



Building Blocks

VOL. 20

OCTOBER - DECEMBER 2010

PRICE ₹ 10/-



Say Goodbye to Leaky Basements !

Editor's note

Dear Friend,

This issue of Building Blocks is dedicated to basement waterproofing and features an informative article on the same. In his article Tirtha Pratim Banerjee, Head - Training for Dr. Fixit Institute, gives an overview of basics of designing a watertight basement. The article helps solve the problem of leaky basements and damp walls by telling you about different types of basement waterproofing techniques.

Also there are some FAQ's related to waterproofing of basements that which will help to solve your doubts & provide solutions.

We also bring to you new products - **Dr. Fixit Pidiproof LW+** an integral waterproofing compound for concrete and plaster which makes the concrete cohesive and prevents segregation & **Roff Stoneguard WB**, water based penetrating sealer for porous & non porous stones. It protects stone or tile from water as well as stains.

Please go through and find out the use for yourself. As usual, do not hesitate to come back on any query or clarification whatsoever, and we will be glad to help you. We hope you find this issue informative and interesting. Do keep writing in your valuable feedback and suggestions.

Bharat Gothoskar

Head - Marketing
Construction Chemicals Division,
Pidilite Industries Ltd.

Contents

No.	Topics	Page No.
A	FROM THE COVER	
	Basement Waterproofing	03
	Leaky basements giving you trouble? Don't worry! We have a solution to your problem. Read these basic approaches to waterproofing and save your precious walls from leaking and crumbling.	
C	Q & A	
	Ask The Expert	08
D	NEW INITIATIVES	
	• ET ACETECH • HCLS	09
E	NEW PRODUCTS	
	• Dr. Fixit Pidiproof LW+ • Roff Stoneguard WB	10
F	NEWS	
	• Activities of DFI -SPR (January-March 2011)	11
	• Training Programs Organised • Exhibitions • Meets	11

PUBLISHED BY

Pidilite industries Ltd.

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Basement Waterproofing – A Basic Approach

Tirtha Pratim Banerjee, Head - Training, Dr. Fixit Institute of Structural Protection & Rehabilitation

Every rainy season most basement ceilings and walls complain of dampness and leaks. Fight this problem before it gets too late. Read here about the basic approaches to waterproofing and welcome the next rainy season with a warm smile and dry ceilings and walls.

Do you have a subsoil basement in your house or building? If yes, then it is important for you to understand the basics of designing watertight basements. In the beginning itself - i.e. at the time of construction, you need to waterproof your basement.

Before going into the details, let us first understand what the words “Basement” and “Basement Waterproofing”

Definitions

A basement is a below grade structure subjected to hydrostatic pressure due to rise of ground water table or accumulation of rain water at the foundation.

Basement waterproofing means as preventing water from penetrating into your basement area.

Concerned Areas

Basements are closed areas - so they are prone to high humidity conditions that ultimately lead to dampness and flooding. This in turn damages the concrete structure as water vapours transmit through the pores or because of direct leakage through the cracks and joints.

Moreover, keeping the water out of your basement will limit the amount of mold and mildew that can occur in your basement area. The mold and mildew can cause illness and sickness in you and your family.

System Selection

Basement design involves the selection of suitable combinations of construction and environmental control systems that enable the required internal environment

to be achieved. The selection of waterproofing system also depends on factors such as basement usage, nature of the foundation soil, ground water level, presence of sulphate or other aggressive chemicals in the ground water, depth of the basement structure and practicality and ease of installation of the waterproofing system. These factors should be considered during the design stage. The degree of protection could vary according to the required internal environment as given in Table 1.

Table 1. : Guidance on functional environmental requirements for basement usage

Basement usage	Required internal environment
Car parking, plant rooms (excluding electrical equipment), workshop	Some seepage and damp patches are tolerable
Workshops and plant room requiring drier environment; retail storage areas	No water penetration but moisture vapour is tolerable
Ventilated residential and working areas including offices, restaurants etc	Dry environment
Archives and stores requiring controlled environment	Totally dry environment

Types of Basement Waterproofing

Though there is a plethora of basement waterproofing products available in the construction industry to keep your basement dry, proper research has found that there are only three basic types of waterproofing solutions available to you.



