



MC-Special DM

Integral Waterproofing of Concrete using Dynamic SynCrystallization® and Hydrophobic Pore Blocking Technology for Production of High Performance Waterproof Concrete



Protection of Reinforced Concrete

Increased Durability and Reduced Porosity using **MC-Special DM**

Reinforced Concrete is one of the most versatile and widely used construction materials on account of its constructability and durability. It is used in a variety of exposure conditions and can be designed specifically for durability. However due to extreme requirements of speed, economy and construction practices, its durability is severely affected.

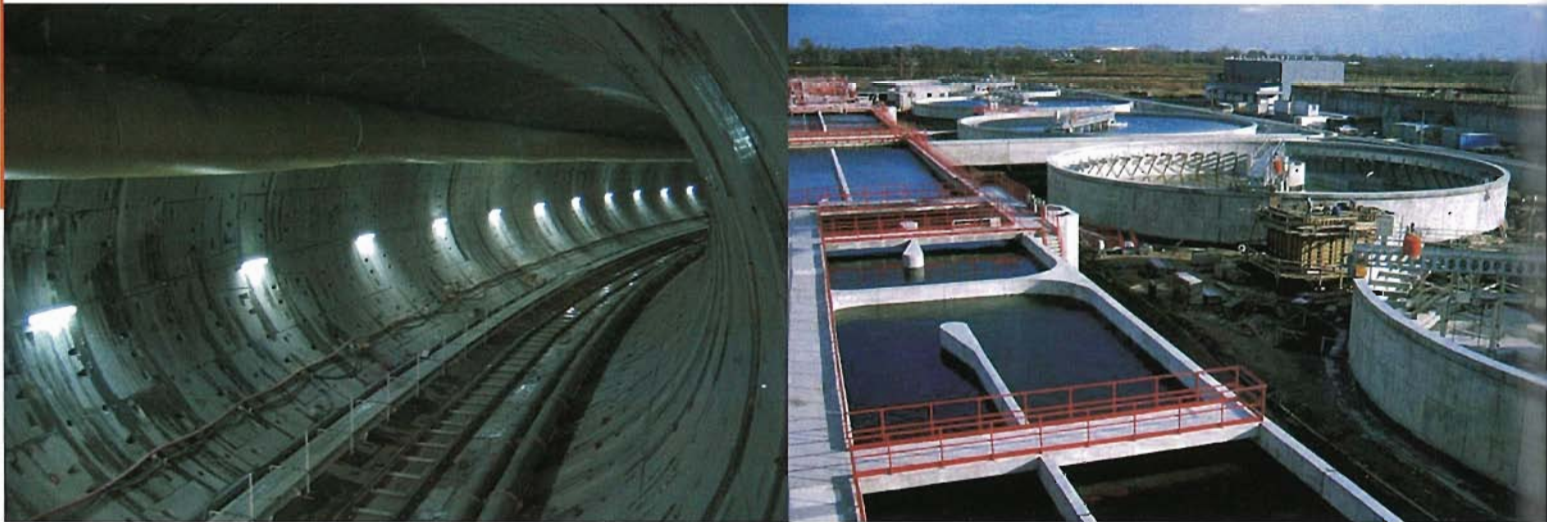
The inherent formulation of concrete and the high workability requirements makes concrete porous, which is a serious threat to its durability. Even M30 Concrete has as much as 14-20% pore volume, not including air pores.

The air pores in concrete, even in the case of excellent composition and compactness, are capillary pores (size 0.1 to 1m) and compaction pores (size > 1m). Concrete contains these pores due to a generous addition of mixing water used to obtain a sufficient compactness and workability.

Owing to these capillary pores, concrete is always pervious to water. These pores typically allow transport of water, gases and other harmful substances within concrete.

Recognizing this fact, it becomes imperative to protect concrete from ingress of water and other substances and the ultimate solution is integral waterproofing using **MC-Special DM**. This form of protection / waterproofing becomes increasingly attractive for applications where membrane or waterproofing coats are cumbersome. For e.g. in basement slabs, walls, lift-pits, underground pipes, tunnels, deep pile foundations, manholes, dams, water-retention structures, swimming pools, wet areas, cooling towers, etc.

In addition, over 40 years of positive experience makes **MC-Special DM**, the product of choice.



