

CRYSTALLINE WATERPROOFING IN CONCRETE

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OVERVIEW

- INTRODUCTION
- NATURE OF CONCRETE
- MOISTURE RELATED PROBLEMS
- WATER PROOFING METHODS
- CRYSTALLINE TECHNOLOGY
- METHOD OF APPLICATION
- TESTING OF CRYSTALLINE WATERPROOFING
- CONCLUSION
- T.D.S & TEST CERTIFICATES

INTRODUCTION

- ☐ Concrete is a composite construction material
- ☐ It is porous & permeable
- ☐ To make it workable more water is added
- ☐ Extra water bleed out of concrete
- ☐ If not waterproofed it can absorb water and aggressive chemicals
- ☐ Crystalline waterproofing: blocks the movement of water

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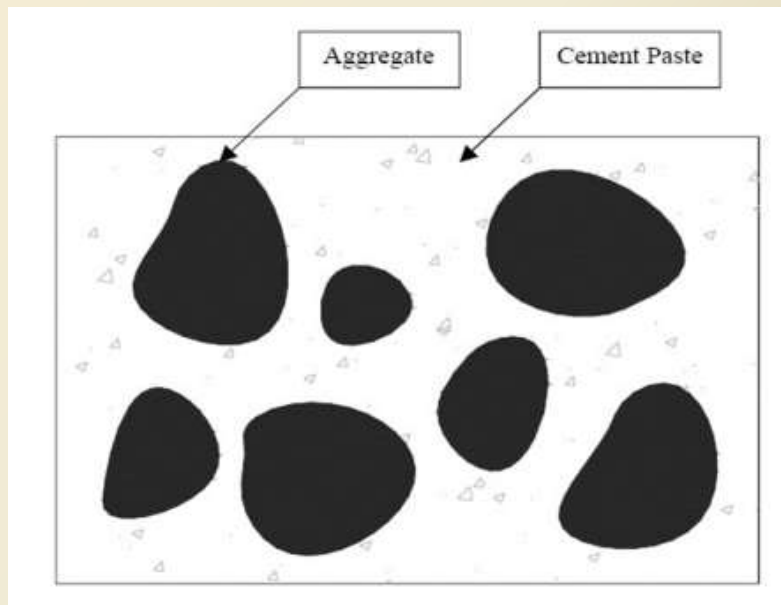
THE NATURE OF CONCRETE

Concrete is a heterogeneous composite of coarse and fine aggregate particles held together by cement paste.

Cement paste ordinarily constitutes about 25 to 40 % of the total volume of concrete.

To make it workable more water is added extra water, known as the

water of convenience, will bleed out of the concrete, leaving behind pores and capillary tracts corrode steel reinforcement and deteriorate concrete.



THE POROUS AND PERMEABLE NATURE OF CONCRETE

- ☐ Concrete as a porous and permeable material
- ☐ Porosity refers to the Amount of holes or voids left in concrete, is expressed as a percentage of the total volume of a material.
- ☐ Permeability is an expression of how well the voids are connected
- ☐ To make concrete workable
- ☐ This extra water will bleed out of concrete leaving behind pores and capillary tracts.
- ☐ Resistance to water permeability is essential requirement for durability. Hence waterproofing .



MOISTURE RELATED PROBLEMS

Freeze-thaw damage

- The change in the volume of water inside the pores of concrete causes stresses on particles adjacent to these pores
- Dependent on internal factors such as water content, pore structure, and distribution, also hydraulic pressure and osmotic pressure
- Different thermal contraction of the constituents, the temperature gradient

Alkali silica reaction (ASR)

- Water is considered to be a catalyst for the alkali silica reaction
- Most important factors that affect the ASR are amount of available moisture, the nature of the reactive silica, the amount of reactive silica and the particle size of the reactive material

cont.

❖ Acidic attack

Water can be considered to be acidic, when compared to concrete; therefore, the penetration of water can cause an acid-base reaction that can damage the concrete.

❖ Chloride ion diffusion.

Corrode the reinforcement of the concrete

❖ Sulfate attack

Sulphates can attack concrete by reacting with hydrated compounds in the hardened cement paste.

These expansive reactions can induce sufficient pressure to disrupt the cement paste, resulting in disintegration of the concrete