1. Tanked Protection System

The first type is called “Tanking” (Fig. 1) or bonding a substance or membrane to the outside of your basement that will prevent water ingress into your basement walls. This method is predominantly used during the initial construction phase of your home. If your builder has built the structure properly, this should be all of the basement waterproofing that you will need.

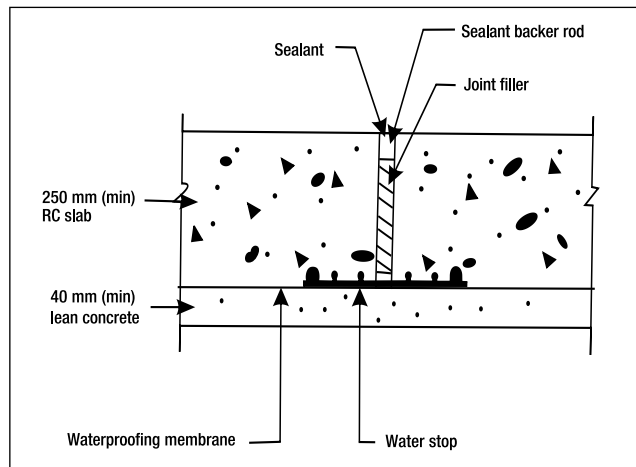


Fig. 1: Typical detail for tanked protection

The protection depends on the application of a continuous waterproofing barrier system applied to the structure.

The waterproofing should preferably be placed on the positive side of the basement. The membrane should ideally be bonded to the basement structure to avoid the problems associated with differential settlement as leak may occur where an unbounded membrane is no longer supported against the structure.

For non-cohesive soil, the waterproofing should extend by at least 300 mm above the maximum ground water level. For cohesive soil, the waterproofing should extend at least 300 mm above the proposed ground level. In cases where there are slabs abutting the basement, the waterproofing should turn below the soffit of the ground slabs for a minimum distance of 600 mm.

The waterproofing should not suffer any impairment of its protective action as a result of the anticipated movements of the buildings component due to shrinkage, temperature fluctuation or soil settlement.

Application

Basement structure should be designed for ease of application of waterproofing system.

The basement should be designed so that there is no differential movement between the structures and waterproofing system as any kind of movement will



damage the waterproofing system. This is especially true if the basement is seated on a slope.

Surfaces of the basement structure on which the waterproofing is to be applied should be prepared.

For membrane applied on negative side, any wall in contact with the waterproofing should be free of voids.

Protective measures should be taken to prevent the waterproofing membrane from damage by construction activities. Unless the waterproofing membrane is robust, it should be provided with protective layers.

Design Considerations

Waterproofing should preferably be applied as positive side barrier system. This will ensure that both the reinforced concrete structural components and the basement interior and finishes are protected from the water. Negative side barrier system sometimes could be used for remedial applications. In cases where the basement walls are cast in the ground, e.g. diaphragm walls and contiguous bored pile walls, a negative side barrier system or a suitably designed water management system may be considered.

For cast in-situ basement slab and wall, integral waterproofing can be considered.

The type and thickness of the waterproofing membrane used would depend on the depth of the basement, the hydrostatic pressure expected, the loading effects of adjoining structures and any heavy ground surface loading against the boundary of the building.

Waterproofing to basement slab should be sandwiched between two layers of protection. One layer protects the waterproofing from the soil and the other layer protects the waterproofing from construction activities such as concreting and steel reinforcement. Where the waterproofing membrane is robust and adequate by itself and will not to be damaged by construction activities; the concrete structure can then act as the internal protection layer itself. For waterproofing

basement wall, one layer of protection against construction activities and backfilling should be provided.

Considerations should be given to possible chemical attacks if the ground water is found to be aggressive. The basement, including its waterproofing system, should be designed to counter the chemical effects.

Generally, a system for collecting, draining and discharging water away from the basement may be installed. This could be in the form of perforated pipes that allow water drainage; coarse gravels or hardcore below the basement slabs to prevent natural capillary action of the soils and drainage mats applied directly against the waterproofing.

For basements where the dryness of the interior is critical, a secondary waterproofing system could be provided in addition to the main system.

It is important that the waterproofing system forms an effective tanking over the entire basement structure.

