though appear to be not very serious, are often the cause of leakage in roofs and pose a serious problem for the maintenance engineer. The normally used practice is to plaster the whole surface, but it involves much labour and material and turn out to be too costly to be met out of the normal funds available for maintenance. A simpler

**Table 1.**  
**Maintenance Painting of Wood**

Condition of surface and type of failure of existing finish	Surface preparation and painting
1. Chalking and/or checking.	Flat down to even up the checked film and clean the surface free of loose pigment particles. Apply one coat each of undercoating and finishing paint.
2. Localised blistering and/or cracking.	Scrape off blistered, cracked and loosely adhering paint. Rub down to even-up checks, if any. Touch-up bare spots with priming paint and apply one coat each of under-coating and finishing paint.
3. Extensive blistering and/or checking.	Remove paint film from the whole surface and finish as new wood.



method as described below may be used to make the roofs with fine cracks, waterproof.

The roof surface may be saturated with commercial sodium silicate (80 per cent solution in water) till the solution gets proper access into the cracks. This should be followed by a 5 per cent solution of the calcium chloride, sufficient to precipitate calcium silicate within the cracks and the roof should then be allowed to dry. To further reinforce the treatment, a thin spray of sodium silicate solution (3 per cent) may subsequently be applied.

### Cracks in RCC Members due to Rusting

The problem requires site inspection before suggesting any remedies. However, the guidelines for repair and protection in normal cases are given below. The measures described will be effective in dry conditions and should only be used in dry season, and when the structure is also fully dry.

All loose mortar, concrete and salt deposits, if any, should be removed and exposed surface rubbed down. The exposed reinforcing bars be derusted preferably by sand blasting and degreasing done with trichloroethylene if required. A coat of suitable epoxy resin should be applied on the derusted reinforcement and exposed concrete surfaces by following the manufacturers instructions. Apply guniting with a rich mortar (1:3) and provide adequate cover to the reinforcement. Very narrow cracks may be sealed with a suitable epoxy resin by gravity, vacuum, or pressure techniques (suppliers may be consulted for details). The columns may be given a shielding treatment (bricks or tiles in rich mortar) to keep out wind-borne spray and salt in saline atmosphere.

### Stains on the Concrete Floors

In spite of due precautions and care, almost all the buildings, get their floors stained with a wide range of stains which look ugly and require removal. The stains may be of ink, rust, oil, paints or varnish, coffee or tea, beverages or soft drinks and blood or urine. Each type of stain requires different method of cleaning or removal as described below.

Ink stains may be removed with the help of any of the solutions like: (i) 10 per cent oxalic acid, ammonium oxalate, citric acid, sodium citrate or ammonium citrate; (ii) 5 per cent sodium per-

borate; (iii) 1 per cent potassium permanganate followed by 10 per cent sodium bisulphate; (iv) 25 per cent hydrogen peroxide and (v) Ammonia solution. Most of ink stains can be removed by ammonia water and in case acid solution is used it should be followed by ammonia solution. In case of old stains when the ink has penetrated into the surface, a flannel cloth well soaked in acidified bleaching powder extract is applied and kept in position for 24 hours, before finally cleaning the floor.

Iron and rust stains may be removed with 10 per cent hydrochloric acid or phosphoric acid solution. The concrete should be wetted before applying acid and finally thoroughly washed with water. A slight roughening of concrete surface is inevitable in this process and to avoid roughening 10 per cent solution of ammonium oxalate or sodium citrate may be used, but this may require repeated applications.

Oils penetrate readily into concrete and care should be taken to mop off immediately with a cloth. In case of an old stain it should be covered with a layer of cotton batting saturated with a mixture of acetone and amylacetate or carbon tetrachloride. The evaporation carries the penetrated oil to the surface and may be cleaned by brushing and wiping when dry.

Paint and varnish stains can be removed by application of carbontetrachloride, benzol, amylacetate or strong alkaline paint remover. It may amount salting and present an unsightly appearance, but the effect is temporary and vanishes after few days.

Coffee and tea stains can be removed by placing a thick cloth saturated with one part of glycerine and one part of water on the stained portion and treatment repeated till the stain is removed. Addition of isopropyl alcohol to the mixture hastens the action. Beverages and soft drink stains are almost unnoticeable at first but turn brown if allowed to stand and can be removed as for coffee and tea.

Tobacco, burnt cigarette, fire and fruit stains may sometimes be removed by scrubbing with powdered pumice. A solution of one part of trisodium phosphate dissolved in 5 parts of water added to a suspension of one part of bleaching powder in 5 parts of water, is stirred and allow-

ed to settle. Some talc is worked into a stiff paste with clear supernatant liquid and applied as poultice about 5 mm. thick, over the stain. It is scrapped off when dry, but several treatments may be necessary in case of deep stains.

### **Efflorescence in Brick Works**

White deposits of salts found on the surface of the brick work are known as efflorescence. These deposits are unsightly but this is a relatively minor defect. Major defects are the disintegration of bricks and mortars, pushing out of the plasters and spoiling of paints and decorative treatments.

