



Fig. 30: Filling the joints with tile grouts



Fig. 31: Filling the gap with acrylic sealant



Fig. 32: View of finished internal wet area

9.0 Conclusion

The seepage and leakages in bath rooms and toilets are most common. The problem arises when proper attention is not provided during the planning stage. The pipe joints are most vulnerable for leakages. If waterproofing is designed and laid properly, then the durability of the system improves. But, we are still using old traditional practices of waterproofing, without any modern system in those areas. In terms of prices, the entire bath room waterproofing system is only a fraction of the total cost of a flat. However, we still follow the old traditional practices and face the seepage and leakages, thus creating a dispute between the occupants of upper and lower floor regarding sharing the cost for remedial measures or fixing the leakages.

Remedial Measures in Internal Wet Areas for a Leak-Free Situation

[Excerpts from "Rehabilitation and Repair of Structures", Vol.2, CE& CR, pp.7-8 and Dr. Fixit Healthy Construction Booklet "Construct Your Ideas", 2012, pp. 40-41]

1.0 Introduction

Internal wet areas of a building are those that are prone to be wet internally within structures. These include kitchens, toilets, bathrooms, wash areas, balconies, etc. Water penetration caused due to a lack of water-tightness in the concrete structure manifests in the form of unsightly patches on the walls (Fig. 1) and ceilings (Fig. 2). It can also be seen as the gradual peeling off of the expensive finishes and paints (Fig. 3). Capillary rise of water in the brickwork can bring up dissolved salts leading to 'efflorescence' (Fig.4). In due course, the moisture will lead to corrosion of the steel reinforcement, and the cracking and spalling of concrete. On the whole, the damages due to water penetration are seen in the form of rotting, staining and blistering (Fig. 5), moulding, odouring, swelling, shrinkage, warping, peeling off of paint or wallpaper, water dripping, fungus growth, defective concrete, plaster or tiles, rust staining, decomposition of adhesives, loosening of renderings and weakening of materials. Water could also accumulate ('ponding') if the surfaces are uneven and difficult to drain, like in the kitchen, bath, toilet, etc.



Fig. 1: Internal dampness in a wall causing agony to the inhabitants

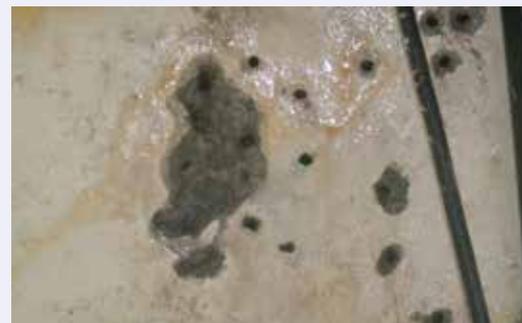


Fig. 2: Water dripping and accumulation on the surface of a roof slab



Fig. 3: Dampness around a wash basin causing the paint of the wall to peel



Fig. 4: Capillary rise of water causing efflorescence



Fig. 5: Stains and blistering of paint in kitchen

Out of the numerous effects of water leakages, some of the more serious ones are:

- Damage to the building's internal appearance
- Danger to human health.
- Loss of property - furniture, equipment, paintings, etc.
- Deterioration of materials, corrosion of reinforcement and decay of timber causing reduced life of structure.
- Ill effects on the building's electrical and technical systems, and overall safety.

2.0 Inspection and Diagnosis of Water Leakage

Though it is obvious that water migrates downwards owing to gravity, it gets difficult sometimes to identify the source or cause of water seepage. An extensive investigation may be necessary with the use of special detectors or some apparatus to track down the source of leakage. Colour dyes, collection samples for analysis, tests on the potential sources or the specific spots, etc, are the usual means adopted to identify the source. Various tests such as a moisture meter (Fig. 6), liquid leakage detector or thermal imaging, are often used for diagnosis of water leakages. The digital and thermal images of same location near the wash basin are taken for identifying the source of leakage (Fig. 7 & 8). However, most of the time, it is very difficult to locate the exact source of the water leakage. The various possible causes of water leakage need to be analysed and checked before performing the remedial measures.