Waterproofing at penetrations, transitions and closures are critical and careful detailing should be implemented for these areas. The detailing will depend on the waterproofing system used and will depend primarily on the types of waterproofing products from the waterproofing manufacturers.

All joints in the basement structure should be protected by water stops as they are potential leakage points. Where possible, joints including construction joints should be minimized. The waterstops used should be compatible with the waterproofing membrane. A waterstop can be placed either internally or externally.

Where there are expansion joints, the waterproofing system should be detailed to accommodate movement and bridge over cracks.

An example of a movement joint is as shown in Fig. 2

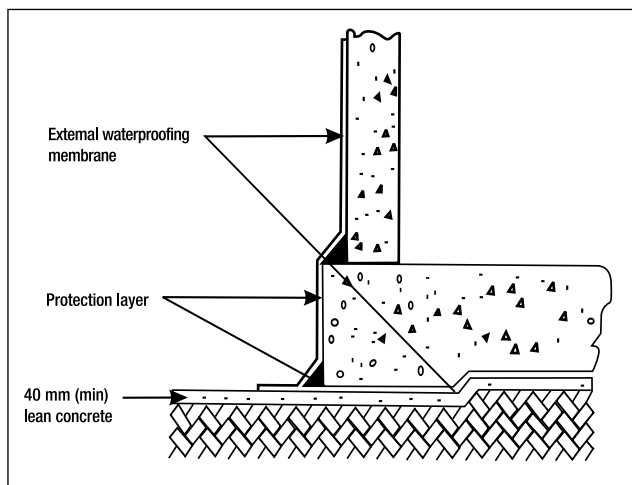


Fig. 2: Example of movement joint

Site Control

Site access is a key issue for positive waterproofing. While open cut excavations allow easy access to basement walls to enable correct placement of the waterproofing system, confined sites, which uses soil retaining systems such as sheet and contiguous pile system, make installation of the waterproofing system very difficult. Special considerations should be made to ensure that the waterproofing system can be installed within confined sites and the installation work procedure should take this into consideration.

A proper base which is the first protection layer must be provided for the installation of the waterproofing membrane. Projections or recesses should be minimized. The base must be able to withstand construction load; so that the membrane will not be subjected to excessive stresses while installing.

The waterproofing membrane should be installed according to manufacturer's instructions. Attention should be given to the construction of the waterproofing joints. The number of joints to be tested and the method of testing should be specified during design stage.

Care must be taken to ensure that the waterproofing membrane is not damaged during and after installation.

The second protection layer, when required, should be installed to prevent damage to the waterproofing membrane. It is preferable to use protection layer that is quick and easy to install.

Limitations

Barrier system of tanking may be membrane or surface coating which are invariably thin section and rely heavily on the skill of applicator to insure integrity. Any damage to this system becomes very much difficult for the repair. There are many cases of failures of such system which may be due to bad jointing, pin holing and damage during back filling operations or simply poor workmanship. Water ingress seen at a particular surface in case of a barrier system may be at a remote place from the actual point.

2. Cavity Drainage Protection System

The second basement waterproofing method that is utilized is called a "Cavity Drainage System" (Fig. 3). When your basement is constructed you will have a thin plastic honeycomb membrane installed on the walls and floors. The floors will be sloped toward the sump pump so that any water that ingresses into your basement structure can be promptly removed.

If your house experiences only mild rains throughout the year, this system may be all that you need for proper

water removal. The downside to the cavity system is probably system failure. During power outages, the sump pump may not work. Thus, allowing your basement to be filled with water. The honeycomb over time could also become a harbinger for mould and mildew spores.



If you live in parts of the country that occasionally receive heavy downpours then you will most assuredly be in need of the third and final type of basement waterproofing product. This product is an “Exterior Foundation Drain”, also called a “French Drain” by many in the construction industry. The drain is a system that is built on the outside wall of your foundation and diverts water through a ground drainage system away from the basement walls.

Utilizing the Tanking method and the Exterior Foundation Drain is the best methodology for preventing basement waterproofing problems. Many companies sponsor seminars and instructional videos on how to handle any basement waterproofing problems that you may have.

