REPAIRS GUIDE
FOR CO-OPERATIVE HOUSING SOCIETIES
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While we think that we can take care of buildings and address problems with a suitable solution, problems do reoccur inspite of doing a good job and thus raise an alarm. This makes us doubtful about our understanding of the problem.

The objective of this publication is to create awareness amongst owners of buildings (Housing Societies), about maintenance and repairs of buildings and develop an understanding approach towards repairs. Creating awareness amongst Housing Societies will have positive influence on Consultants and Contractors. Time being of essence in any project (including repair jobs) it is invariably found that repair works of Housing Society's buildings are delayed due to improper financial management, escalation in prices of materials, labour, no proper guidance, etc. Hence it is of utmost importance to identify, plan and implement maintenance and repair work timely, which will lead to the prolonged life of building, safety of the occupants, arrest on price escalation of material and labour and appreciation of property value.

We hope that this publication will be beneficial to all and will go a long way in achieving the sole objective of preserving the assets.

It is a strong belief that conventional systems work longer time and are more successful than modern systems. One cannot overrule this; there exist old references that prove that they do work, but due to absence of the skilled manpower of those good days today, people are shifting to modern systems. Modern materials and techniques that are used for repair and waterproofing jobs are approximately 15 years old and ignorance about these materials prevents many from using them. Besides, untrained contractors, who are in this profession from generations, do repair and waterproofing jobs for old buildings. They generally mishandle these modern materials, resulting in failure. We must make an effort to understand this subject as a whole and for this we need to change our approach towards repair and waterproofing jobs to make them a success. Concrete deterioration coupled with the corrosion of steel bars resulting into fast reduction of load carrying capacity of building is on the increase these days on account of direct exposure to salinity, increase in levels of environmental pollutants especially in urban areas and industrial townships.
“That which is taken from the ground returns to the ground”.

The above statement is a well-known one and outlines the necessity of maintenance to preserve and care entailed in the prevision of deterioration. Buildings provide shelter to live work and are valuable assets for Individuals, Organizations and Society. If the assets are preserved, the value appreciates; else it is a loss to the owner whosoever capital has been invested. For the owner the building must have a return in the form of trouble free service life. It is uneconomical to replace the assets before the intended service life by another capital investment.

The preservation of the building is to enhance the life cycle and prevent deterioration and is therefore considered to be as important as construction and constitutes maintenance programme.

The standard of maintenance varies from building to building depending upon,

- Year of construction
- Materials used
- Quality of construction
- Type of building
- Type of maintenance related work carried out periodically in past

A very common question asked is What is the intended service life of a building?

The answer to this question depends on,

- Location
- Type of construction
- Construction materials
- Utilization
- Maintenance etc.

Following figures can be given for indication of life of a structure:

Type of Building / Structure Intended Service Life

- Monumental building 100 years
- RCC framed building 75 years
- Load bearing construction 55 years
- Semi permanent structures 30 years
- Purely temporary structures 05 years
Repair is an essential activity to make good the damage caused to the building due to decay or poor maintenance. Repair can be avoided by proper and timely maintenance work.

**Scope of Maintenance**

**To Ensure Structural Stability**

- A well maintained building would withstand all the possible load (Live load, Dead load, Wind load and Seismic load and their combinations) safely; provided there are no genetic problems of inadequate design, poor construction specifications or poor quality of construction materials.

**Water Tightness**

- A well maintained building would have a good system of leak proof waterproofing and drainage system, watertight terrace and external façade and good plinth protection to keep the surface water away from building structure.

**Durability**

- Maintenance of building should commence immediately after construction to improve the durability. The buildings that have been well maintained remain in good condition to serve better for the expected service life.
1.1 **Types of maintenance**

Maintenance is an ongoing activity in which decay or deterioration is continuously observed, checked and monitored by necessary small remedial measures and methods. It concentrates towards up-keeping of various components of buildings to make these effective useful during service life.

Structures like humans, respond to environment, loads, bad or good design / construction. It’s a myth that once a structure is constructed, it does not require maintenance. If the structure has to be efficient, it requires maintenance.

<table>
<thead>
<tr>
<th>Type</th>
<th>Activities</th>
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| Routine maintenance works     | • Cleaning of plumbing choke ups  
                              | • Filling up of rat holes  
                              | • Servicing of electric pumps  
                              | • Common lighting arrangement |
| Incidental maintenance works  | • Opened/loose drinking water/waste water pipelines at junction  
                              | • Damaged compound wall  
                              | • Small theft |
| Periodic maintenance work     | • Treatment of cracks  
                              | • External painting  
                              | • Underground water tank cleaning  
                              | • Overhead water tank cleaning  
                              | • Fungus and termite treatment  
                              | • Removal of weeds in joints  
                              | • Terrace monitoring |
| Service contract maintenance work | • Maintenance of lifts  
                              | • Maintenance of Intercom system  
                              | • Common Cable T.V. Network Antenna  
                              | • Common wiring / transformer |

1.2 **Legislation & bye-laws related to building maintenance & repair**

1.2.1 Government of Maharashtra appointed a commission to enquire the causes of collapse of houses in Mumbai in 1964; the report was submitted the same year. The outcome of report focused on:

- Age of the building
- Grouping of the building on the basis of age
- Collection and levy of the cess
- Mumbai Building Repair Fund
- Ordinary and tenantable repair
- Structural repairs
- Acquisition of irreparable building and reconstruction of the same
- Rehabilitation of occupants

1.2.2 In addition to above, necessary Bye-Laws have been framed and incorporated by the Commissioner for Cooperation and Registrar, Maharashtra, Pune to have control on repairs and maintenance of the properties of Cooperative Housing Societies. The extracts of main bye-laws are:

1.2.2a Bye-Law No. 156

It shall be the responsibility of the Committee to maintain the property of the Society in good condition at all times.

1.2.2b Bye-Law 157

The Secretary of the Society, on receipt of any complaints about the maintenance of the Society property from any of the members or on his own motion, shall inspect the property of the Society from time to time and make the report to the Committee, stating the need of the repairs, if any, considered necessary. The Committee shall consider the report made by the Secretary of the Society and decide as to which of the repairs should be carried out.

1.2.2c Bye-Law 158(a)

The Committee shall be competent to incur expenditure on the repairs and maintenance of the Society’s property, if the one time expenditure does not exceed:

- Up to 25 members  ₹ 25,000/-
- 26 to 50 members  ₹ 50,000/-
- 51 and above  Up to ₹ 1,00,000/-

1.2.2d Bye-Law 158 (b)

If one time expenditure on repairs and maintenance of the Society’s property exceeds the limits as mentioned under Bye-law No. 158(a), prior sanction of the general body of the Society shall be necessary.

1.2.2e Bye-Law 158(c)

The General Body Meeting of the Society shall decide the limit up to which the Committee could incur the expenditure on repairs and maintenance of the property of the Society without calling for tenders for the work. In respect of the work, the cost of which exceeds the limit, so fixed, the Committee shall follow the procedure of inviting tenders, placing them before the General Body Meeting for approval and entering into contract with the architect (if appointed) and the Contractor.
1.2.2f Bye-Law 159

The following repairs and maintenance of the property of the Society shall be carried out by the Society at its costs:

- All internal roads
- Compound walls
- External water pipe lines
- Water pumps
- Water storage tanks
- Drainage lines
- Septic tanks
- Staircases
- Staircase lights
- Street lights
- Terrace and parapet walls
- Structural repairs of roofs of all flats
- Outside walls of the building/s
- All leakages of water including leakages due to rainwater and leakages due to external common pipeline and drainage line
- Electric lines up to main
- Lifts switches in the flats
- The damaged ceiling and plaster thereon in the top floor flats, on account of the leakage of the rainwater through the terrace

1.2.2g Bye-Law No. 160(b)

All the repairs, not covered by the Bye-law No. 160(a) shall be carried out by the members at their cost.
Who will identify the need of repair? / How to identify the need of repair?

Office bearers of Managing Committee of a Co-op Housing Society always want to know the answers to the above basic questions related to Society’s Building Repair.

2.1 Statutory Requirements

At the initiation and suggestion of Structural Engineers the Commissioner for Cooperation and Registrar of Cooperative Societies has approved the 'Revised Bye-Laws of Cooperative Housing Societies', which is now mandatory.