Fields of Application For **MC-Special DM**

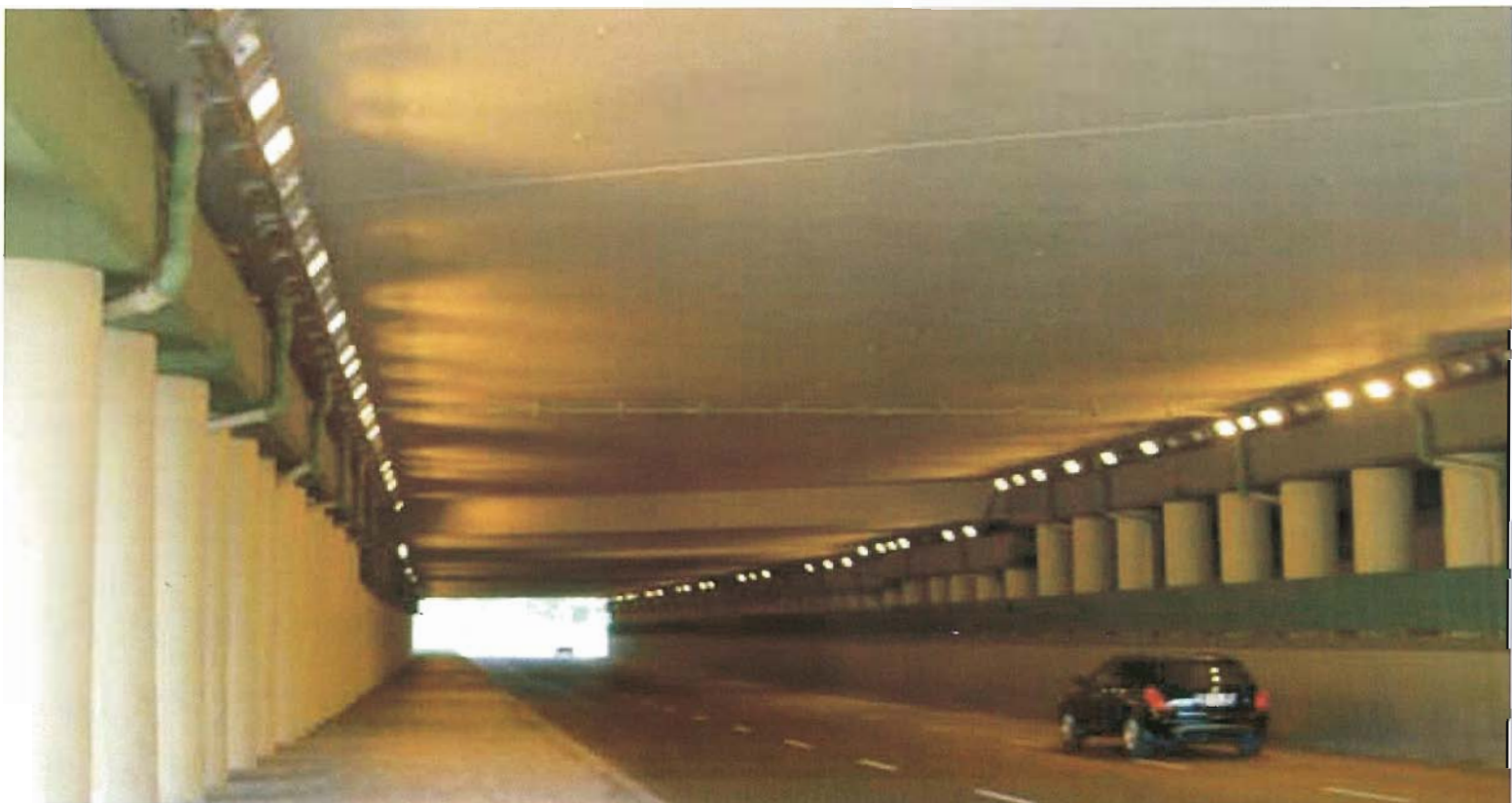
- Basement slabs
- Basement walls
- Cast in place structural slabs
- Elevator pits
- Concrete foundations
- Underground pipes
- Tunnels
- Deep pile foundations
- Manholes
- Dams
- Water-retention structures
- Swimming pools
- Cooling towers
- Podium decks
- Outdoor balconies
- Potable water tanks
- Wet Areas



As opposed to conventional waterproofing products, **MC-Special DM** provides integral waterproofing properties by combining three characteristics into one specially designed product. These properties which give Your Concrete the Extra Edge in Protection against water ingress are:

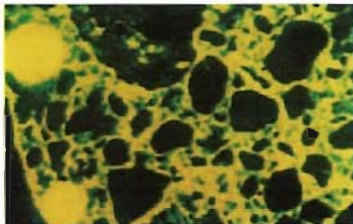
- **Reduction of Capillary Pores**
- **Dynamic SynCrystallization® (DySc) Technology**
- **Hydrophobic Pore Blocking**

MC-Bauchemie's expertise in material technology ensures the best protection for your concrete. A brief overview of these characteristics and how can **MC** can assist you to protect your structure is given on the following pages.