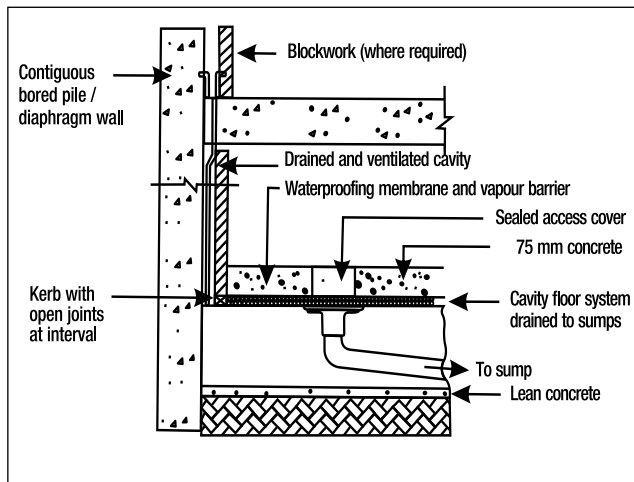


Fig. 3: Typical details for cavity drainage protection

The protection depends on the provision of floor and wall cavity to collect and channel water out of basement.

The Drained cavity protection system comprises cavity floors and walls with drainage channels leading to sumps, from which any water penetrating into the basement can be pumped away. This system is usually adopted where an external tanking system cannot be provided due to the construction system e.g. cofferdams comprising diaphragm walls, secant piles or continuous piles.

Application

Basement structure should be designed to minimise the ingress of water. Any moisture, which does find its way into the basement is channelled, collected and discharged within the cavity created through the addition of an inner skin to the walls and / or floor. Vapour transmission may be prevented by ventilation of the cavity and by providing an effective damp-proofing membrane over the under drained floors and walls.

The protection system is suitable for cast-in walls, such as diaphragm walls and contiguous pile walls, where it is difficult to exclude water from the basement structures. It is therefore more practical to accept some water penetration and design for positive removal of water.

The cavity should not be used to conceal large leaks.

Design Considerations

Cavities should be provided to allow free flow of any water penetrations, which should be directed to water collecting points.

The water collecting points, either channels or scupper drains, should be provided within the structure to discharge into sumps. The collected water should then be pumped or connected to a drainage system.

Wall cavities should be adequately ventilated to prevent any build up of a saturated atmosphere inside the cavities.

Site Control

Care should be taken during the construction of the cavities to keep them clear and free from debris and mortar droppings. Any ties used to stabilize the inner skin should be made of non-ferrous materials and dimpled or twisted to shed any water that may collect on them. The degree of success in achieving a watertight structure depends on the quality of workmanship in making and placing concrete, good site organization, clean and dry excavation, careful storage of materials, close fitting formwork, correctly fixed reinforcement, clean and properly prepared joints and adequate curing.

Limitations

There is a loss of usable space area whose cost would be much higher in metro cities comparing with the cost of an alternate modern system of basement waterproofing. There is also always risk of maintenance due to various problems which may arise like failure of pump, silting of drainage channels, over-loading due to bursting of water mains and the effects of rising water tables. Failure of such systems will lead to flooding of basement and a huge loss to the owner.

3. Structurally Integral Protection System

The structurally integral protection system (Fig. 4) comprises only the reinforced or pre-stressed concrete structure designed to either SS CP 65 or BS 8007. The permeability of the concrete is reduced by introducing water-reducing agents, pozzolanic products, organic binders or pore blocking additives. Provisions have to be made to ensure that all the joints are watertight. Integral crystalline waterproofing is more suitable for prevention of leakage as it permanently seals the pore of the concrete and lies in a dormant stage and becomes active in presence of water.

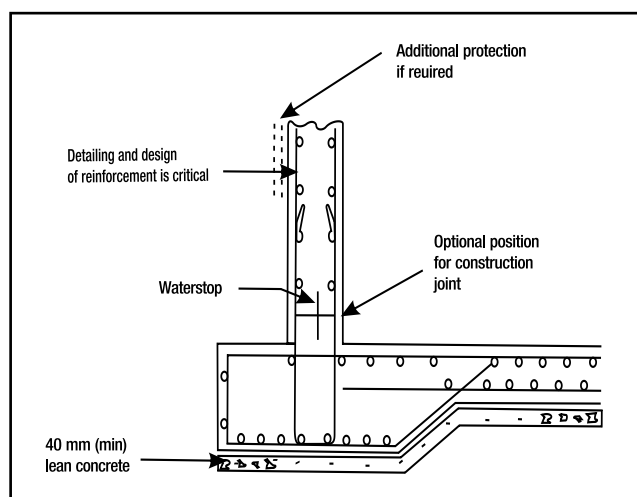


Fig. 4: Typical details for integral water proofing

The protection depends on the ability of the concrete structure to minimise / prevent water penetration.