2.1.1 Structural Audit

As per Clause No. 77 of the revised Bye-Laws of Cooperative Housing Societies: “The Society shall cause the ‘Structural Audit’ of the building the Society” as follows:

- For building aging between 15 to 30 years once in 5 years.
- For building aging above 30 years Once in 3 years

A Registered structural engineer from the panel of Municipal Corporation should carry out such structural audit. During the structural audit the detailed inspection of the society building needs to be done externally and internally. Being a very new concept there is no standard norms in this regard as what it should focus on.

Broadly structural audit of the society building should cover the following:

- External facade
- All flats from inside (including shops and offices in the premise).
- Staircase block / lift machine room / lift shaft / lift pit.
- Common utility area like passage, foyer, etc.
- Terrace staircase mumty
- Overhead tank
- Underground tank
- Stilt area (soft storey)
- Vegetation / plant growth
- Surroundings of the building
- Dish antennae / Hoarding
- Non-Destructive Testing (NDT) can be carried out to assess the strength of RCC at the advice of Structural Engineer.
2.1.2 Relevance of structural audit for buildings

The main objective of structural audit is to know the condition of the building. The structural audit report should be taken in its true spirit by the societies instead of just fulfilling and mandatory requirement as per bye-law. The report should be discussed among the members of the Managing Committee and the Structural Auditor so that the recommendation of Structural Auditor can be implemented in true sense. Structural Audit report should reveal the following:

- Quality of original construction and construction material.
- Status of periodic maintenance of the building. [fig. 1]
- Modifications, alterations and additions carried out in past [fig. 2 & 3]
- Unwanted load on the building. [fig. 4]
- Deterioration or decay or damage to the RCC members and identification of the same
- Block estimate of repair under different heads of items
- Priorities of different repair work
• Success or failure of previous major repair. [fig. 5]
• Leakages (inter flat leakages, façade leakages, terrace leakages). [fig. 6]

Fig. 5  Fig. 6

Common problems in a poorly designed / construction / maintained building are:
• Leakages (in flat, façade, terrace leakages). [fig. 7 & 8]
• Termite and rat ingress

Fig. 7  Fig. 8

• Cracks [fig. 9 & 10]
• Deterioration in RCC [fig. 11 & 12]
• Unauthorized modifications/alterations.
• Failure of any repair carried out in past.
• Plumbing related problems. [fig. 13]
• Vegetation / plants / weeds growth at inaccessible areas. [fig. 14]

• Problems and their varieties vary from building to building and every problem may be unique in nature.
• Few examples, based on past experience of Consulting Engineers and Housing Society’s Office Bearers, will be able to explain many aspects related to above issues.
2.2 Common leakage problems

2.2.1 Leakage/ Dampness Seepage (Refer Annex - A/C/D/E)

- Appearance of damp patches on Western and South walls exposed to rain. [fig. 15] (Refer Annex A - 1.1)
- Formation of hairline cracks near the beam / column and wall joints and seepage of rain water through these cracks. [fig. 16] (Refer Annex A)
- Occurrence of water seepage along the perimeter of the window frame at the joint between frame and concrete. [fig. 17] (Refer Annex A - 1.2)
- Leakage from overhead water tanks. [fig. 18] (Refer Annex E)

- Leakage from upper flat toilets/WC to neighbour ceiling downstairs. [fig. 19] (Refer Annex C - 1.1)
- White salt powdery deposition on walls adjacent to toilets/WC’s efflorescence. [fig. 20] (Refer Annex C - 1.4)
- Dampness rising upward from ground causing dampness on wall. [fig. 21] (Refer Annex A - 1.4)
- Dampness in the peripheral walls of top floor flats. [fig. 22] (Refer Annex A - 1.3)
- Leakage at a location where the neighbour on upper floor is constructing a bathroom. (Refer Annex C - 1.1)
- Leakage in the top floor flat when overhead water tank overflows. (Refer Annex C - 1.1)
• Dampness in the wall near the expansion joint of the building. [fig. 23]
• Corroded plumbing and sanitary fitting including concealed pipes. (Refer Annex D - 1.2)
• Leaking joints of drainage and rainwater pipes. [fig. 24] (Refer Annex D - 1.2)
• Sewer line choke-ups. [fig. 25]
2.2.2 RCC/ Plaster Deterioration (Refer Annex B)

- Ugly cracks on building façade
- Open cracks in beams and columns
- Jamming of windows
- Falling of concrete and exposed corroded steel bars
- Separation gaps in wall near RCC columns and beams
- Diagonal cracks in wall near window sills
- Mushy cracks on entire plaster
- Excessive deflection in slab and beam
- Extensive cracking in chajja and worn out edges
- Tiled floors upheaval
- Tilting of compound wall
Since independence, the construction activity has been increasing without any increase in availability of matching inputs, in terms of materials and skilled workmen. This gap contributed to the damages and distresses in buildings right from construction stage and these are concealed under the external plaster and paint. A defect takes time to manifest itself.

To add further buildings remain unattended for several years. Water stagnation, plaster cracking, paint peeling, fungus growth and cracking of protective cover concrete are very common. Office bearers of Housing Societies unintentionally attempt treating the symptoms, instead of dealing with the cause and effect phenomenon.

The following flow chart shows three major factors that affect the durability of a building.

### 3.1 Causes that lead to Building Repair

Apart from genetic problems of poor architectural planning, inadequate structural design, inferior construction materials and their specification, poor maintenance, etc., there are other manmade causes, which lead to building repair.
3.1.1 In-Built Factors

3.1.1a Poor Design
- Inadequacy of design and details.
- Undefined drawings, specifications and construction methodology.
- No supervision from designer side during construction.

3.1.1b Poor Quality of Materials
- No check on ingredient materials used in construction.
- Procurement of construction materials from unreliable source.
- No proper storage of construction materials at site.

3.1.1b Poor Quality of Construction
- Selection of incompetent Contractor for the building construction.
- Inadequate supervisory level staff.
- Failure to understand drawings, details and specifications.
- Other lapses in quality control for speedy construction.

3.1.2 Damage

3.1.2a Poor Maintenance and Defect
Once the building is constructed and occupied by the users, the maintenance of the building is the responsibility of users. The importance and types of maintenance have already been emphasized in chapter 1.0.

Among the many factors of deterioration of building, poor maintenance and neglect are major factors. Users are reluctant to take up the maintenance work for the following reasons.
- Lack of maintenance / repair knowledge.
- Tendency to save money during maintenance related repairs.
- Inferior quality of materials used due to shortage of fund resulting into ineffective maintenance or repair.
- Reluctant to adopt new material due to high cost and unknown track record of such materials.
• Tendency to go for short-term gains.
• Maintenance related repairs are time consuming and cause inconvenience.
• Reluctance in appointing proper and experienced Consultant to save fee and relying on incredulous contractors.

3.1.2b Indiscriminate Additions/Alterations

There have been some building collapses, which were quite healthy, due to indiscriminate additions and alterations done by so-called interior designers (decorators) at the instruction of the Owner. The common alterations / additions made are alteration to window canopies, additions of walls on window canopies, enclosing of open balconies, conversion of a dry area into toilet / bath, addition of heavy weights on weak or inadequate structural elements, etc. All these additions / alterations take place when entire building or part changes hands. It is always the case that no engineering advices are taken before any such changes in the building or its part. Careless modification can lead to leakages or serious structural damages.

3.1.2c Overloading

Many times the building elements are forced to take load more than what they are designed for. Temptation of users to occupy more and more area without bothering about the effect on building element jeopardizes the safety and durability of the building. In case of change in the purpose of use, say from residential to commercial, it is likely that the load on entire building or part will increase or change thus causing the damage.
3.1.2d Natural Calamity, Fire & Accidents

A building may require repair after natural calamities like earthquakes, hurricanes, tsunamis and floods. The developed technology has made it possible to design and construct buildings to withstand these forces. However for buildings, which are old and for which the design is suspected, can be rechecked for their stability by structural engineers. Such buildings can be structurally upgraded knowing the correct deficiencies under these forces.