Fig. 6: Measuring the moisture content using a moisture meter



Fig. 7: Digital image for comparison with thermal image for detection of water leakage

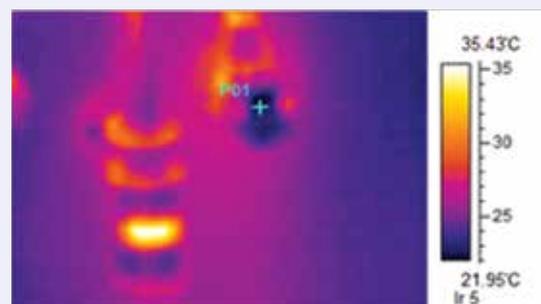


Fig. 8: Source of water leakage (+) being identified by thermal imaging

3.0 General Causes of Water Leakage

Bathrooms and toilets can leak due to the following reasons:

- Negligence during plumbing and sanitation
- Usage of conventional tiling methods that do not actually work as waterproofing
- Sealing of through joints with white cement
- Usage of through joints between ceramic sanitary units such as wash basins / bathtubs
- Compromise in the quality of construction
- Usage of concrete which has aged or has honeycombs and voids

Let us now look at some causes in detail.

3.1 Negligent During Plumbing and Sanitation

Plumbing lines must be checked by a plumber for leakage through joints / elbows / bends in the pipes. It may require breaking open the pipes to expose the exact point of leakage. Fix up the joints, elbows or nipples with effective caulking material. In case of hot water lines, it is also necessary to check their ability to withstand high temperature of the geysers.

If the pipeline is being put back into the walls and re-concealed, it is preferable to use a polymer modified mortar made with SBR Latex for waterproofing to seal it back. This will ensure water-tightness.

Nahani traps must be inspected for leakages. All the gaps around the pipes in the traps must be filled in with fine cementitious grouts.

3.2 Leakage through Conventionally Tiled Surfaces

Traditionally, tiling does not use waterproofing materials. It is done with grey or white cement, which will shrink and crack. The fixing material for tiling consists of a neat cement paste made with water, which is applied partially on the back of a tile. This practice does not give a 100% waterproof tiling solution. It is therefore important to compulsorily use a tile adhesive.

3.3 Through Joints Sealed with White Cement

Tile joints are still being grouted with white cement mixed with colour in order to match tiles. White cement shrinks making it possible for water to permeate to the gaps behind the tiles and the walls of the bathrooms. Rake out all the existing tile joints with a paste to ensure a water-tight grouting system.

3.4 Joints between Ceramic Sanitary Units

Joints between ceramic sanitary units like washbasins, bathtubs, etc. are traditionally grouted with white cement, which could crack and allow seepage of water. Besides, white cement also starts looking shabby since dust / bacteria can be easily spotted on white surfaces. Such joints can be raked out and re-filled with an acrylic-based sealant.

3.5 Downtake Pipes on the Exterior Wall

Downtake pipes often leak at the joints, allowing water to seep into the interior of the bathroom / toilet resulting in internal dampness. These points can be re-done with a polymerised cement-sand mortar to ensure no leakage. This joint will now be waterproof due to the use of the polymer.

3.6 Toilets Dripping with Water from the Roof Slab

If dripping from the roof slab is persistent, drill holes to fix injection packers and grout PU Foam Injection with a user-friendly pump. This injection will expand on contact with the water-bearing cracks and permanently seal the leakage. Over a period of time, the entire roof slab will become dry.

4.0 Remedial Waterproofing

The following steps are necessary for effective remedial waterproofing :

- Complete removal of unsound material like dust, oil, etc. from surfaces
- Undercutting to form smooth edges
- Providing good cavity form with rounded inside corners and uniform surface
- Repairing cracks, if present
- Treating of joints, if present
- Stopping or rerouting of water
- Application of the coating in accordance with the manufacturer's instructions.
- In case of walls, where plaster is badly damaged, re-plastering is required mainly to the extent of the damaged portion. The mortar used for re-plastering should contain an integral waterproofing admixture. On the finished plaster, a waterproofing coating should be applied.
- The shoulders of the joints must be thoroughly cleaned and then the seal must be rebuilt. Poor adhesion to the sub-surface of the facing sealant is the commonest cause of failure.