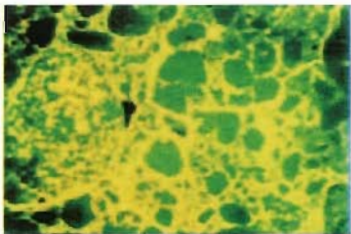


Watertight Concrete Construction

Special Product Characteristics to Safeguard your Construction



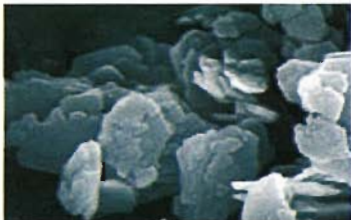
Capillarity with $w/c > 0.6$.
Large Pore Network and
Voids due to high w/c



Capillarity with $w/c = 0.45$.
Dense Cement Matrix,
ideal for watertight concrete



Dense Packing of Nanoparticles
and Aluminosilicates



Followed by Crystallization
Process Below



Application of MC-Special DM

MC-Special DM is easy to use, either in the concrete batching plant or in a transit mixer at site. **MC-Special DM** should be added to the concrete after all other components of the mix have been added.

Concrete should be mixed for at least a minute after addition of **MC-Special DM**. Dosage is economical at 1% by weight of cement or at least 3 kg **MC-Special DM** per m^3 of ready mixed Concrete.

Post addition of **MC-Special DM** to the concrete, the ensuing actions help protect your concrete against water ingress.

1. Reduction of Capillary Pores

Special additives in **MC-Special DM** make the concrete more workable (increases slump) at the same w/c ratio or provide a reduction in w/c at the same workability levels. This property helps concrete achieve excellent compactability thereby reducing capillary pores.

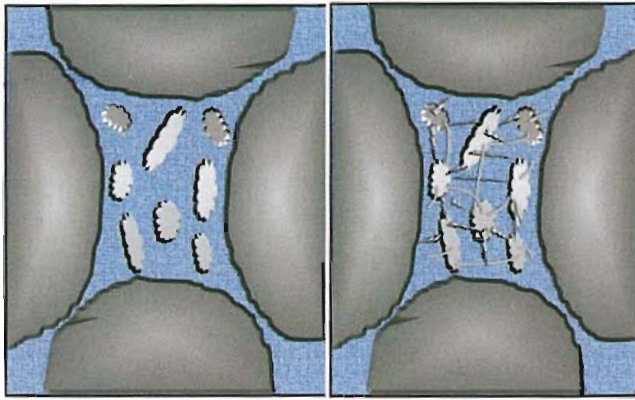
Less capillary pores means less transport of water through the cement matrix, giving your concrete an excellent first line of defense against water ingress.

2. MC's Revolutionary DySC® Technology

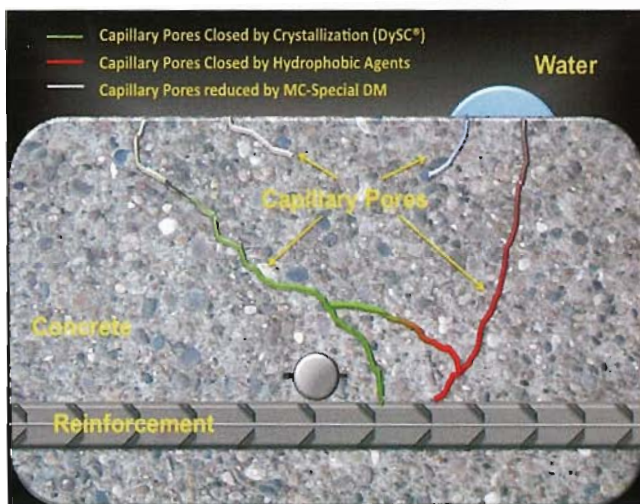
MC-Special DM uses special latent hydraulic and pozzolanic Nanoparticles to ensure densest packing in the cement matrix at the Nano scale. The cement matrix is therefore densified by a complex process called **Dynamic SynCrystallization (DySC®)**.