WATERPROOFING

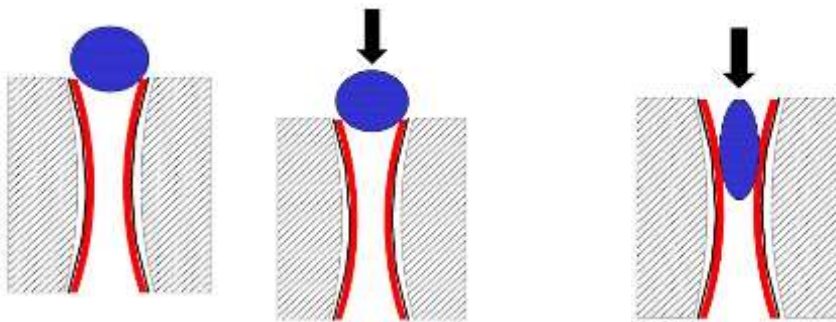


Damp proofing vs. Waterproofing

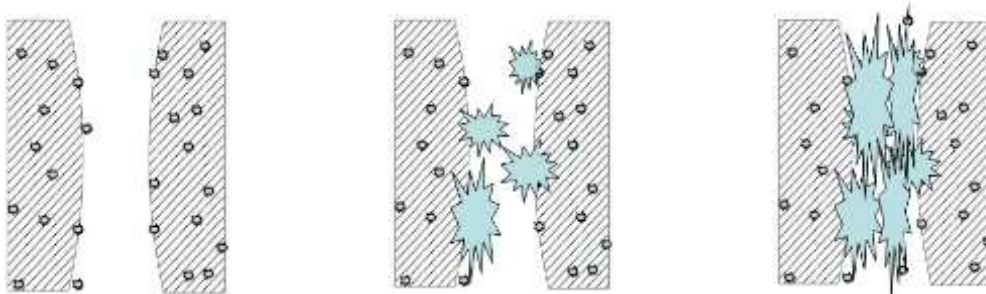
- Damp proofing products that get applied to the surface are coatings and form a physical barrier against water.
- Damp proofing admixtures are typically hydrophobic
- Damp proofing products will not resist water under pressure.
- For structures exposed to water under hydrostatic pressure, waterproofing is required.
- Surface applied or admixtures, form a strong physical barrier to water and will prevent water from entering the concrete even under a significant head pressure.

Hydrophilic vs. Hydrophobic

Hydrophobic or water repellent products such as fatty acid derivatives (stearates), soaps, oils, silicones and finely divided solids (bentonite, siliceous powders, etc.), repel water by increasing hydrophobicity

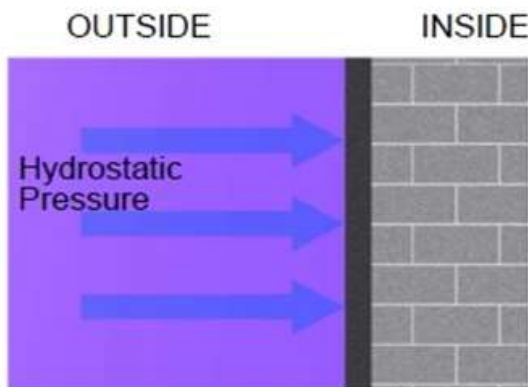


Hydrophilic chemicals absorb and utilize water to catalyze and react with cement particles to produce elongated crystalline structures



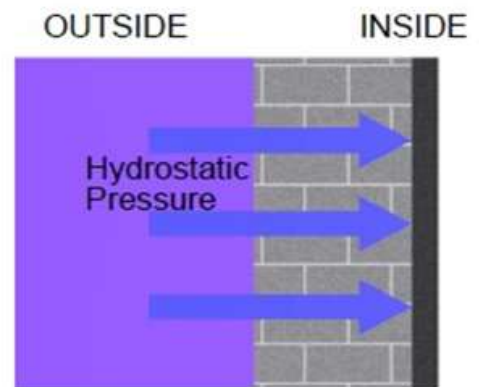
Positive And Negative-Side Waterproofing

- ❑ “positive” side of a waterproofing application the side where the water will be coming in contact with the concrete
- ❑ Negative side waterproofing is applied to the inside (dry) face of a structure



Waterproofing

POSITIVE SIDE WATERPROOFING



Waterproofing

NEGATIVE SIDE WATERPROOFING

WATERPROOFING METHODS

Fluid Applied Membranes

Fluid-applied waterproof products are liquid coatings containing a base of urethanes, rubbers, plastics, vinyl's, polymeric asphalts, or combinations thereof, which are applied to the surface usually by spraying or rolling.



Sheet Membranes

Sheet membrane products are normally made from thermoplastics, vulcanized rubbers, and rubberized asphalts. The sheeting membranes can be applied as fully bonded to the substrate or unbonded.



Internal Waterproofing

- Also known as integral waterproofing, are products that perform their function within the pores of the concrete as opposed to on the surface
- Significant advantage of being extremely durable
- Two major groups: reactive or un-reactive.
- Examples of unreactive products include sodium silicate, bentonite, water repellents, pozzolans etc.
- Reactive products are crystalline in nature and grow crystal formations to block cracks, pores.

EARLIER TECHNOLOGIES AND ITS DEMERITS

Barrier systems

- Mainly polymeric systems (epoxy resin, acrylic resins, bitumen systems, etc.)
- Drawback on barrier systems is the one-sided protection

Silicate solution

- Gel will absorb internal moisture from the concrete and begin to swell
- Produce extreme internal pressures and stresses
- Damaged quite severely

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Silane/ siloxane products

- Waterproofing materials for large concrete structures, such as airports, bridges, and marine applications
- Moisture-repellent nature to minimize the water penetration
increasing environmental concerns
- Because of the use of solvent-based products

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CRYSTALLINE WATERPROOFING TECHNOLOGY

- Contrast to conventional methods
- Has been used in Europe & North America for many years
- Method of waterproofing has been proven effective
- Prevent movement by filling the pores , capillaries & micro cracks.
- Become integral part of the structure



CRYSTALLINE CHEMICALS

- Crystalline chemicals create a reaction that causes long, narrow crystals to form and fill the pores, capillaries and hairline cracks of the concrete mass
- Crystalline growth continues till moisture is available
- Once the concrete is cured & dried the chemicals sit dormant until other dose of water cause the chemical reaction to begin again & grow crystals to shut off water