3.1.3 Environmental Impact

Due to wind pressure, seasonal and daily temperature variation, chemical reaction in saline coastal atmosphere, moisture variation in humid area, corrosion of metal (rusting of steel in RCC), root of growing trees, moss / lichens / fungi growth, etc. the building undergoes fast aging and comes to repair stage.
FLOW CHART SHOWING DETERIORATION OF RCC STRUCTURE IN STAGES

STATE OF CONCRETE

NEW RCC STRUCTURE APPARENTLY WITH NO DEFECTS

RCC CONTAINING MICRO CRACKS

LOSS OF WATER TIGHTNESS AS CRACKS BECOME CONTINUOUS

WIDENING OF CRACKS IN CONCRETE

NOT FIT TO LIVE

ENVIRONMENT IMPACT

PENETRATION OF WATER, OXYGEN, CHLORIDE, SULPHATE, CARBON DIOXIDE

INCREASE PENETRATION OF WATER, OXYGEN, CHLORIDE, SULPHATE & CARBON DIOXIDE

EXCESSIVE PENETRATION OF WATER, OXYGEN, CHLORIDE, SULPHATE, CARBON DIOXIDE

VISIBLE EFFECTS

NO VISIBLE DAMAGE

INITIATION OF SLOW DAMAGE (VISIBLE IN PATCHES)

RAPID PROPAGATION OF DAMAGE (VISIBLE AT MANY PLACES)

DETERIORATION BEYOND REPAIR
3.1.2d Natural Calamity, Fire & Accidents

Reinforcement steel bars have to be protected against corrosion, caused due to reaction with oxygen, moisture and chlorides in the atmosphere, ground water or sub-soil. Reinforcement steel bars are generally protected by providing concrete cover around them or by providing a protective coating on steel.

Resistance against corrosion of reinforcement steel and the degree of protection to reinforcing steel is greatly dependent on the many factors. Mechanism of corrosion of steel is an electro-chemical process and for this, presence of moisture and oxygen is necessary.

Metal (embedded steel rods in RCC) that gets converted into rust (corrosion product) may occupy 6 to 8 times the original size of steel. This growth creates tensile force within the concrete mass surrounding the reinforcement steel. Since concrete is brittle and weak in taking tensile or expansive forces, it cracks and spalling of concrete takes place.

Most of the building structures in and around Mumbai have a very conductive atmosphere for a permanent problem for leakage or seepage through peripheral portion of window and exterior skin walls. Air pressure results the forced entry of rain water inwards through unprotected opening or through joint, seal imperfection in the window sill or frame and gap of concrete and masonry.

**Water is the primary vehicle for the diffusion of all aggressive ions, such as chlorides and sulphates, into the concrete mass.**

Any repair strategy approved and adopted will not yield any good result unless the major source of deterioration is not addressed in the repair strategy and planning.
Flow Chart showing deterioration of RCC Structure in stages

In developing countries like India, repair of existing buildings is and shall remain an activity of great importance as resources are scarce and need proper utilization to take maximum value out of the repair projects. To achieve above, detection of area of repair is a prerequisite. Success of project is always based on:

- Correct diagnosis
- Study of problem
- Proper strategy, planning and methodology
- Need based specifications
- Socio-economical consideration

4.1 Does a building structure really need repair?

The Managing Committee of any housing society always encounters a major opposition from general members before obtaining the general body approval for repair work. The main points of arguments revolve around few questions:

- What is the need to spend so much money on repair?
- All are living happily.
- Except few damp patches here and there, during monsoon there appears to be no problem.
- All are doing good business and prospering.
- All the services (electricity, lift, water supply, etc.) are normal.
- Above all, property value is appreciating every day.
- In general there appears to be no problem at all.

The Managing Committee finds it difficult to answer the above questions. At the end they find themselves either frustrated or convinced that there is no need to go for repair of the building.

A very simple approach of getting the answer to the questions related to need of repair of the building is to analyse the following:

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<th>Question</th>
<th>Answer</th>
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<tr>
<td>Are there cracks visible on building façade?</td>
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<tr>
<td>Do these cracks re-appear after repair?</td>
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<tr>
<td>Is there dampness / seepage / leakage from walls and terrace either during monsoon or for all 12 months in a year?</td>
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<tr>
<td>Are there unwanted ugly patches?</td>
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If majority of answers to above questions are ‘Yes’ then there is a problem and the opinion of an experienced consulting engineer should be taken. Method statement is elaborated in Chapter 2.0 and in the forthcoming topics below.

Painting, waterproofing, crack filling, allied civil work and beautification are parts of maintenance process and maintenance related repair but these do not constitute the repair in true sense.

### 4.2 Planning Repair

Method statement for repair of building in distressed condition should have following sequence:

- Selection of Consultant, who should have in depth knowledge of structures, repair experience, technical expertise in repair and good organizational set-up to provide supervisory control.
- Structural audit and investigation by the consultant.
- Diagnosis of cause of damage, distress, deterioration and decay by the Consultant.
- Selection of need based repair area on priority basis by the Consultant.
- To assess financial implications jointly by Consultant and Society.
- Selection of proper and effective repair materials.
- Writing of specifications of repair work by the Consultant to suit the feasibility of repair project based on socio-economical consideration.
- To prepare the efficient tender documents by the Consultant to include terms and conditions, payment terms, legal obligations of Society and contracting agency, environment obligations, specifications, bill of quantities, provision of unforeseen items of work.
- Selection process and selection of Contractor by Society under guidance of Consultant based on technical qualifications, work experience, establishment, tools & plants, financial soundness, past performance, etc.
- Preparation of contract agreement by the Consultant.
- Effective supervision by the Consultant to monitor quality, quantity, progress, cost effectiveness, billing certification, adhering to conditions of contract, etc.
- Billing and certifications.
- Regular review meeting jointly attended by Society, Consultant and Contractor.
- Issuing of completion certificate after defect rectification by the Consultant.
- Issuing of post repair maintenance plan to the Society by the Consultant.

### 4.3 Selection of proper and effective repair materials

#### 4.3.1 General

Selection of repair material is one of the most important tasks for ensuring durable and trust worthy repair. Though, the pre-requisite for a sound repair system is the detailed investigation and determining the exact cause of distress, yet an understanding of the process of deterioration of the repair materials (such as concrete and other auxiliary materials) under service conditions is vital. Of course availability of materials of relevance, equipment and skilled labour has to be explored before deciding upon the repair material.
Exactly this is applicable to selection of materials for repair of concrete/plaster (what is applicable?). Also the selection of the repair material has a chemical angle and the manufacturer’s literature normally highlights the composition of the material rather than performance characteristics. Since, cementitious products have a tendency to shrink and hardening with age, it is essential that the repair material for repairing concrete or plaster should be of non-shrink type and compatible with parent material.

Flowchart for process for selection of material:

```
MATERIAL SELECTION PROCESS

PERFORMANCE REQUIREMENTS?

SERVICE & EXPOSURE CONDITION?

LOAD CARRYING REQUIREMENT

OPERATIONAL CONDITION DURING PLACEMENT AND CURING

ADDRESSING THE ORIGINAL CAUSE OF DAMAGE?

PLACEMENT TECHNIQUE/REQUIRED CHARACTERISTICS FOR PLACEMENT

PROPERTIES REQUIRED TO MEET THE CONDITIONS AND REQUIREMENT

MATERIAL & SYSTEM?

SELECT SYSTEM WITH OPTIMUM COST PERFORMANCE RISK
```
4.3.2 Essential Parameters for Repair Materials

Besides being of compatible properties, repair materials for cement concrete/mortar should also be easy to apply and should require no attention and monitoring after the completion of the repair work. The essential parameters for deciding upon a repair material for concrete are:

- Low shrinkage properties
- Requisite setting/hardening properties
- Workability
- Good bond strength with existing concrete/plaster
- Compatible mechanical properties and strength to that of the existing concrete/plaster
- Should allow relative movement, if expected, particularly in case of sealing of cracks, patch repair work or dealing with expansion joints.
- Minimal or no curing requirement
- Low air and water permeability
- Aesthetics to match with surroundings
- Cost
- Durable, non-degradable or non-biodegradable due to various forms of energy, life, Ultra Violet rays, heat etc.
- Non-hazardous/non-polluting.