4.1 Bathrooms, Kitchens or Balcony Floors

4.1.1 Sources of Leakage

In bathrooms or kitchens, the source of the leakage must be identified before any repairs are considered. If it is the loosening of components in the drainage system such as bottle traps under the sink, basin or bathtub, some simple fixing can curb the leak. However, if defective water supply pipes are identified as the culprit, licensed plumbers should be engaged to replace the defective parts or overhaul the entire system. A common cause is defective sealant around the bathtubs, basins, sinks or defective waterproofing system at the floor. This problem can be easily dealt with the replacement of sealant. However, if the

floor is wet habitually, the waterproofing system of the floor is put to test. Should the cause be identified as water spilled on to the floor, it is always advisable to reconstruct the entire waterproofing layer instead of patch repair. But the bare concrete surface should be sound enough and without any cracks. Otherwise, the waterproofing may fail. In such cases, the cracks should be repaired with a polymer modified mortar. If the surface is having more voids and honeycombs inside, then it should be injected with cementitious grouts (Fig. 9) at certain intervals depending on the condition of the site.



Fig. 9: Fixing of nozzles for grouting injection in a bathroom

In balconies where ponding may be frequent due to heavy rain or blockage of drain outlets because of rubbish, the waterproofing system has to be sound so as to not create nuisance to the floor below.

4.1.2 Remedial Measures

Before reconstructing the waterproofing layer of a floor, all the sanitary fitments and finishes should be removed to allow the formation of a continuous waterproofing construction. Waterproof cement-sand screeding or other similar materials are commonly used. The screeding should be applied to have sufficient upturns at the base of the walls, and have an adequate fall to the floor drain to prevent water ponding. Sanitary fitments are to be installed on top of the waterproofing layer without penetrating it. The floor surface under the bathtub or shower tray should be formed with a fall to avoid trapping water at their bases if water leakage ever occurs.

After applying the floor finishes, the joints between tiles should be grouted properly with waterproof cement mortar. Junctions of wall finishes and bathtub or shower trays should be sealed with a suitable silicon sealant. Wall tiles should be fully bedded with tile adhesive and joints should be fully grouted with waterproofing cement. Gaps between marble tiles should be fixed with flexible waterproofing joint sealant to prevent long-term minor movements that give rise to cracks for water penetration. Should the source of leakage be identified from drains

embedded in walls and floors, repair methods should be carried out as per standard procedure. An embedded drain should be changed to an exposed one to avoid any future difficulty in maintenance.

4.1.3 Treatment for Dampness underside of Bath & Toilet

Treatment for damp patches from underside of roof slab of bath and toilet areas can be done by cementitious crystalline coating applied on negative sides. Whenever these crystalline materials come in contact with water they traverse in reverse direction of flow of water and form the crystal which breaks the capillary and seals the crack. But this is not suitable when there will be dripping leakages.

4.1.4 Treatment for Dripping Leakages

Treatment for dripping leakages from underside of roof slab of bath and toilet areas should be done only when the treatment from positive side is not possible. A polyurethane foam material can be injected from negative side by drilling holes and installing the packers. The PU foam material expands when it comes in contact with the water and completely arrests the water leakage.

4.2 Treatment for Internal Damp walls

All the mild and moderate dampness such as damp spot, damp patches, black spot, green spot etc. in inside flat of bath room, toilet and other areas need to be applied with two coats of Epoxy based damp proof coating. For severe dampness such as peeling of paints, efflorescence, blistering, and white patches etc. the same need to be scrapped and cleaned thoroughly. A putty of Epoxy mixed with white cement to be applied over scrapped surfaces for leveling over which two coats of Epoxy based damp proof coating need to be applied.

5.0 Conclusion

The main causes of water leakage are the natural deterioration of materials by wear and tear over a period of time as well as poor workmanship and surface preparation. In bathrooms, the main reasons for water leakages are the degradation of pointing between tiles and wall / floor joints and deterioration of concrete infill / grouts around the pipes. Faulty pipes / sanitary fittings / fixtures may also lead to leakage. Since it requires dismantling the entire floor, finished materials and redo the pipe fitting, remedial waterproofing of internal wet areas turns out to be a costly affair. However, if proper planning and designing is done using latest waterproofing material, then such problems may not even arise. Compromising on waterproofing may save us some money initially, but could lead to ten times the amount being spent over remedial measures!