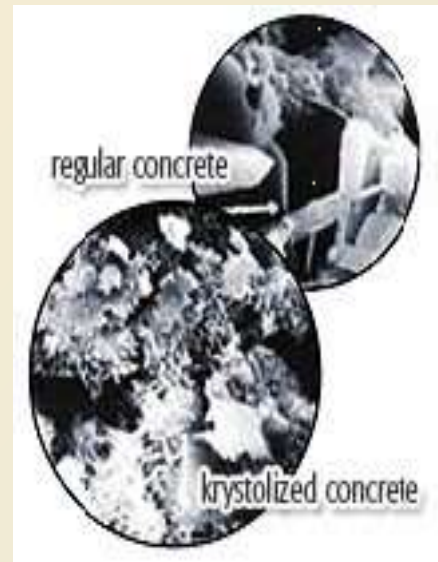
WORKING OF CRYSTALLINE TECHNOLOGY

Waterproofing effect is based on 2 reaction

1. Physical

2. Chemical

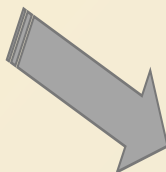
- Chemical diffusion is the physical reaction.
- Soln of high chemical density will migrate through a soln of low chemical density until the 2 equalizes.
- Water the low chemical density liquid is applied to concrete before crystalline chemicals.



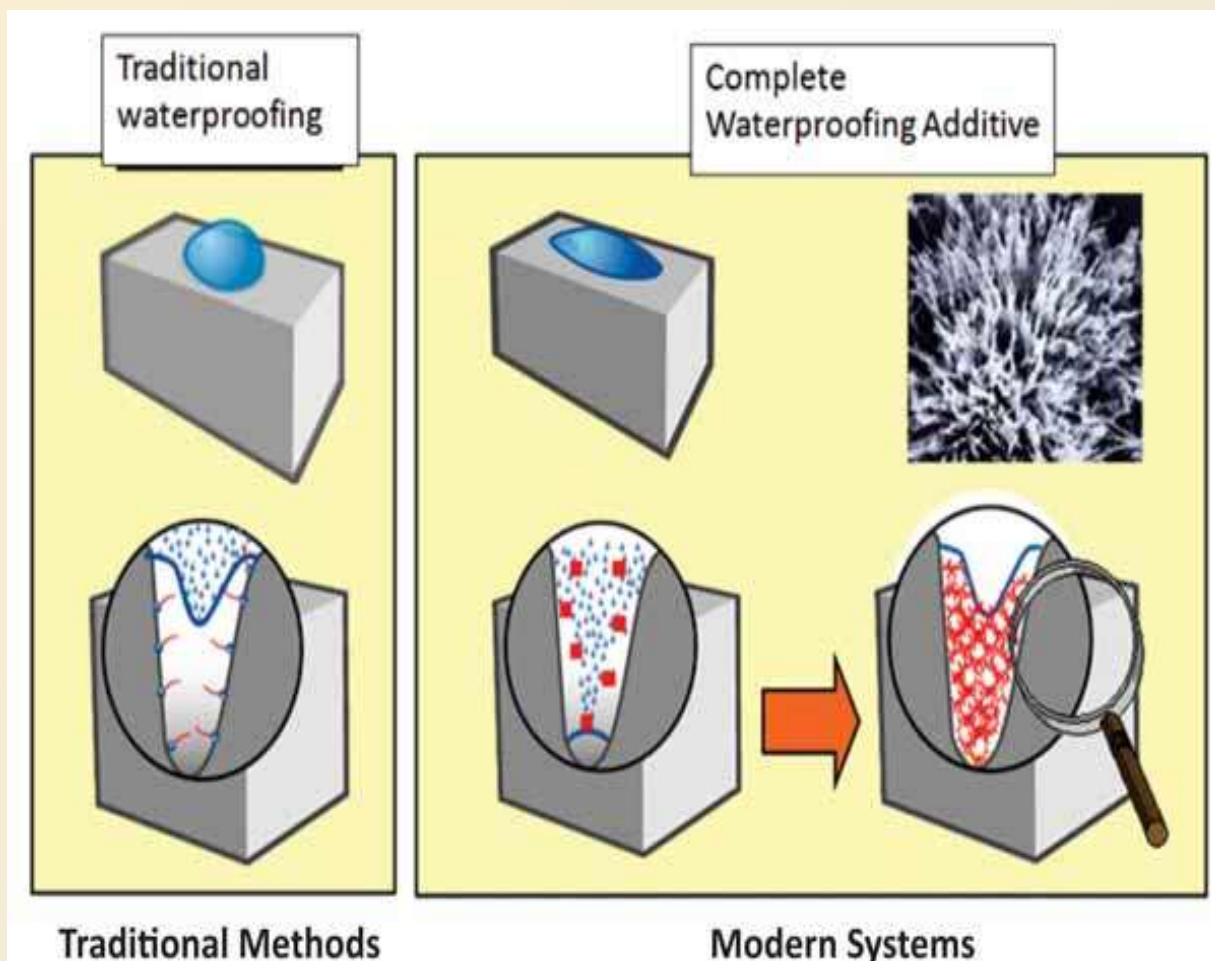
WORKING (CONTIUE)...