4.3.3 Materials for Repairs

Wide range of materials for repair of concrete is available differing in cost and their performance. Their application range covers:

- Materials for surface preparation
- Chemical rust removers for corroded reinforcement
- Passivators for reinforcement protection
- Bonding agents
- Structural repair materials,
- Non-structural repair materials
- Injection grouts
- Joint sealants
- Surface coatings for protection of RCC
- Wrappings
Products available in the market are generally in pre-proportioned and in pre-weighed packs together with accompanying instructions regarding mixing procedure, pot life, dosage and application procedure etc. It is desirable that the manufacturer indicates the generic name and proportion of the components in the products on the packs; though, these materials are being marketed under their brand names, yet these could be classified in the following categories:

• Polymer/latex modified cement additives for mortars / concrete / cement slurry (styrene butadiene rubber (SBR) latex, acrylics and modified acrylics)

• Epoxies

• Chemicals for removal of rust

• Polymer Modified Mortars and Concrete (PMM/PMC)

• Water based waterproofing coatings

• Protective coatings

• Water based type flexible water proofing materials. Thicknesses of such waterproofing membranes are 1.5 to 3 mm and are generally available as pre packaged products. The performance advantages of such membranes are:
  » Safe application due to absence of organic solvent system.
  » Convenience of application as it does not require the surface to be dry.
  » Good adhesion with the cementitious, metallic and most other substrates.
  » Excellent elongation, flexibility and crack resistance.
  » Good waterproofness.
  » Resistant to harmful chemicals penetration.
### 4.3.4 Dr. Fixit / Roff Product Range for Repairs

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Generic Name</th>
<th>Area of Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Fixit Pidicrete MPB</td>
<td>Acrylic based polymer</td>
<td>For making polymer modified mortars for structural repairs &amp; as a Bonding Agent</td>
</tr>
<tr>
<td>Dr. Fixit Pidicrete URP</td>
<td>SBR based polymer</td>
<td>For making polymer modified mortars for structural repairs</td>
</tr>
<tr>
<td>Roff Supercrete XL</td>
<td>High Solid Content Acrylic based polymer</td>
<td>For making polymer modified mortars for structural repairs</td>
</tr>
<tr>
<td>Roff Bond Repair</td>
<td>High Solid Content SBR based polymer</td>
<td>For making polymer modified mortars for structural repairs</td>
</tr>
<tr>
<td>Dr. Fixit Epoxy Injection Grout</td>
<td>Low Viscous Epoxy Injection grout</td>
<td>For Structural Strengthening</td>
</tr>
<tr>
<td>Dr. Fixit Epoxy Bonding Agent</td>
<td>Epoxy Bonding Agent</td>
<td>For Bonding old to new concrete at locations where high open time is required</td>
</tr>
<tr>
<td>Dr. Fixit Anchorfix</td>
<td>Polyester Resin Based Anchoring Grout</td>
<td>For Anchoring reinforcement steel bars in the concrete</td>
</tr>
<tr>
<td>Roff Concrete Bond GP</td>
<td>General purpose Epoxy bonding Agent</td>
<td>For Bonding old to new concrete</td>
</tr>
<tr>
<td>Dr. Fixit Rust Remover</td>
<td>Rust Removing Compound</td>
<td>For cleaning and removing rust of reinforcement steel</td>
</tr>
<tr>
<td>Dr. Fixit Polymer Mortar PX</td>
<td>Two part Polymer Modified Mortar</td>
<td>Reinstatement of spalled concrete to RCC members like beam, columns, wall, Slab etc</td>
</tr>
<tr>
<td>Dr. Fixit Polymer Mortar HB</td>
<td>Single part high build High strength Polymer Modified mortar</td>
<td>For repairs to Structural members in tension zone and underneath the slab.</td>
</tr>
<tr>
<td>Dr. Fixit Newcoat</td>
<td>Heavy duty abrasion resistance aliphatic acrylic polymer based waterproof coating</td>
<td>For New / old RCC flat and sloping roofs</td>
</tr>
<tr>
<td>Dr. Fixit Pidifin 2K</td>
<td>2 part polymer modified cementitious W/p Coating</td>
<td>Balconies, Small terraces, wet areas, Chajjas</td>
</tr>
<tr>
<td>Dr. Fixit Raincoat</td>
<td>Waterproof decorative wall coating</td>
<td>Exterior surfaces of RCC, plastered masonry walls</td>
</tr>
<tr>
<td>Dr. Fixit Epoxy Zinc Primer</td>
<td>For cathodic protection to re-bars &amp; steel surfaces</td>
<td>For coating re-bars and steel surfaces</td>
</tr>
<tr>
<td>Dr. Fixit Coal Tar Epoxy</td>
<td>Coal Tar Epoxy</td>
<td>For corrosion resistant coating for concrete and metal structure</td>
</tr>
</tbody>
</table>
4.4 Non Destructive & Destructive Testing (NDT)

A number of non-destructive evaluation (NDE) tests for concrete members are available to determine in-site strength and quality of concrete. Some of these tests are very useful in assessment of damage to RCC structures subjected to corrosion, chemical attack and fire and due to other reasons. Non-Destructive Testing (NDT) can be carried out to assess the strength of RCC at the advice of Structural Engineer. These tests have been put under five categories depending on the purpose of test as under:

- In-site concrete strength
- Chemical attack
- Corrosion activity
- Structural integrity/soundness

Various non-destructive evaluation tests commonly used under each of these categories have been listed out in the following table:

<table>
<thead>
<tr>
<th>Commonly used NDE tests</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. In-site Concrete Strength</strong></td>
</tr>
<tr>
<td>1. Rebound Hammer Test (A qualitative field test method to</td>
</tr>
<tr>
<td>measure surface hardness of concrete)</td>
</tr>
<tr>
<td>2. Ultrasonic Pulse Velocity (A qualitative field test by</td>
</tr>
<tr>
<td>measurement of Ultrasonic Pulse Velocity)</td>
</tr>
<tr>
<td>3. Core cutting / sampling and Lab Testing of Core (Field</td>
</tr>
<tr>
<td>cum lab test method for assessing strength, density,</td>
</tr>
<tr>
<td>texture, permeability)</td>
</tr>
<tr>
<td><strong>B. Chemical Attack</strong></td>
</tr>
<tr>
<td>1. Carbonation test (for assessment of pH of concrete and</td>
</tr>
<tr>
<td>depth of carbonation)</td>
</tr>
<tr>
<td>2. Chloride test (for assessment of total water/acid soluble</td>
</tr>
<tr>
<td>chloride contents)</td>
</tr>
<tr>
<td>3. Sulphate test (for assessment of total acid/water soluble</td>
</tr>
<tr>
<td>sulphate contents of concrete)</td>
</tr>
<tr>
<td><strong>C. Corrosion Potential Assessment</strong></td>
</tr>
<tr>
<td>1. Cover-Meter (to measure the thickness of protective</td>
</tr>
<tr>
<td>concrete cover to reinforcing bars, reinforcement</td>
</tr>
<tr>
<td>diameters, reinforcement spacing)</td>
</tr>
<tr>
<td>2. Half Cell Method (for assessing probability of corrosion)</td>
</tr>
<tr>
<td>3. Permeability Test (for assessment of permeability of</td>
</tr>
<tr>
<td>concrete due to water and air)</td>
</tr>
<tr>
<td><strong>D. Structural Integrity/Soundness Assessment</strong></td>
</tr>
<tr>
<td>1. Ultrasonic Pulse velocity (A field method for</td>
</tr>
<tr>
<td>determination of discontinuities, cracks and depth of</td>
</tr>
<tr>
<td>cracks)</td>
</tr>
</tbody>
</table>

4.5 Factors, which make Repair Work successful

- The Managing Committee of any society should minutely look into socio-economic consideration in detail before finalizing the repair project for its success.
- Economic class of occupants.
- Immediate and future need of occupants after the repair work.
PLANNING REPAIRS

- Education of occupants towards building maintenance and repair.
- Capacity of occupants to contribute towards repair work.
- Impact on occupant’s monthly contribution towards maintenance if extra amenities like lift, extra underground water tank, security services, pest control services, etc. are coupled with repair work.
- Understanding the past history pertaining to administration of building maintenance and repair affairs.
- Harmony / disharmony among occupants.

4.6 Financial Planning

A Cooperative Housing Society is non-profit making body where members hold equity shares of the Society. In Mumbai majority of building are Cooperative Housing Societies where day to day affairs are conducted by elected Managing Committee and approval of major decisions are taken in General Body Meeting or Extra Ordinary General Body Meeting (in case of emergencies).