There is no perfect remedy for efflorescence except complete isolation of the construction from water. This is however, not always practical and some of the remedial measures has to be used depending upon the circumstances. Patches of salt on isolated bricks in buildings provided with adequate D.P.C. may be removed by dry brushing and washing repeatedly. Water repellent surface treatments such as silicone treatment may be used for stone work or even brick work. In most of the existing buildings, the cause of efflorescence has been traced to be the ingress of water and as a remedial measure such sources should be checked and rectified. Electro-osmosis and latex-silicone injection treatments are claimed to have prevented efflorescence in existing buildings without D.P.C. but both these methods need handling by specialists.

### **Dampness in the Existing Walls**

Most of the old buildings constructed without damp-proof course suffer from rising damp. In some buildings the D.P.C. becomes ineffective due to some reasons and suffer from the same defect. The rising damp which spoils the decorative finish of walls and is also unhygienic requires checking. This can be done by inserting damp-proof course in existing walls or by injecting sodium silicate solution and centrifuged rubber latex. For inserting a damp-proof course the cut is made in the masonry at a convenient level above the floor with the help of a sledge immediately. The little gap left between the water-proof membrane/target is filled with masonry sand and the water-proof membrane in-cements and mortar grout (1:3) and finally finished flush on both sides of the wall. In case of silicate injection method, 18-25 mm./inclined holes are drilled at a convenient level above floor and 3-4 per cent silicate solution injected

in the masonry with the help of a delivery chute. In case of extraordinary thick walls holes may be drilled from both sides. After injecting, the holes can be filled with 1:4 cement-sand mortar.

### **Termite Attack on Buildings**

There is no easy method of eradicating termites that have once established themselves in buildings, and termite control measures in building construction is the only reliable means of preventing termite damage. However, few of the possible methods of termite control in existing buildings are given below.

The first step is to locate the points of entry in the building. Direct contact between the soil and wood in the building should then be broken by setting door frames etc. on the flooring than through the flooring. In case of wooden floors they may be separated from the soil. There is no other way than to replace the damaged timber member by treated ones or naturally resistant to termites as recourse to painting, brushing or spraying with chemicals will not be lasting.

The alternate treatment is the destruction of nest from which the attack originates. Any mound within 50 metres of the building should be opened up and treated with the following chemicals per 1 cubic metre of mound volume.

- (i) 2 kg. of 10 per cent DDT dust.
- (ii) 10 litres of 2-3 per cent solution of sodium arsenite in water.
- (iii) About 35 litres of 0.5-1 per cent suspension of gamma-benzenehexachloride in water.
- (iv) 5 litres of 0.004 per cent emulsion of aldrin in water.

Another step is to create poisoned soil barriers around the building and beneath the floors. The barrier is created by digging a trench 30 cm. wide along the foundations upto the concrete depth and back filling with successive layers of soil and toxic chemicals. Any of the chemicals like, aldrin, gamma-benzenehexachloride, chloradane, dieldrin, DDT or pentachlorophenol may be used. For creating soil barriers beneath the floor, holes may be drilled 30 cm. apart along a line 15 cm. from the face of the wall and any of the chemicals mentioned above injected through them

The effect of the termite eradicating chemicals usually lasts several years but still routine in-



spection should be carried out and recurrence of attack checked immediately, when noticed. All the chemicals being toxic in nature due care must be taken while using them.

### Leakage of Rain Water through Flat Roofs

During recent years considerable trouble has been experienced from leakage and seepage of rain water through flat roofs. In certain cases the trouble had been so widespread that necessary renewals became necessary within a short time after laying. Here are some points which may be kept in view at the time of water-proofing of flat roofs.

Stagnation of water on the roof surface, due to various causes should be avoided to ward off the failure of an otherwise satisfactory treatment. Stagnation of water can be avoided by providing adequate slope (say 1 in 30 to 1 in 40) and providing outlets to carry full discharge. Normally no outlet should be less than 10 cm. in diameter to serve an area not exceeding 30 sq.m.

In existing houses where the adequate slope and outlets have not been provided any water-proofing treatment will not be a long lasting measure and as such to make water-proofing layer effective it is highly advisable to resort to correcting of roof slopes and outlets than going in for any sort of water-proofing treatment.

### References

1. Remedial measures for cracked buildings

in expansive soil areas (CBRI) Building Digest No. 91).

2. Painting of wood and wood-based materials (CBRI Building Digest No. 54).
3. Painting wood work Do's and Dont's (CBRI Building Digest No. 84).
4. Painting non-ferrous metals in buildings (CBRI Building Digest No. 76).
5. Painting ferrous metals in buildings (CBRI Building Digest No. 71).
6. Some typical enquiries and their replies (CBRI Building Digest No. 88).
7. Removal of stains from concrete floors (CBRI Building Digest No. 42).
8. Efflorescence in brick work (CBRI Building Digest No. 65).
9. Insertion of damp proof course in existing walls (CBRI Building Digest No. 41).
10. Eradicating termites from buildings (CBRI Building Digest No. 30).
11. Water-proofing of flat RCC roofs (CBRI Building Digest No. 29).
12. Dampness of buildings (CBRI Building Digest No. 34).