- Chemical reaction takes place between the crystalline water proofing chemicals & by products of cement hydration in the presence of moisture.
- Crystalline formation
- Reaction continue until the crystalline chemicals are either depleted or run out of the water.
- The crystalline formation fills and plugs the voids in concrete becoming an integral and permanent part of the structure.

CRYSTALLIZATION PROCESS



COMPARISON WITH TRADITIONAL METHODS



SELF SEALING

- Concrete can crack due to drying shrinkage , settling , seismic activity
- Concrete is able to seal itself off without the help of crystalline materials . Cracks can become blocked by deposited lime salts or loose material carried by the flow of water. This is called autogenous healing and can occur if cracks are very tight – less than 0.2mm
- Seal much wider cracks
- Once the concrete is cured & dried the chemicals sit dormant until other dose of water cause the chemical reaction to begin again & grow crystals to shut off water.

SELF SEALING



Crystalline materials can seal these cracks plus much wider cracks. Most manufacturers claim crack sealing up to 0.4 or 0.5mm

STABILITY

- Resistant to chemicals with ph between 3 & 11 under constant contact
- Resistant to chemicals with ph between 2 & 12 under periodic contact
- Tolerate temperature between - 32 & 130 degree Celsius
- Humidity , UV & oxygen levels have no effect on the ability to perform



Krystol Growth. With integral crystalline waterproofing, crystals grow within concrete to self-seal cracks and keep water out.

CRYSTALLINE TECHNOLOGY APPLICATIONS

3 different application methods

1. Applied as a coating to surface of an existing structure
2. Mixed directly at the batch plant as an admixture
3. Shaken as a dry powder to fresh concrete and trowelled into surface

BRUSH ON METHOD/ SURFACE COATING

- ☐ Crystalline product are supplied as a dry powder
- ☐ Mixed with water to form slurry
- ☐ Applied to inner or outer structure
- ☐ Best to apply on negative side
- ☐ Crystalline chemicals are absorbed into the cement by capillary action
- ☐ Majority of chemicals migrate into concrete in 28 days



Stages of Application

1. Surface preparation

- Have an open pore texture to allow the transfer of the reactive crystalline chemicals
- Be clean and free of form oil, laitance and other foreign matter

2. Wetting the surface

- Concrete be in a saturated, surface damp condition
- Diffusing medium that allows the chemicals to transfer from the coating into the capillary tracts

3. Coating application

- With a brush, broom, or spray equipment.

4. Curing

- Evaporation will first dry out the coating and then begin to pull moisture from out of the concrete
- Hardens and bonds properly to the concrete

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DRY SHAKE METHOD

- When placing concrete slab crystalline product as a dry powder is applied on surface just prior to finishing
- Material is troweled into the surface
- New concrete has high moisture content –accelerates the reaction
- Becomes part of the concrete the surface can be finished smooth



ADMIXTURE METHOD

- For new construction
- Crystalline admixture is added into the concrete mix
- Result in complete even and immediate distribution of crystalline product
- Material time and labour required to apply on surface can be avoided



BENEFITS

- Integrated - Penetrate into the concrete - will not crack, peel, tear or wear away
 - Self sealing
 - Environmental friendly
- Can be used from negative side
- Unaffected by climate and remain effective
- Saves time
- Protects reinforcing steel
- Perfect for blind wall application
- Inhibits the effects of CO, CO₂, SO₂ and NO₂
- Protects concrete against alkali aggregate reactions

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APPLICATIONS

- Potable water tanks
- Waste water treatment plants
- Tunnels
- Elevator pits
- Manholes
- Foundations
- Below grade waterproofing

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Testing Concrete Waterproofing

Crystalline waterproofing products has been thoroughly tested in independent labs throughout the world and according to international standards. Permeability, chemical resistance, compressive strength, freeze-thaw durability, potable water and other tests, all concluded positive results.



Permeability

U.S. Army Corps of Engineers CRD C48, "Permeability of Concrete", Aviles Engineering Corp., Houston, USA

Two concrete samples containing crystalline Admix and an untreated control sample were tested for water permeability. Both the treated and untreated samples were subjected to a pressure of 150 psi / 1.04 MPa (350 ft. / 106.7 m water head). Results showed moisture and permeated water throughout the untreated sample after 24 hours. However, the crystalline Admix samples showed no leakage, and water penetration of only 1.5 mm / 0.06 inches after 120 hours (5 days).

U.S. Army Corps of Engineers CRD C48, "Permeability of Concrete", Setsco Services, Pte Ltd., Singapore

Six crystalline Admix-treated and six untreated concrete samples were tested for water permeability. Pressure was gradually increased over five days and then maintained at 7 bars (224 ft. / 68.3 m water head) for 10 days. While the six reference samples showed water leakage beginning on the fifth day and increasing throughout the test period, the crystalline Admix samples showed no water leakage at any time during the test.

***ACCI Water Permeability Test, “Water Permeability of Concrete”, Australia
Centre of Construction and Innovation, University of New South Wales, Sydney,
Australia***

Concrete samples containing crystalline Admix at a dosage rate of 0.8% and 1.2% were tested for water permeability against control samples. All the samples were subjected to a pressure of 10 bars (100 meters / 328 ft. water head) for 2 weeks. Water permeability coefficients were calculated and the crystalline Admix treated concrete showed significant reduction in water permeability by up to 93 % at a dosage rate of 1.2%.