4.6.1 Mobilization of Fund by the Society

<table>
<thead>
<tr>
<th>Input Source of Income</th>
<th>Output Maintenance</th>
<th>Future Repairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Equity capital from the members transfer/sell of share</td>
<td>• <strong>Salary</strong>&lt;br&gt;  - Manager&lt;br&gt;  - Lift operator&lt;br&gt;  - Pump operator&lt;br&gt;  - Sweeper&lt;br&gt;  - Gardener&lt;br&gt;  - Security</td>
<td>Partly kept as reserved fund for future maintenance related repairs</td>
</tr>
<tr>
<td>• Maintenance charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Interest on collected fund</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Lump sum from member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Income from member submitting their flats on rental</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Rents for allowing terrace/ common space for parties etc. to the members/ outsiders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Car parking charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Banner and signboards fees from the advertiser</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Income from installation of common towers from mobile/ pager/ telephone companies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Any other source identified and tapped by the Society</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Taxes&lt;br&gt;  - To Municipal Corp.&lt;br&gt;  - Assessment Tax&lt;br&gt;  - Education Tax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Bill&lt;br&gt;  - Electricity&lt;br&gt;  - Water charges&lt;br&gt;  - Stationary&lt;br&gt;  - Auditors fees&lt;br&gt;  - Accountants fees&lt;br&gt;  - Donation for Cultural activities</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fund Flow related to Regular/Routine Maintenance:

- FUNDS FOR MAINTENANCE
  - INTEREST FROM DEFAULTERS
  - CAR PARKING CHARGES
  - INTEREST ON DEPOSITS
  - ANY OTHER POSSIBLE SOURCE
  - MAINTENANCE FROM REGULAR MEMBERS
  - HIRING CHARGES FOR COMMON UTILITY AREAS/ BANNER/ ANTENNA TOWERS
  - NON-OCCUPANCY CHARGES
  - SALARY
  - ELECTRIC BILL
  - FEES TO INTERNAL AUDITOR
  - HOUSE TAX
  - WATER BILL
  - INCIDENTAL SMALL REPAIRS & CIVIL WORKS
  - ROUTINE MAINTENANCE
    - CLEARING OF CHOKE UPS
    - REPAIR OF LIGHTS
    - REPAIR/ SERVICING OF PUMPS
    - REPAIR/ SERVICING OF LIFTS
    - TREATING OF CRACKS
    - PAINTING
    - ANTI-TERMITE TREATMENT
Fund Flow related to Regular/Routine Maintenance:

CONTRIBUTION FROM MEMBERS IN INSTALLMENTS FOR SPECIFIC REPAIR WORK ONLY

- LOAN FROM F.I.S., (IF REQUIRED)
- TRANSFER FROM CHARGES RECEIVED ON TRANSFER OF SHARES
- SAVING IN THE FROM OF F.D.R.
- FEE TO CONSULTANT
- PAYMENT TO MATERIAL SUPPLIER IN CASE OF MATERIALS SUPPLIED BY SOCIETY
- MOBILISATION ADVANCE TO CONTRACTOR

Funds for Maintenance

- SINKING FUND (IF REQUIRED)
- INTEREST ON FIXED DEPOSITS
- FUND RECEIVED FROM SELLING OF SURPLUS FSI
- INSTALLMENTS OF REPAYMENT OF LOAN (IF ANY)
- RELEASE OF RETENTION MONEY & PAYMENT OF TDS
- PAYMENT TO CONTRACTOR FOR R. A. BILL

Final Payment to the Contractor
4.7 **Execution of Repair Work**

In any repair work there are four phases. These are:

- Pre-repair planning
- Appointment process of contractor
- Execution of repair work
- Defect liability and final acceptance

4.7.1 **Pre-repair planning**

Pre-repair planning has been discussed in detail earlier starting from appointment of Consultant to fund mobilisation.

4.7.2 **Appointment Process of Contractor**

Before appointing the Contracting Agency for execution of repair work, there are certain procedures to be followed so that the repair work can be executed to achieve the objectives. The procedures to be followed are:

- Invitation of tender through public notice (newspaper, etc.)
- Issue of blank tender document comprising technical & commercial bids.
- Calendar of events for date of issue, receipt and opening of tender bids.
- Preparation of comparative statement of quotations received from bidders and evaluation of bidder based on documentary proof furnished.
- Interview of bidders.
- Study of rates of each item of work and deviations from workable rates of each item of work followed by item rate negotiation.
- Second tier of negotiation focusing on commercial terms and conditions and their impact on contract.
- Finalisation of best three bidders after overall evaluation.
- Site visit of completed project and ongoing projects of the bidders.
- Finalisation of contractor.
- Legal formalities like issue of letter of intent, work-order, signing the contract agreement, issuance cover, statutory formalities pertaining to Municipal Corporation.
- Preparation of schedule bar chart, cash flow v/s. work plan, materials requirement, etc.
- Allocation of space for site office, go-down, labour camp, parking shifting, temporary services.
- Check list for existing status and report.
4.7.3 Execution of Repair Work

- Mobilisation of resources by Contractor.
- Check on quality and quantity.
- Appointment of Site Engineer / Supervisor.
- Regular visits of Engineers / Management Consultant / Experts.
- Fortnightly meeting with Society, Consultant and Contractor for review of progress, next fortnight planning, cash management.
- Joint measurement of work actually executed.
- Checking of bills and issue of pay advice by Consultant.
- Issue of completion certificate and final bill certificate.
- Restoration of services.
- Demobilisation from site.
- Provisional acceptance of work by the Society.

4.7.4 Defect Liability and final acceptance

- Visit of Consultant once in 3 months and 1 week before monsoon.
- Maintaining the complain register for 1 year.
- Instruction by the Consultant to Contractor to rectify any defect appeared.
- Consultant’s certificate to release retention money after completion of defect liability period.
- Final acceptance of work by the Society.

4.8 Some Do’s & Don’ts for Housing Society’s Office Bearers

- For routine repair keep a panel of competent repair people like electricians, plumbers, carpenters, painters, etc. to be called upon to render their services. Maintain and update the database of these competent repair people. Do not get the repair services from any unauthorized vendor.
- Pay due and justified remuneration to competent repair people for keeping them motivated and inclined to render their services in future.
- Attend any damage to the building immediately. Do not go for short-term gains in repair.
- Do not wait for standby services also to fail.
- Do not grant permission for proposed modifications/alterations inside individual flats during renovation/interior decoration/refurbishing unless feasibility is checked and approved by Structural Engineer before start of work and certified after the completion of work. Maintain the records of the same for future reference.
- Maintain the record of repair work carried out in past under different categories.
• Educate the occupants of the building in maintenance & up keep of the building
• Do not become reluctant to appoint Consultant/Expert before going for major repair work.
• Do not judge the competency of a Consultant / Contractor from his tall promises, big publicity and volume of work.
• Do not rely on vague technical data given in Repair Chemical Manufacturer’s catalogues.
• Learn to trust the professional service providers (Consultant/Expert) after verification of his/her credentials.
• Allow sufficient time to implement complex and conventional methods of repairs as per the available advice.
• Be very objective all the time. Be loud and bold followed by deeds. Be fair (impartial), tolerant and at times firm. Ride over all the obstacles righteously to complete the repair project.
• Do not play too safe giving undue thought to personal responsibilities.
• Do not prolong the decisions deliberately even if cursed with inherent shortage of funds, compulsion to spend less than effectively required, general refusal of moral obligations towards a thankless job.
• Understand or try to understand the true concept of scientific and planned repair to avoid a near chaotic situation.
Replacement or restoration of a building is not an easy task and never an economical affair. Success of the Restoration Programme is always based on correct diagnosis, thorough knowledge and in-depth studies of problems faced by the building, proper methodologies, a very specific specification, and finally socio-economic considerations.

It is necessary for User, Engineer and Contractor to be conversant with the properties of repair materials. Also the behaviours of materials already used in the existing building and the compatibility of repair materials likely to be used in repair of building are to be understood. The properties of materials available from natural source cannot be easily altered whereas the artificial repair materials can be manufactured in such manner that they possess the desired properties. Artificial repair materials, their behaviours, their suitability under the given circumstances and their success in repair can be well analysed.

These artificial repair materials play a very important role in making any repair project a success. Situation of deteriorating structures in our country is much better due to lesser severity of environment with the exceptions of those structures situated in the coastal regions like in Mumbai, wherein both humidity and air borne salt take the toll on them, especially since they are not designed, constructed and maintained with extra care and better protection against these natural forces.

Owner (Societies or Individual), Engineer and Contractor are three important elements to make a repair project successful. Owner is such element, who occupies / capitalizes the building and intends to use the building for their entire life but also expects the same to perform for next generation. Engineer plays the role of identifying the need of repair, writing the specifications, supervision and execution at the building repair project. The third element Contractor and his Workers are physically in contact with the building repair work.

Unfortunately, except the Engineer and to some extent the Contractor, workers lack the training and owner lack the education. Workers should know the basics about building, construction material, handling and application of repair material, etc. while the owner should understand the need of timely maintenance and maintenance related repair. Owner should not take the building for granted, misuse it or leave it attended. Education of owner will definitely influence the workers, contractor and engineer positively, which was the whole concept of present booklet.