Application

Basement structure should be designed in reinforced or pre-stressed concrete to minimise water penetration as per BS 8007 (to prevent water penetration), depending on the required internal environment of basement.

Design Considerations

The basement should be designed to ensure the prevention of differential settlement, the control of

cracking and the provision of a dense impervious concrete structure.

Basements should be designed to act monolithically with floors and walls continuously, and sharp changes at cross sections of the floors and walls should be avoided. Special consideration should be given to the provision of reinforcement at the junction of walls and slabs due to the bending stress which would occur at such positions.

The wall and floor thickness is generally not less than 250 mm with reinforcement percentages assessed on a serviceability crack width limit state. The minimum floor and wall thickness should consider the depth of basement measured from ground floor level as well as the water table. Cover to reinforcement on the external face should be determined in accordance with severe conditions of exposure as defined in IS 456.

Service entries are particularly vulnerable to water penetration and their design and installation should be given careful consideration.

Waterstops should be used in all construction joints and the sequence of construction should avoid trapped panels, a closing panel being limited in length and the reinforcement lapped.

The lowest level of basement floor slabs should be cast in bays or a series of continuous strips with transverse induced contraction joints provided to ensure that cracking occurs in predetermined and protected positions. Closing pours should be of limited size with reinforcement lapped and coincide with similar closing pours in the walls wherever possible. Longitudinal joints between the strips should form complete contraction joints.

Pipes and penetrations through the wall and slab should be minimised. Where this is unavoidable, waterbar and sealants should be used to make it watertight.

Site Control

The site should be kept essentially free of water during and prior to the concreting of the basement.

Tubes with removable caps may be inserted in the basement slabs to check on the water pressure when necessary, and to provide facilities for relief should this be required during the construction of the building.

The degree of success in achieving a watertight structure depends on the quality of workmanship in making and placing concrete, good site organization, clean and dry excavation, careful storage of materials, close fitting formwork, correctly fixed reinforcement, clean and properly prepared joints and adequate curing.



Ask The Expert

- 1 **The floor of our basement is leaking. It becomes aggressive in monsoon. The entire floor gets flooded and has to be pumped out frequently, and therefore not used by any of the residents. Please suggest a solution for the same?**

Normally in this case, dampness showing up in the floor will be due to a strong presence of water pressure. Waterproofing barrier/membrane may not have been provided under the floor, during construction itself. The only solution is to inject the leakage spots with ultra fine cementitious injection Pagel ZS 10 /ZL 10 - Super and ultra fine Cementitious Injection. Even after a few days, if the problem persists, go in for injecting PU foam injection followed by PU plain injection - Dr. Fixit PU Foam and Plain Injection systems. You can use cementitious instant leak plugging compound -Dr. Fixit Instant Leak Plug, as a temporary measure to arrest active leakage before arranging for the PU injection systems. If the problem is not solved, it is advised to lay an EPDM membrane - Dr Fixit Flexshield Blue as the floating w/p membrane of 1.2 mm thickness and cast over it a 4 inch RC slab admixed with a high range water reducing super-plasticising admixture.



- 2 **Our basement wall has been built in masonry. It has dampness and in certain points drip leakage. Can you help us to solve the problem?**

For brick walls, directly inject superfine cementitious injection through the plaster in the spots of dampness. The wall should start drying out after a few days. If it does not, go in for PU foam injection followed by PU plain injection. (Take care that the nozzles should penetrate well into the brick wall, beyond the plaster). Leave it for few days for the walls to dry up. Scrape off the paint till plaster is seen. Damp the wall and apply two coats of water based epoxy coating. After seven days, you can take up painting.