Compressive Strength

***ASTM C 39, “Compressive Strength of Cylindrical Concrete Specimens”,
Kleinfelder Laboratories, San Francisco, USA***

At 28 days, the compressive strength test of the concrete containing crystalline Admix measured 7160 psi / 49.5 MPa as compared to the reference sample at 6460 psi / 44.5 MPa (a 10% increase).

Freeze / Thaw Durability

***ASTM C 666, “Freeze/Thaw Durability”, Independent Laboratory, Cleveland,
USA***

After 300 freeze/thaw cycles, the crystalline Admix-treated samples indicated 94% relative durability.

Potable Water Exposure

***NSF 61, “Drinking Water System Component-Health Effects”, NSF
International, Ann Arbor, USA***

Exposure testing of potable water in contact with crystalline treated samples indicated no harmful effects.

Crack Sealing

***ASTM C1585 and ASTM C1202, “Evaluation of Self-healing Capability of Self-
compacting Concrete Made with Blast-furnace Slag Cements Activated by the
Crystalline Catalyst”***

Portland, blast furnace slag and slag-modified Portland concrete samples, treated with 2.5% Admix, were evaluated for self-healing capabilities. Microcracks were induced by loading to 90% of ultimate compressive strength. Cracked samples were then immersed in water to trigger self-healing after 28 , 56 and 84 days. Strength and ultrasonic pulse velocity tests were used to determine mechanical recovery; sorptivity and rapid chloride permeability were used to evaluate watertightness recovery. Results substantiated the ability of crystalline Admix to provide self-healing of cracked concrete.

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CONCLUSION

- ✓ Crystalline waterproofing technology will reduce porosity and permeability
- ✓ Provide high performance and benefits
- ✓ Crystals of this salt grows relatively fast and, therefore, minimize pore volumes inside the concrete.
- ✓ Cost-effective, when compared with short-service-life barrier systems.

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- ✓ Becomes an integral part of the concrete to increase the service life of the concrete.
- ✓ Also eliminates major demerits of earlier systems like barrier system, silicate solution etc
- ✓ Various experiments used to investigate the water-resisting capability of concrete crystalline penetration sealer materials shows that
 - It has acicular-structured crystals filling capillary pores for mortar substrate and
 - It reduces porosity and appears more effective in sealing pores or cracks

Product Data Sheet
 Edition 04.2022
 Identification No. CA-20

Crystalseal Admix

Cementations, Crystalline, Waterproofing Concrete Admixture
 ECO Friendly

Description

A dry powder admixture ,effective in creating waterproofing concrete
 It consist of O.P.C ,fine silica sand and active chemicals . These active chemicals react with moisture and by products of cement hydration to generate insoluble crystals throughout the pores and capillary tracts of the concrete. Thus the concrete became permanently sealed against water, water bore contaminants from any direction

Where to use

- Reservoirs
- Sewage and water treatment plants
- Tunnels & subway systems
- Foundations & basements
- Swimming pools , decks
bathrooms & elevators

Advantages

- Permanently waterproof concrete
- Resist both positive & negative hydrostatic pressure (up to 50 m)
- Resistant to chemicals (sulphates chlorides)
- Easy of application
- Seal hairline cracks up to 0.5 mm
- Breathable
- Less cost and save time
- Increase flexibility in construction schedule
- Safe in contact with potable water

Properties

Appearance	Grey
Specific Gravity	2.6
Compressive strength (28 days)	40MPa
Water permeability DIN 1048 ASTM) D-4068 , CRDC 48-92) pressure ≈ 50 m	No leakage
It complies with ASTM G1202 , C 666 , C -341,C-233 and NSFANSI Standard 61 Slump (30 min)	45mm

How to use

- For ready mix plant (Dry Batch) , the admix. Is added in powder form to the drum and then add the concrete materials and mix for 5 minutes
- For ready mix plant (central mix), the admix. Mixed with water to form a slurry (9 kg powder with 13.5 L . of water). Pour the concrete and mix for 5 minutes
- For precast batch plant , add the admix to the aggregates , mix for 2-3 minutes before adding cement and water , then blend the concrete
- Do not add admix. Powder to wet concrete

Product Data Sheet
Edition 04.2022
Identification No. CA-20

Theoretical Dosage rates

1-1.5% by weight of cement (Regular concrete)

0.8-1% by weight of cement (Ready mix concrete)

Packaging

15,5 kg/bag

One year in its sealed packs stored under proper conditions

Health and Safety

- **Crystal seal admixture** is non-toxic
- Use gloves to avoid contact with skin
- If skin comes in contact, wash immediately with soap and water.
- Do not use solvents
- Eye contamination must be immediately washed with water, then seek medical treatment.

Additional Information

PROKEM provides the construction industry with a comprehensive range of construction chemicals and specialty products answering the queries of modern engineers for trouble free durable structure.

PROKEM designs tailor made products should there be critical application that requires specific properties rather than our main range. For our customer's satisfaction,

PROKEM reserves the right to change the properties of its products.

All orders are accepted subject to our current term of sale & delivery.

Users must always refer to the most recent issue of the local product data sheet for the product concerned, copies of which will be supplied on request.

PROKEM extends technical services to include after sales support to assist users in

a proper handling of our products.