Hopefully, the present booklet must have created awareness among the Owners (Societies) and about the importance of maintenance and related repair besides understanding approach towards the repair.

ABOUT THE AUTHOR

Prof. A. K. Singh is an accomplished Educationalist, Structural Designer and Repair and Rehabilitation Consultant, with over 20 years experience in the field of civil engineering and many prestigious projects to his credit.

Prof. Singh is the founder head of A. K. Associates, a professional civil engineering firm offering engineering services like total repair and rehabilitation consultancy, specialised earthquake (Seismic) retrofitting of existing structures, stability checking of buildings for all combinations of Load etc.

This book is the result of a collaboration between the Dr. Fixit team at Pidilite Industries Ltd. and Prof. Singh to assure quality assessment and diagnosis of a sick building in a scientific and technical manner, to create and sustain an atmosphere of correct engineering practices and to develop competency of technical staff through continuous education.
<table>
<thead>
<tr>
<th>Area</th>
<th>Common Visible Problem</th>
<th>Solution</th>
<th>Product Choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walls</td>
<td>Severe rising dampness at floor level</td>
<td>Injection grouting at floor level</td>
<td>Dr. Fixit Dampfree</td>
</tr>
<tr>
<td></td>
<td>Damp spots on interior walls</td>
<td>Damp-proof coating on exposed plaster</td>
<td>Dr. Fixit Dampguard</td>
</tr>
<tr>
<td></td>
<td>Cracks on walls (&lt; 5 mm)</td>
<td>Crack filling using shrink-free crack filler</td>
<td>Dr. Fixit Crack X/Powder</td>
</tr>
<tr>
<td></td>
<td>Cracks on walls (&lt; 10 mm)</td>
<td>Crack filling using shrink-free crack filler</td>
<td>Dr. Fixit Crack X/Shrinkfree</td>
</tr>
<tr>
<td></td>
<td>Cracks around door/window frame joints</td>
<td>Crack filling using flexible-acrylic crack filler</td>
<td>Dr. Fixit Gapfill</td>
</tr>
<tr>
<td></td>
<td>Cracks in separation joints of Masonry/RCC</td>
<td>Crack filling using Polymer Modified Mortar</td>
<td>Dr. Fixit Magic Mortar</td>
</tr>
<tr>
<td></td>
<td>Spalling plaster</td>
<td>Re-plaster using Polymer Mortar Additive</td>
<td>Dr. Fixit Pidicrete MPB/URP/Super Latex</td>
</tr>
<tr>
<td></td>
<td>Protective coating for exterior facade</td>
<td>UV resistant, stretchable, weather-proof coating</td>
<td>Dr. Fixit Raincoat</td>
</tr>
<tr>
<td>Bathrooms</td>
<td>Dampness on outer face of bathroom wall</td>
<td>Damp-proof coating on exposed plaster</td>
<td>Dr. Fixit Dampguard</td>
</tr>
<tr>
<td></td>
<td>Mild dampness on ceiling</td>
<td>Damp-proof coating on exposed plaster</td>
<td>Dr. Fixit Krystalline</td>
</tr>
<tr>
<td></td>
<td>Drip-leakage from ceiling</td>
<td>Injection grouting for ceiling</td>
<td>Dr. Fixit PU Foam/Plain Injection</td>
</tr>
<tr>
<td></td>
<td>Wearing out of tile joint filler</td>
<td>Re-fill the worn out tile joints with a tile grout</td>
<td>Dr. Fixit Fevimate TG</td>
</tr>
<tr>
<td></td>
<td>Leakage from nahani trap</td>
<td>Re-install using non-shrink grout</td>
<td>Dr. Fixit Pidigroat 10 M</td>
</tr>
<tr>
<td></td>
<td>Sealing of sanitary joint fittings</td>
<td>Joint sealing using flexible-acrylic crack filler</td>
<td>Dr. Fixit Gapfill</td>
</tr>
<tr>
<td></td>
<td>Sealing of drain pipes in walls</td>
<td>Seal the joint with mortar using Polymer Mortar Additive</td>
<td>Dr. Fixit Pidicrete MPB/URP/Super Latex</td>
</tr>
<tr>
<td>Roof/Terrace</td>
<td>Cracks on RCC slab</td>
<td>Crack-filling using Polymer Modified Mortar</td>
<td>Dr. Fixit Pidicrete MPB/URP/Super Latex</td>
</tr>
<tr>
<td></td>
<td>Loose mortar on RCC slab</td>
<td>Re-plaster using Polymer Modified Mortar</td>
<td>Dr. Fixit Pidicrete MPB</td>
</tr>
<tr>
<td></td>
<td>Dripping from ceiling</td>
<td>Injection grouting for ceiling</td>
<td>Dr. Fixit PU Injection</td>
</tr>
<tr>
<td></td>
<td>Waterproofing of RCC slab (without screed/plaster overlay)</td>
<td>Waterproof coating</td>
<td>Dr. Fixit Newcoat</td>
</tr>
<tr>
<td>Basement</td>
<td>Cracks in RCC wall/floor</td>
<td>Crack-filling using Polymer Modified Mortar</td>
<td>Dr. Fixit Magic Mortar</td>
</tr>
<tr>
<td></td>
<td>Loose mortar on RCC slab</td>
<td>Re-plaster using Polymer Modified Mortar</td>
<td>Dr. Fixit Magic Mortar</td>
</tr>
<tr>
<td></td>
<td>Drip leakage on RCC wall/floor</td>
<td>Injection grouting for wall/floor</td>
<td>Dr. Fixit PU Foam/Plain Injection</td>
</tr>
<tr>
<td></td>
<td>Dampness on RCC wall/floor</td>
<td>Injection grouting for wall/floor</td>
<td>Pagel ZS/ZL 10</td>
</tr>
<tr>
<td></td>
<td>Damp-proofing of RCC wall/floor</td>
<td>Damp-proofing using crystalline waterproofing system</td>
<td>Dr. Fixit Krystalline</td>
</tr>
<tr>
<td></td>
<td>Honey-combing in RCC</td>
<td>Injection grouting for wall/floor</td>
<td>Pagel ZS/ZL 10</td>
</tr>
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1.1 Distressed Beam
1.2 Cracks
1.3 Damp Patch
1.4 Rising Dampness
1.5 Spalling Plaster
### 1.1 REPAIR TO STRUCTURAL MEMBERS

**Product**

Dr. Fixit Epoxy Zinc Primer, Dr. Fixit Epoxy Bonding Agent, Dr. Fixit Pidicrete MPB, Dr. Fixit Polymer Mortar PX/HB, Pagel U10/40/80

- Chip off the damaged portion to obtain a sound surface with straight edges
- Clean the corroded reinforcement bars using a wire brush or other mechanical means
- Ensure rust free re-bar surface prior to application of protective coating
- Brush apply 2 coats of Dr. Fixit Epoxy Zinc Primer at an interval of 30 minutes.
- Wash the area to be repaired with water & apply 1 bonding coat of Dr. Fixit Pidicrete MPB
- Bonding primer of Dr. Fixit Pidicrete MPB to be applied as a neat coat, undiluted
- Use Dr. Fixit Epoxy Bonding Agent in critical situations
- Repair to be carried out using Structural Grade Mortar - Dr. Fixit Polymer Mortar HB/PX or Pagel U10/40/80
- Reinstall the mortar whilst the bonding coat is still tacky
- Mixing & application of Dr. Fixit products as prescribed in ‘TDS’
- Allow the repaired beam/column/slab to cure adequately

### 1.2 CRACK REPAIRS

**Product**

Dr. Fixit Crack X Powder/Paste/Shrinkfree

- Ensure complete surface preparation prior to application
- Chisel the crack to a ‘V’ groove of 5 mm x 5 mm
- Clean the groove to remove all loose laitence & wash with water
- Apply crack-filler, Dr. Fixit Crack X Paste/Powder with a putty blade, as prescribed in the ‘TDS’
- Air cure for 24 hrs prior to overcoating with decorative paint
- Use Dr. Fixit Crack X Shrinkfree for cracks upto 10 mm width