The strength of any cement-based material is based on hydration of the clinker components. The C-S-H gel so formed along with interlocked hydration crystals form the dense, impenetrable cement matrix.

MC-Special DM's Nanoparticles in the cavities (capillary pores) now act as additional crystallization seeds that lead to new C-S-H gels and crystal formation thus completing mineralization of the cavity structure.



Deposition of special nanoparticles between the cement particles in free water section of the pore. These nanoparticles react with the alkaline pore water and itself undergoes crystallization, keeping the pore gel intact. This process continues, mineralizing the pore cavity and reducing micro-cracks in the cement matrix. This process is called **DySC®**



Working Mechanism of MC-Special DM



2. DySC® Technology –Densest Matrix

The crypto-crystalline gels are in dynamic balance with the crystalline hydration phases. In presence of alkaline pore water, re-crystallisation and additional formation of new minerals occur on the surface of the specialized Nano-particles.

At this phase, the crystallization continues to the surface of the cement grains, without affecting the pore gel solution. Over time the structure of the matrix is becomes refined, overall porosity decreases, micro-cracks are sealed and pore size distribution is optimized.

In presence of external water ingress and existing calcium hydroxide in the pore space, this crystallization process accelerates, thereby filling up the pore cavities with the CSH gel and crystal hydration products. This mineralization process reduces further water ingress into the concrete.

Thus **DySC®** technology reduces pore content of the concrete and gives a second line of defense against water.

3. Hydrophobic Pore Blocking Mechanism

In addition to reduction of capillary pores and the Dynamic SynCrystallization®, **MC-Special DM** has special additives, which on one hand causes contraction of capillaries and on the other hand converts the water-absorbing capillary forces into water repellent capillary forces due to the hydrophobic effect of the constituent. Thus water is pushed out of the capillary pores and the concrete is kept dry.

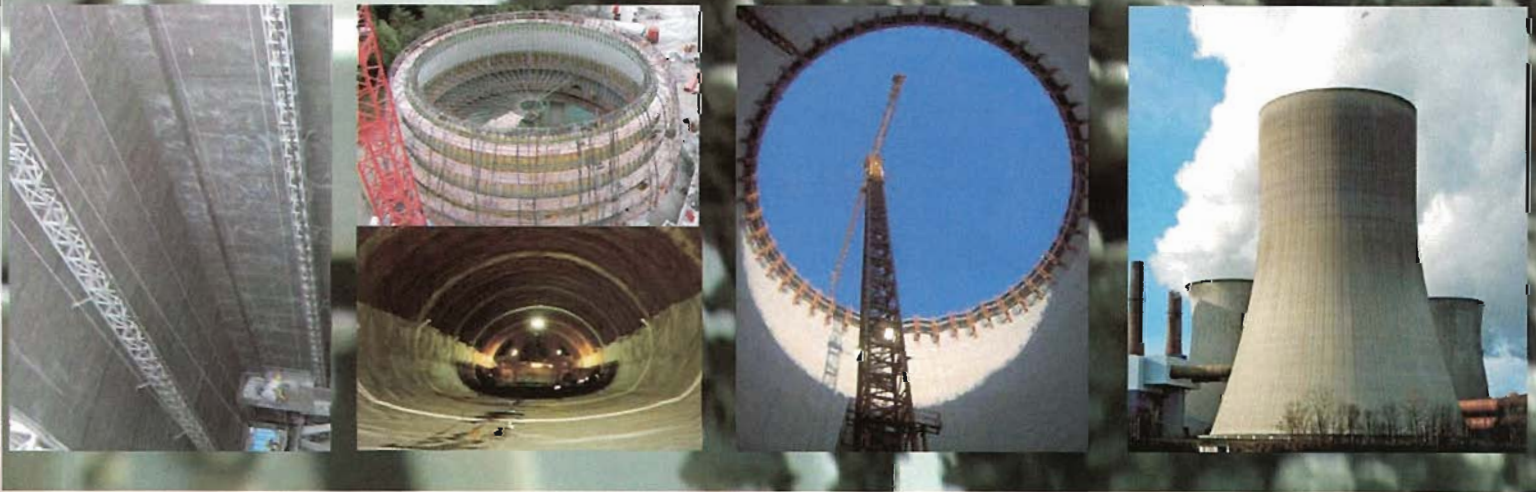
MC-Special DM is specially formulated and designed to prevent the passage of water through pores and capillaries of the concrete. This Hydrophobic Pore Blocking Mechanism gives your concrete the third and final line of defense against water ingress.