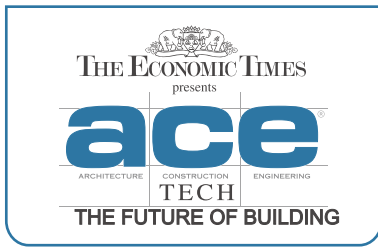
- 3 **We have a basement wall in RCC which is plastered from inside and tiled (plastered from inside but not tiled) and (no plaster or tiling inside). Adjacent to the wall outside the compound, there is a water carrying pipeline (can be marshy land with wet soil and high water table outside the compound), which we feel is always leaking, which is causing dampness and leakage in our basement wall. Can you suggest any remedy for this?**

If the surface of wall is not plastered, spots from where dampness is seen, should be marked. Paint, if any should be scrubbed off mechanically to expose the bare wall. Drill to fix perforated PVC nozzles and fix them with a quick setting epoxy putty - Dr. Fixit Magic Seal - Two part epoxy putty for fixing nozzles and filling wet cracks, available in a 2 part package. Wait for one hour and inject with ultra fine cementitious injection-PAGEL ZS / ZL 10 - Super and ultra fine cementitious injection - in all the points showing wetness / water / moisture. Even after 3 days, if the problem persists, opt for Dr. Fixit PU Foam and Plain Injection systems. In spots where water is dripping, use cementitious leak plugging compound Dr. Fixit Instant Leak Plug- available in powder form. Hold the plug against the water until the powder sets. This is only a temporary measure till you drill injection nozzles or packers around the spot. Drilling of nozzles must be done diagonally at an angle to the surface. This ensures that the injection material enters into the crack or void and fills it up effectively. If cracks are continuous the epoxy putty must be applied along the full length of the crack, while fixing the nozzles. This procedure must be followed at the junction of floor and wall, in all the spots of leakage. If the concrete wall has plaster or tiling over it, the source of the damp patches cannot be pin-pointed. It will become necessary to chip off the plaster or remove the tiling to expose the bare concrete wall to determine the point of leakage.

As a rule drip leakage must be treated with PU foam injection, followed by pumping a plain PU injection - Dr. Fixit PU Foam and Plain Injection systems. If the points are just damp, ultrafine cementitious injection - Pagel ZS 10- will solve the problem. After the wall becomes dry, you can choose to re-tile / re-plaster the surface. You can also leave the wall coated with 2 to 3 coats of water based epoxy coating Dr. Fixit Dampguard - Two part water based epoxy coating mixed with the colour of choice. If you choose to re-tile, use pre-packed tile adhesives and tile grouts, to ensure a proper tile fixing and additional waterproofing in the wall.



New Initiatives



For the last four years, Pidilite has been associated with ET ACETECH exhibition that focuses on the builders, architects, contractors rather than trade exhibitors. Pidilite is using this platform to promote Healthy Construction practices through Dr. Fixit, Pagel and Roff brands, in the minds of specifiers and ACE community.

The theme for our stall this year was "Construct Your Ideas". We created a look & feel of an under construction building, wherein we demonstrated the construction problems and their solutions provided by Pidilite. We had taken a stall size of 100 square meters at all the four venues, viz Mumbai, Chennai, Delhi and Bengaluru. We have got over whelming response at all the venues.

This connect initiative helps us to build and grow relationship with top consultants, contractor, architects, builders & applicators and have one-to-one interaction with the fraternity. Over 5000 visitors, visit Pidilite stall each year and we are in constant touch with them to solve their construction related problems and provide them information about new technologies in construction chemicals.



PRESENTED BY DR. FIXIT INSTITUTE

In our earlier edition we informed you that we have started Healthy Construction Lecture Series to promote healthy construction practices. Taking the series forward, a HCLS meet was held at Kolkata and Delhi on 23rd & 24th September '10 respectively. More than 200 top architects, consultants and builders attended the event at both the venues. Speaker for the event was Prof. Nele De Belie who spoke on "Self Healing Concrete as repair material in concrete structures". Prof. Nele De Belie is professor in Durability of Cement Bound Materials at Ghent University (UGent). She is technical director of the Magnel Laboratory for Concrete Research and in charge of the calibration department.