### 1.3 DAMPPROOF COATING

**Product**

Dr. Fixit Dampguard

- Ensure complete surface preparation prior to application
- Wire brush the surface to remove existing paint & putty so as to expose the plastered wall
- Ensure complete crack-filling as recommended & wet the wall prior to over-coating
- Brush apply 2 coats of damp-proof coating Dr. Fixit Dampguard over the plastered wall
- Time duration between two coats to be 6 hrs. approx.
- Air cure for 24 hrs. prior to overcoating with decorative paint (refer ‘TDS’)
- Dr. Fixit Dampguard mixed with cement can also be use as a ‘Waterproof-Putty’

### 1.4 DAMPPROOF INJECTION GROUTING

**Product**

Dr. Fixit Dampfree

- Draw a line along the wall, 300 mm from the ground level & parallel to the window sill
- Mark points for grouting along the wall at a spacing of 300 mm c/c
- Now, drill holes of 12 mm dia at an angle of 45° at the predetermined points
- Fix PVC/MS nozzles in the grouting holes using a suitable putty & allow to set
- Inject Dr. Fixit Dampfree using a grouting pump as prescribed in the ‘TDS’
- Allow to cure for 24 hrs. & seal the grouting hole appropriately

### 1.5 REINSTATING SPALLING PLASTER

**Product**

Dr. Fixit Pidicrete URP

- Chip off the damaged portion to obtain a sound surface with straight edges
- Wash the area with water & apply 1 primer coat of Dr. Fixit Pidicrete URP
- Primer mixed in the proportion 1:1.5 (URP:Cement)
- Prepare PMM using Dr. Fixit Pidicrete URP & apply while the primer is tacky
- PMM consists of 1 part cement+3 parts sand+ 15% URP+20% water(% by weight of cement)
- Mixing & application of Dr. Fixit Pidicrete URP as prescribed in ‘TDS’
- Allow the repaired patch to cure adequately
1.1 Algae/ Fungus Growth
1.2 Cracks on Walls
1.3 Damaged Chajja
1.4 Spalling Plaster
Distressed Column
1.1 WATERPROOF COATING FOR EXTERNAL WALLS

Product: Dr. Fixit Raincoat/ Dr. Fixit Primeseal

- Ensure complete surface preparation prior to application
- Wire brush the surface to remove all the loose laitence & wash with clean water
- Ensure complete crack-filling as recommended & wet the wall prior to over-coating
- Brush apply 1 primer coat of Dr. Fixit Primeseal & allow to dry for 4 hrs.
- Brush apply 2 coats of Dr. Fixit Raincoat in a span of 4 hrs. over the primed surface
- Air cure for 7 days prior to complete functional usage
- Mixing & application of Dr. Fixit products as prescribed in ‘TDS’

1.2 CRACK FILLING

Product: Dr. Fixit Crack-X Powder/Paste/Shrinkfree

- Ensure complete surface preparation prior to application
- Chisel the crack to a “V” groove of 5 mm x 5 mm
- Clean the groove to remove all loose laitence & wash with water
- Apply crack-filler, Dr. Fixit Crack-X Paste/Powder with a putty blade, as prescribed in the ‘TDS’
- Air cure for 24 hrs. prior to overcoating with decorative paint
- Use Dr. Fixit Crack-X Shrinkfree for cracks up to 10 mm width

1.3 REPAIR TO STRUCTURAL MEMBERS

Product: Dr. Fixit Epoxy Zinc Primer, Dr. Fixit Epoxy Bonding Agent, Dr. Fixit Pidicrete MPB, Dr. Fixit Polymer Mortar PX/HB, Pagel U10/40/80

- Chip off the damaged portion to obtain a sound surface with straight edges
- Clean the corroded reinforcement bars using a wire brush or other mechanical means
- Ensure rust free re-bar surface prior to application of protective coating
- Brush apply 2 coats of Dr. Fixit Epoxy Zinc Primer at an interval of 30 minutes.
- Wash the area to be repaired with water & apply 1 bonding coat of Dr. Fixit Pidicrete MPB
- Bonding primer of Dr. Fixit Pidicrete MPB to be applied as a neat coat, undiluted
- Use Dr. Fixit Epoxy Bonding Agent in critical situations
- Repair to be carried out using Structural Grade Mortar - Dr. Fixit Polymer Mortar HB/PX or Pagel U10/40/80
- Reinstate the mortar whilst the bonding coat is still tacky
- Mixing & application of Dr. Fixit products as prescribed in ‘TDS’
- Allow the repaired beam/column/slab to cure adequately

1.4 REINSTATING SPALLING PLASTER

Product: Dr. Fixit Pidicrete URP

- Chip off the damaged portion to obtain a sound surface with straight edges
- Wash the area with water & apply 1 primer coat of Dr. Fixit Pidicrete URP
- Primer mixed in the proportion 1 : 1.5 (URP : Cement)
- Prepare PMM using Dr. Fixit Pidicrete URP & apply while the primer is tacky
- PMM consists of 1 part cement + 3 parts sand + 15% URP + 20% water (% by weight of cement)
- Mixing & application of Dr. Fixit Pidicrete URP as prescribed in ‘TDS’
- Allow the repaired patch to cure adequately
1.5 Leakage from drainage outlet

1.4 Spalling Plaster

1.3 Cracks

Delaminated W/P or Screed
### 1.1 WATERPROOFING OF ROOF SLAB (WITH PROTECTIVE SCREED OVERLAY)

**Product**
- Dr. Fixit Torchshield/Torchshield Primer, Dr. Fixit Roofseal

- Ensure complete surface preparation prior to application
- Chip off the damaged portion to obtain a sound surface with straight edges
- Wire brush the surface to remove loose pwrmaged portions with PMM as recommended
- Allow the repaired surface to cure for 24 hrs. Post which wet the surface to a SSD condition
- Brush apply 1 primer coat of Dr. Fixit Torchshield Primer & allow to dry for 4 hrs
- Brush apply 2 coats of Dr. Fixit Roofseal in a span of 8hrs over the primed surface
- Each coat of Dr. Fixit Roofseal to be applied in right angles to the previous coat
- Air cure for 24 hrs. post which overlay
- Mixing & application of Dr. Fixit products as prescribed in ‘TDS’

### 1.2 WATERPROOFING OF ROOF SLAB (WITHOUT PROTECTIVE SCREED OVERLAY)

**Product**
- Dr. Fixit Newcoat, Dr. Fixit Primeseal

- Ensure complete surface preparation prior to application
- Chip off the damaged portion to obtain a sound surface with straight edges
- Wire brush the surface to remove loose particles & laitence. Wash with clean water
- Ensure complete crack-filling & reinstate damaged portions with PMM as recommended
- Allow the repaired surface to cure for 24 hrs. Post which wet the surface to a SSD condition
- Brush apply 1 primer coat of Dr. Fixit Primeseal & allow to dry for 4 hours
- Dr. Fixit Primeseal to be diluted with 50% water (%by volume of Dr. Fixit Primeseal l)
- Brush apply 3 coats of Dr. Fixit Newcoat in a span of 4 hrs. over the primed surface
- Each coat of Dr. Fixit Newcoat to be applied in in right angles to the previous coat
- Air cure for 7 days prior to complete functional usage
- Mixing & application of Dr. Fixit products as prescribed in ‘TDS’

### 1.3 INJECTION GROUTING FOR DRIP LEAKAGE

**Product**
- Dr. Fixit PU Foam/Plain Injection

- Clean the area of leakage to expose the plaster
- Mark points for grouting at the desired location
- Now, drill holes of 12 mm dia at the predetermined points
- Fix MS nozzles in the grouting holes using a suitable putty & allow to set
- Inject Dr. Fixit PU Foam Injection using a grouting pump
- Follow the process with secondary grouting using Dr. Fixit PU Plain Injection
- Use Dr. Fixit Epoxy Bonding Agent in critical situations
- Repair to be carried out using Structural Grade Mortar - Dr. Fixit Polymer Mortar HB/PX
- Allow to cure for 24 hrs & seal the grouting hole appropriately

### 1.4 REINSTATING SPALLING PLASTER

**Product**
- Dr. Fixit Pidicrete URP

- Chip off the damaged portion to obtain a sound surface with straight edges
- Wash the area with water & apply 1 primer coat of Dr. Fixit Pidicrete URP
- Primer mixed in the proportion 1 : 1.5 (URP : Cement)
- Prepare PMM using Dr. Fixit Pidicrete URP & apply while the primer is tacky
- PMM mix may be of the following proportion 1 part cement + 3 parts sand + 15% URP + 20% water(% by weight of cement)
- Mixing & application of Dr. Fixit Pidicrete URP as prescribed in ‘TDS’
- Allow the repaired patch to cure adequately