This property has been verified in accordance with DIN 1048:Part 5 which is testing water penetration into the concrete at varying pressure upto 5 bars. Results indicate that depending upon the concrete mix-design the absorption of water into the concrete is reduced by up to 60%.

In addition, similar tests for co-efficient of permeability for concrete treated with **MC-Special DM** was reduced by up to 67% as compared to control concrete.

Advantages of MC-Special DM

- Provides an efficient and durable barrier against rainwater, moisture and ground water and makes concrete waterproof
- No external application, simply mix it into your existing concrete
- Save costs on material and application costs for external membranes
- Speed up your construction, no waiting for external membrane application
- Permanent protection from water penetration and absorption
- Makes the mix more workable (improves the slump) at lower w/c
- Does not change setting time nor adversely effect the reinforcement.
- Disperses rapidly and makes a homogenous mix.
- Free from chlorides
- Certified for use in contact with water intended for Human Consumption



MC-Bauchemie, a leading name in the construction chemicals manufacturers over 2500 construction chemical products in over 40 locations all over the world, is an ISO 9001 certified company.

The strength of our Company lies in our Quality and Reliability.

We provide free technical services to solve the constructional problems. In addition to integral waterproofing for concrete we can also provide solutions for integral waterproofing of mortars, injection systems and protective coatings. The risks incurred when using untried materials and systems when protecting concrete are unacceptable. Modern and reliable material technology from **MC** eliminates those risks. We will be pleased to assist you in any of your concrete endeavors!

Application Example for MC-Special DM

Mix Design	Control Mix	MC-Special DM Mix
Cement (kg/m ³)	350	350
Fine Aggregate (kg/m ³)	840	840
Coarse Aggregate (kg/m ³)	1050	1050
Water (kg/m ³)	135	135
Admixture (kg/m ³)	5.25	5.25
MC-Special DM (kg/m ³)	-	7

Test Result	Control Mix	MC-Special DM Mix
Water Absorption at 7D, %	1.3	0.9
Water Absorption at 28D, %	1.3	0.7
Compressive Strength 7D, N/mm ²	66	67.5
Compressive Strength 28D, N/mm ²	75.5	76
Water Penetration @ 1kgf/cm ² , cm	10.1	4
Water Penetration @ 3kgf/cm ² , cm	14.1	9.1
Water Penetration @ 5kgf/cm ² , cm	19.4	11.8
Initial Drying Shrinkage, %	0.026	0.030
Wetting Expansion, %	0.016	0.005

Partial Job References: Projects using Concrete with Integral Waterproofing

Project	Location/Structure
Hiranandani Constructions – Powai and Thane	Residential Buildings and Basements
Hyatt Regency Hotel Nepal	Basements
Infosys Projects – Pune, Orissa and Bengaluru	Factory Buildings and Basements
Penguin Pools (over 100 swimming pools)	Swimming Pools and Basements
Bayernwerk AG	Cooling Tower Structure
Changi Water Reclamation Plan – C2, C3 and C4	Watertight Shafts 70m below ground, Slabs, Water Retaining Structures, Service Buildings, 3m Thick Raft Slabs, Basements, Digester Tanks.
BITS Pilani – Goa Campus	Basements and Roofs
Nehru Stadium	Tunnel Grouting
Serangoon Dam	Dam Structure
PWD Turkman Gate	Lift Pits
Mass Rapid Transit, Singapore	Base Slabs for Stations
10 Janpath New Delhi (CPWD)	Waterproofing Cooling Tower



MC-Special DM

Integral Waterproofing using **Dynamic SynCrystallization®** Technology

- Integral Crystallization for Water-tight Concrete
- Hydrophobic Pore Blocking
- Good Plasticizing Properties
- Improves Slump of Concrete
- Reduces Segregation and gauging water in Concrete
- Produces Waterproof Concrete

Other Waterproofing Solutions from MC

- Dichtament DM
- Dichtament DS/DS2
- Roofex 2000
- MC-APC
- Zentrifix Elastic
- Dichtament DS-Flex
- Nafuflex 2K
- Putz Dichtament



MC - Bauchemie (India) Pvt. Ltd.

411, Arenja Corner, Sector 17, Vashi, Navi Mumbai 400 703
Tel. : (022) 2789 2856 / 2788 0803 • Fax : (022) 2789 3870
E-mail : info.india@mc-bauchemie.com / mcbindia@yahoo.co.in
mcbindia_goa@rediffmail.com • www.mc-bauchemieindia.com