Product Data Sheet
Edition 02.2022
Identification No. WP - 11

Crystalseal

Surface Applied Capillary Waterproofing Cementitious Coating

Description

The **Crystalseal** waterproofing coating ensures the total and permanent solution to water leakage, ingress, or seepage in concrete structures or any cementitious substrate. The formation and development of insoluble crystals into water bearing capillaries and interstitial effectively blocks the further passage of water and ensures permanent water tightness for the life of the structure.

It complies with **ASTM C-39, 78, 1202, 666, 494, 1585, 1012, 579.**

CRD C 48-92. EN 1542, 12390-8.

NSF 61. DIN 1048

Where to use

Water Retention

- Water tanks / towers
- Reservoirs / Swimming pools
- Planters & Green roofs
- Water treatment works
- Dams & Canals & Harbours

Waterproofing

- Basements
- Tunnels
- Inspection pits
- Foundations
- Retaining walls

Advantages

- Provides total and permanent waterproofing properties by becoming an integral part of the structure to which it is applied. Active ingredients will not delaminate, peel off or wear away.
- Protects concrete and reinforcement against corrosive waterborne substances.
- Crystalline action is reactivated by contact with water providing dormant additional protection.
- Effective against both positive and negative water pressure.
- Non-toxic or tainting.
- Anti root complying with EN - 13948.

Properties

Form	Powder
Color	white , Grey.
Density	2 kg/L.
Pot life at 23°C.	30 min
Compressive strength after 28 days.	45-50N/mm ²
Flexural strength after 28 days.	10-12 N/mm ²
Bond strength in shear after 28 days.	7-8 N/mm ²
Water Permeability Pressure	5 Bar -ve/+ve
Water Vap. transmission	0.012Perms

How to use

Surface Preparation:

- Surfaces to be treated must be free from dust, oil, grease, paint residual curing compound, mould oils.
- Remove any laitance and provide an open pored, slightly rough surface sufficient to act as a mechanical key, essential for adequate adhesion of the **Crystalseal** treatment.
- Areas of weak or honeycombed concrete must be repaired. Hollow, debonding renders must be removed
- Surfaces to be treated if not already wet, should be saturated before first applications

Mixing:

- Add (7.5-8 L.) of clean water to 25 kg. sack of product.
- Place 3/4 of potable water into a suitable mixing container
- Add **Crystalseal** (powder) to the clean water while mixing. Mechanical mixing must be used to ensure complete dispersion of the powder component, add the remaining clean water and mix for an additional three minutes

Product Data Sheet
 Edition 02.2022
 Identification No. WP - 11

Application:

Crystalseal mixes are applied by brush or spray onto the dampened substrate. Apply the material in 2 coats at right angles, the second coat whilst the first is firm, but 'green' - usually 3-4 hours after first coat (dependant on temperature) or maximum 24 hours.

For old concrete, brickwork and granular concrete blocks, replace the second

Crystalseal coat with a render 5-10mm thick

Curing:

- The **Crystalseal** must be prevented from drying out too rapidly and should be kept damp for 5-7 days.
- Mist spraying with water and covering with polythene is effective when drying out would otherwise take place.
- Protect from weathering, sun, frost and wind for a similar minimum period.

Theoretical Coverage:

Two coat slurry application:

- **Crystalseal** : 0.8-1kg / m² / coat.

Application of render coat:

- **Crystalseal** : 10kg per m² at 5mm thick

Packaging:

Crystalseal is supplied in 25 kg sacks powder.

Shelf life & Storage:

12 months when stored in accordance with manufacturer instructions.

Additional Safety

- Use gloves to avoid contact with skin.
- If skin comes in contact, wash immediately with soap and water.
- Do not use solvents.
- Eye contamination must be immediately washed with
- water, then seek medical treatment.

Add PROKEM

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Central Unit For Analysis And
Scientific Services (CUASS)
Material Test Lab.
Ceramics, Polymers and
Solid Matter Department.

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معمل اختبار المواد
قسم السيراميك والبلاستيك والمواد الصلبة



Test Report

Report No.

Client

Authority & date

Items Tested

Results

Report Typist

Test carried

and supervised by

Authorized by

Issue date

**Condition of Test
& Issue**

MO1 2737 09 2013

Prokem Specialty Chemicals

Request Orders 25/8/2013

(Crystal Seal , Crystal Seal admix)

The detailed test results are given on the following pages of this report (3 pages)

* Mis. Noha samir – Naglaa Mohamed

* Mis . Fatma El – Zahraa Fikry

* H.Eng. Ahmed Said

* Chem. Amr El Shafey

* Dr. Abeer Abou El Soad

* Dr. Abou El Ftouh Abd El Hakem

Prof. Dr. Mostafa Zaki Mostafa

* The Supervisor of ceramics, Polymer and Solid Matter Department.

* Management Representative and Quality Assurance Manager.

3/10/2013

The test specimen was conditioned at 23 °C with a humidity of 60 % and the needed calibrations as well as balancing of the all used machines were always done .





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معمل اختبار المواد
قسم السيراميك والبلاستيك والمواد الصلبة



To/ Prokem Specialty Chemicals

Dear Sir.,

With correspondence to your request dated 25/8/2013 concerning the testing on a samples of (Crystal Seal , Crystal Seal admix) , We would like to inform you that the all following needed test was carried out which namely :-

1) Water Permeability according to CRD-C 48-92 .

The following data are give the obtained results representing the sample produced by your company.

Water Permeability

according to CRD-C 48-92

On a sample of Crystal Seal

Delivered from Prokem Specialty Chemicals

* There is no leakage in the testing sample at 5 bar .