### 1.5 WATERPROOFING OF SANITARY OUTLETS

**Product**
- Dr. Fixit Pidicrete URP

- Wire-brush/ chip-off the damaged surface to remove all the loose laitence
- Ensure complete surface preparation of area surrounding the sanitary outlet
- Brush apply, 1 bonding coat of Dr. Fixit Pidicrete URP mixed with cement (1 : 1.5)
- Prepare PMM using Dr. Fixit Pidicrete URP
- PMM mix may be of the following proportion 1 part cement + 3 parts sand + 15% URP (by wt of cement) + 20% water (by wt of cement)
- Apply the PMM whilst the bonding coat of Dr. Fixit Pidicrete URP is still tacky
- Cure adequately as recommended
- Mixing & application of Dr. Fixit products as prescribed in ‘TDS’
1.1 Dripping Ceiling

1.4 Wall Dampness
### 1.1 INJECTION GROUTING FOR DRIP LEAKAGE

**Product**  
Dr. Fixit PU Foam / Plain Injection

- Clean the area of leakage to expose the plaster
- Mark points for grouting at the desired location
- Now, drill holes of 12 mm dia at the predetermined points
- Fix MS nozzles in the grouting holes using a suitable putty & allow to set
- Inject Dr. Fixit PU Foam Injection using a grouting pump
- Follow the process with secondary grouting using Dr. Fixit PU Plain Injection
- Allow to cure for 24 hrs. & seal the grouting hole appropriately

### 1.2 WATERPROOFING OF SANITARY OUTLETS

**Product**  
Dr. Fixit Pidicrete URP

- Wire-brush/ chip-off the damaged surface to remove all the loose laitence
- Ensure complete surface preparation of area surrounding the sanitary outlet
- Brush apply, 1 bonding coat of Dr. Fixit Pidicrete URP mixed with cement (1 : 1.5)
- Prepare PMM using Dr. Fixit Pidicrete URP
- PMM mix may be of the following proportion
  - 1 part cement + 3 parts sand + 15% URP(by wt of cement) + 20% water(by wt of cement)
- Apply the PMM whilst the bonding coat of Dr. Fixit Pidicrete URP is still tacky
- Cure adequately as recommended
- Mixing & application of Dr. Fixit products as prescribed in ‘TDS’

### 1.3 TILE JOINT FILLING

**Product**  
Dr. Fixit Fevimate TG

- Ensure complete surface preparation prior to application
- Wire brush or scrape the tile joints to remove any loose particles so as to expose a clean joint
- Mix 2.5 parts of tile joint filler, Dr. Fixit Fevimate TG with 1 part water to obtain a putty of even consistency
- Apply to the tile joints with squeegee, spatula or putty blade.
- Finish the joint flush to the surface of tile using a hard rubber float, working diagonally across the grout joints
- Ensure to fill and compact the joints & remove all excess grout to get a clean surface
- Allow the tile grout to set for 8 hrs prior to full use of the ‘wet area’
- Mixing & application of Dr. Fixit products as prescribed in ‘TDS’

### 1.4 DAMP-PROOF COATING

**Product**  
Dr. Fixit Dampguard

- Ensure complete surface preparation prior to application
- Wire brush the surface to remove existing paint & putty so as to expose the plastered wall
- Ensure complete crack-filling as recommended & wet the wall prior to over-coating
- Brush apply 2 coats of damp-proof coating Dr. Fixit Dampguard over the plastered wall
- Time duration between two coats to be 6hrs approx
- Air cure for 24 hrs prior to overcoating with decorative paint (refer ‘TDS’)
- Dr. Fixit Dampguard mixed with cement can also be use as a ‘Waterproof-Putty’
1.1 Injection grouting along cracks

1.3 Structural Cracks Strengthening

Injection along Construction Joint

Surface Sealing with Curtain injections

CROSS SECTION OF BASEMENT
### Standard procedure for waterproofing of Basement

- Validate the severity of seepage. If the intensity of running water is high & cannot be controlled, then divert the flow of water using a PVC pipe at the spot of leak.
- Drill grouting holes at an angle of 45° on the wall adjacent to the area of leakage at a spacing of 500 mm c/c or less in a grid pattern.
- Fix PVC or MS nozzles (packers) in the grouting holes Dr. Fixit Instant Leak Plug or epoxy putty. Allow the nozzle to set for 24 hrs.
- Using a grouting pump, inject pre-packed cementitious grout Pagel ZS10/ZL10 through the nozzle at required pressure.
- Grouting should commence from the lowest possible level & proceed upwards along the grid with the pumping pressure increased gradually.
- Continue pumping until the grout flows out from adjacent nozzle. Detach the pump & nozzle and seal the grouting hole with Dr. Fixit Instant Leak Plug.
- Complete grouting of the entire wall in a similar manner.
- Follow similar procedure for drilling & fixing nozzle on the wall of seepage providing grouting holes along the crack (source of seepage) if any, on either sides, in a staggered manner.
- Using a grouting pump, inject Dr. Fixit PU Foam Injection followed by backup grouting with Dr. Fixit PU Plain Injection. Carry out grouting as prescribed above, along the crack (area of seepage).
- Make a “V” shape groove of dimension 25 mm x 25 mm along the crack & construction joint by mechanical means. Clean the groove of any loose material & wash with water.
- Apply Dr. Fixit Pidicrete MPB; acrylic bonding agent along the joint/crack & fill the groove with Polymer Modified Mortar using Dr. Fixit Pidicrete URP as prescribed in the technical data sheet.
- Use damp-proof coating Dr. Fixit Krystalline or any other suitable waterproofing membrane from the Dr. Fixit Product Range to ensure complete protection.
Company
Pidilite Industries has been the pioneer and market leader in adhesives and sealants, construction chemicals, hobby colours and polymer emulsions in India. We started manufacturing white glue – Fevicol only in 1959, and have now grown to cater to various other categories including paint chemicals, automotive chemicals, art materials and stationery, fabric care, maintenance chemicals, industrial adhesives, industrial and textile resins and organic pigments and preparations.

Unique Brands
Pidilite has some of the biggest and strongest brands in the adhesives and sealants category. These brands include Fevicol, M-seal and Fevikwik. Fevicol has become synonymous with adhesives to millions all over India and is ranked amongst the most-trusted brands in the country. Some of our other major brands are Dr. Fixit, Pagel & Roff in Construction Chemicals, Cyclo and Motomax in auto care, Ranipal in fabric care and Hobby Ideas in the Do-It-Yourself range of hobby and craft products.

State-of-the-Art Manufacturing
Pidilite continuously invests in state-of-the-art manufacturing facilities across 18 locations in India and 7 other countries.

R&D Facilities
We develop most of our products in-house with the help of a strong, research-driven innovation led by consumer insights. Innovation being one of the core values of the company, Pidilite established a state-of-the-art research centre in Singapore to expand the company’s product innovation strategy and attract international talent to work on its in-house global brands.
Construction Chemicals Division

Pidilite has a unique mission to ensure that the latest in construction chemical technology reaches the Indian masses. To help achieve this mission Pidilite has wide distribution network and an army of trained applicators who ensure that the correct solution is provided for Healthy Construction. Since Dr. Fixit - the waterproofing expert, was launched almost a decade ago; it has become the undisputed leader in the waterproofing category. In addition to waterproofing, Dr. Fixit offers solutions in Tile Fixing, Building Repairs, Sealants, Coatings & Paints, Grouts, Flooring and Concrete Admixtures.

To further propagate the message of “Healthy Construction”, Pidilite has set up a not-for-profit organisation - Dr. Fixit Institute of Structural Protection and Rehabilitation. The aim is to enlighten professionals and applicators about the latest advances in technology and challenge the wrong conventional building techniques. It has also set up an Advanced Diagnostic Laboratory and library for the industry professionals on its campus.

Global Presence

Pidilite is growing its international presence through acquisitions, setting up manufacturing facilities and sales offices in important regions around the world. Our products have been very well received in international markets and are now exported to more than 100 countries. In order to achieve sustained growth in international business, we are expanding our distribution network in various countries and also deploying additional manpower.

We have established offices / subsidiaries in several countries including USA, UK, Brazil, UAE, Saudi Arabia, Indonesia, Egypt, Bangladesh, Kenya, South Africa and Ghana. Besides distribution, we are carrying out various brand-building activities in these countries to establish our brands.

Global Prestigious Projects

[Map illustrating global projects]
Dr. Fixit brings you the widest range of Construction Chemicals

![Construction Chemicals Icons]

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