Talking about developments in modern construction technology, she said, "Building repair materials like steel, cement, brick etc have a lot of embedded energy. Self-healing concrete can reduce the emissions that result from the production of Portland cement based concrete, simply due to the act that if the self-healing concrete can lengthen the life of the concrete, reduce maintenance and repair, it will ultimately reduce the production of excess amounts of concrete and decrease CO2 emissions. Applied in the Indian context where infrastructure is on the rise and cities are already full with several buildings, the savings of time and costs can be tremendous, apart from reduction of traffic jams and loss of productivity."



New Products



DR. FIXIT PIDIPROOF LW+

LIQUID INTEGRAL WATERPROOFING COMPOUND FOR CONCRETE & PLASTER

Dr. Fixit Pidiproof LW+ is specially formulated additive composed of cement compatible, surface active Plastisizing agent, polymers & additives. It is used as an additive for cement concrete/ mortar/ plasters, because plastisizing properties, makes concrete cohesive and prevents segregation. It improves the integral waterproofing properties of cement concrete & plasters after curing.

Areas of application

Waterproofing of concrete and sand-cement mortar used in

- Basements
- Roof slabs and screeds
- Water tanks & water retaining structures
- External plastering
- Bathrooms and balconies
- Sumps and drains

Features & benefits

- Resists corrosion of steel
- Increases workability of plaster & concrete
- Increases its strength & durability
- Waterproofs mortar & concrete

Dosage

200 ml per 50 kg bag of cement.

Packaging

200 ml, 1, 5, 10, 20 & 100 litre



ROFF STONEGUARD WB

WATER BASED STONE SEALER

ROFF Stoneguard WB is water based penetrating sealer for porous & non porous stones. It is transparent in nature & protects stone with advanced penetrating microbond technology. It protects stone or tile from water as well as stains.

Areas of application

Natural stone such as marble, granite, limestone, slate, terrazzo, travertine & sandstone. Best suited for the most porous stone surfaces.

Features & benefits

- Non staining
- Transparent
- Water resistant
- Easy to use
- Maintains natural look of stone
- Cleaning of stone is easier

Coverage

- Marble / Granite - 23 - 23.5 sq. mtr. / ltr. per 2 coats
- Sand stone - 5.5 - 9.5 sq. mtr. / ltr. per 4 coats

Packaging

200 ml, 500 ml, 1 ltr & 5 ltr

News

Activities of DFI -SPR (January-March 2011)

Sr. No.	Programme	Date	Location
1	Building maintenance -Waterproofing and General Repair	20 th & 21 st January 2011	DFI-SPR, Andheri (E), Mumbai
2	Protective Coatings for Durable Structures	18 th March 2011	DFI-SPR, Andheri (E), Mumbai

For participation in any of the DFI program & any enquiry related to Dr. Fixit Institute, please contact **Tirtha Pratim Banerjee** on **022 - 28357683** or e-mail at **tirtha.banerjee@pidilite.com**

Meets, Programme & Exhibitions



SGA at SIS point - Patel Trading Co., Ahmedabad



Movie Show (DABAANG) for Dealers, Ahmedabad



Dealers Meet, Indore



Tile Application Level II, Ahmedabad



KACEA Expo, Bhuj



Technical Presentation at Mecon Limited, Ranchi



For any suggestions, please feel free to contact us at Pidilite Industries Ltd., Construction Chemicals Division, Ramkrishna Mandir Road, P.O.Box No.17411, Andheri (E), Mumbai-400 059. Phone : 2835 7000, 2835 7111 • Fax : (022) 2835 7008
 CALL DR. FIXIT ADVICE CENTRE TOLL FREE NO. FOR EXPERT ADVICE 1800 209 5504
 • Website: www.doctor-fixit.com • email: drfixit@pidilite.com



DR. FIXITTM

Prescriptions

FOR HEALTHY CONSTRUCTION

R_x

Terrace garden causing water seepage?

One of the most visible areas of the green building movement is green roofing, where roof tops are literally being built green with living plant. Obviously, these "vegetative roofs" present significant challenges to designers and contractors. The weight of the soil, lack of run-off, root penetration issues, and other factors make them more complex than a typical built-up roof.

Dr. Fixit Flexshield is EPDM based waterproofing and lining membrane that is used for making Green roofs. It enhances durability, since Dr. Fixit Flexshield last for 20 years.



For expert advice and field support,
Call helpline no. **1800-22-5502**
email us at drfixit@pidilite.com visit us at www.doctor-fixit.com



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