Water Permeability

according to CRD-C 48-92

On a sample of Concrete + Crystal Seal admix

Delivered from Prokem Specialty Chemicals

* There is no leakage in the testing sample at 5 bar .





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معمل اختبار المواد
قسم السيراميك والبلاستيك والمواد الصلبة



*This report was given to you representing only the results for testing samples of (Crystal Seal , Crystal Seal admix), These results and conclusions were given to you without any responsibility on **THE CERAMICS, POLYMERS AND SOLID MATTER DEP. of THE MATERIAL TEST LAB in THE NATIONAL RESEARCH CENTRE** for pick up the samples to be tested.*

Head of Director of The Board of Central Department

for Scientific Analysis and Tests

&

**SUPERVISOR
OF CERAMICS, POLYMER AND
SOLID MATTER DEPARTMENT**

PROF.DR. MOSTAFA ZAKI MOSTAFA





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معمل اختبار المواد



Test Report

Report No.	MOI 3294 04 2020
Client	Prokem Special chemicals
Authority & date	Request Orders 30/4/2020
Items Tested	CRYSTALSEAL ADMIX
Results	The detailed test results are given on the following pages of this report (3 pages) .
Report Typist	* Mis. Sara Abdel Reheam – Naglaa
Test carried by	Mohamed - Noha Samir
	* Mis . Fatma El – Zahraa Fikry
	* H.Eng. Ahmed Said
	* Chem. Amr El Shafey
	* Dr. Abou El Ftouh Abd El Hakem
Authorized by	Prof. Dr. Mostafa Zaki Mostafa
	* The Supervisor of ceramics, Polymer and Solid Matter Department.
	* Management Representative and Quality Assurance Manager.
Issue date	10/6/2020
Condition of Test & Issue	The test specimen was conditioned at 23 °C with a humidity of 60 % and the needed calibrations as well as balancing of the all used machines were always done



(1/3-3294)

شارع التحرير - الدقى - القاهرة

مباشر ١٨١٠
٣٣٣٨٧٨٠٣
وفاكس ١٤٢٤

داخلى ٢٢٣٧١٦١٥-٢٢٣٧١٣٦٢
٢٢٦٠٧٥٤١-٢٢٣٥٥١٩٢

٢٢٣٧١٦١٥-٢٢٣٧١٣٦٢
٢٢٦٠٧٥٤١-٢٢٣٥٥١٩٢



E-mail: nrc1302a@yahoo.com



NATIONAL RESEARCH CENTRE
TAHRIR St. DOKKI, CAIRO, EGYPT
Central Unit For Analysis And
Scientifical Services (CUASS)
Material Test Lab.

المركز القومي للبحوث
الدقى . القاهرة . جمهورية مصر العربية
وحدة التحاليل والخدمات العلمية المركزية
معمل اختبار المواد



To / Prokem Special chemicals

Dear Sir.,

With correspondence to your request dated 30/4/2020 concerning the testing sample sample of CRYSTALSEAL ADMIX , We would like to inform you that the all following needed tests were carried out which namely:-

1- Water permeability test according to CRD C48 .

The following data gives the obtained results representing the sample delivered from your company .

Water permeability test according to CRD C48

On a sample CRYSTALSEAL ADMIX

Delivered from Prokem Special chemicals

* The sample un permeable to water pressure up to 1 bar .

Water permeability test according to CRD C48

On a sample CRYSTALSEAL ADMIX

Delivered from Prokem Special chemicals

* The sample un permeable to water pressure up to 3 bar .



(2/3-3294)

شارع التحرير - الدقى - القاهرة

مباشر ٢٢٢٨٧٨٠٣
وفاكس ١٤٢٤

داخلى ١٨١٠
١٤٢٤

٢٢٢٧١٦١٥ - ٢٢٢٧١٣٦٢
٢٢٦٠٧٥٤١ - ٢٢٢٥٥١٩٢



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This report was given to you representing only the results for the delivered sample of CRYSTALSEAL ADMIX , delivered from Prokem Special chemicals . These results and conclusions were given to you without any responsibility on THE CERAMICS, POLYMERS AND SOLID MATTER DEP. of THE MATERIAL TEST LAB in THE NATIONAL RESEARCH CENTRE for pick up the samples to be tested

These results up resent only the delivered sample and not any stored or produced quantities for any other purpose or project, Unauthorized reproduction of this report or copy of it by any way or for any target is prohibited .

**Head of Director of The Board of Central Department
for Scientific Analysis and Tests**

&

SUPERVISOR OF Material Test Lab

PROF.DR. MOSTAFA ZAKI MOSTAFA



(3/3-3294)

شارع التحرير - الدقى - القاهرة

مباشر ٣٣٢٨٧٨-٠٣
وفاكس ١٤٢٤

داخلى ١٨١٠
١٤٢٤

٣٣٣٧١٦١٥ - ٣٣٣٧١٣٦٢
٣٧٦-٧٥٤١ - ٣٣٣٥٥١٩٢



E-mail: nrc1302a@yahoo.com

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Test Report

Report No.	MOI 2120 10 2019
Client	Prokem Specialty Chemicals
Authority & date	Request Orders 17/10/2019
Items Tested	<u>Crystal seal</u>
Results	The detailed test results are given on the following pages of this report (3 pages) .
Report Typist	* Mis. Sara Abdel Reheam – Naglaa
Test carried by	Mohamed - Noha Samir
	* Mis . Fatma El – Zahraa Fikry
	* H.Eng. Ahmed Said
	* Chem. Amr El Shafey
	* Dr. Abou El Ftouh Abd El Hakem
Authorized by	Prof. Dr. Mostafa Zaki Mostafa
	* The Supervisor of ceramics, Polymer and Solid Matter Department.
	* Management Representative and Quality Assurance Manager.
Issue date	8/11/2019
Condition of Test & Issue	The test speciemen was conditioned at 23 °C with a humidity of 60 % and the needed calibrations as well as balancing of the all used machines were always done



(1/3-2120)





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To/ Prokem Specialty Chemicals

Dear Sir.,

With correspondence to your request dated 17/10/2019 concerning the testing sample of Crystal seal , We would like to inform you that the all following needed tests were carried out which namely:-

1- Solution resistance test according to ASTM C267 .

We would like to inform you that the all needed tests were carried out taking into consideration the following conditions :

1- Weighing Balance with tolerance + 0.0001 g was used in determining the weights .

2- On heating a Memmert West Germany oven was used .

3- The all used Machinery and the apparatus were calibrated periodically

The following table give the obtained results representing the sample delivered from your company .

Solution resistance test according to ASTM C267

On a Sample of Crystal seal

Delivered from Prokem Specialty Chemicals

Solution	Concentration (%)	Time (day)	Temp. (°C)	Result
NaCl	6	7	23	No effect



2019

(2/3-2120)





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*This report was given to you representing only the results for the delivered sample of Crystal seal , delivered from Prokem Specialty Chemicals. These results and conclusions were given to you without any responsibility on **THE CERAMICS, POLYMERS AND SOLID MATTER DEP. of THE MATERIAL TEST LAB** in **THE NATIONAL RESEARCH CENTRE** for pick up the samples to be tested These results up resent only the delivered sample and not any stored or produced quantities for any other purpose or project, Unauthorized reproduction of this report or copy of it by any way or for any target is prohibited .*

**Head of Director of The Board of Central Department
for Scientifical Analysis and Tests**

SUPERVISOR OF Material Test Lab

PROF.DR. MOSTAFA ZAKI MOSTAFA



(3/3-2120)

شارع التحرير - الدقى - القاهرة

مباشر ٣٣٣٨٧٨٠٣
وفاكس ١٤٢٤

داخلى ١٨١٠
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٢٢٢٧١٦١٥-٢٢٢٧١٣٦٢
٢٧٦٠٧٥٤١-٢٢٢٥٥١٩٢



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معمل اختبار المواد
قسم السيراميك والبلاستيك والمواد الصلبة



Test Report

Report No.
Client
Authority & date
Items Tested
Results

Report Typist
Test carried
and supervised by

Authorized by

Issue date
Condition of Test
& Issue

MO1 2737 09 2013

Prokem Specialty Chemicals

Request Orders 25/8/2013

(Crystal Seal , Crystal Seal admix)

The detailed test results are given on the following pages of this report (3 pages)

* **Mis. Noha samir – Naglaa Mohamed**
* **Mis . Fatma El – Zahraa Fikry**
* **H.Eng. Ahmed Said**
* **Chem. Amr El Shafey**
* **Dr. Abeer Abou El Soad**
* **Dr. Abou El Ftouh Abd El Hakem**

Prof. Dr. Mostafa Zaki Mostafa

* **The Supervisor of ceramics, Polymer and Solid Matter Department.**
* **Management Representative and Quality Assurance Manager.**

3/10/2013

The test specimen was conditioned at 23 °C with a humidity of 60 % and the needed calibrations as well as balancing of the all used machines were always done .





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قسم السيراميك والبلاستيك والمواد الصلبة



To/ Prokem Specialty Chemicals

Dear Sir.,

With correspondence to your request dated 25/8/2013 concerning the testing on a samples of (Crystal Seal , Crystal Seal admix) , We would like to inform you that the all following needed test was carried out which namely :-

1) Water Permeability according to CRD-C 48-92 .

The following data are give the obtained results representing the sample produced by your company.

Water Permeability

according to CRD-C 48-92

On a sample of Crystal Seal

Delivered from Prokem Specialty Chemicals

* There is no leakage in the testing sample at 5 bar .

Water Permeability

according to CRD-C 48-92

On a sample of Concrete + Crystal Seal admix

Delivered from Prokem Specialty Chemicals

* There is no leakage in the testing sample at 5 bar .





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قسم السيراميك والبلاستيك والمواد الصلبة



*This report was given to you representing only the results for testing samples of (Crystal Seal , Crystal Seal admix), These results and conclusions were given to you without any responsibility on **THE CERAMICS, POLYMERS AND SOLID MATTER DEP. of THE MATERIAL TEST LAB in THE NATIONAL RESEARCH CENTRE** for pick up the samples to be tested.*

Head of Director of The Board of Central Department

for Scientifical Analysis and Tests

&

**SUPERVISOR
OF CERAMICS, POLYMER AND
SOLID MATTER DEPARTMENT**

PROF.DR. MOSTAFA ZAKI MOSTAFA





Crystalseal Admix-NF

Cementations, Crystalline, Waterproofing Concrete Admixture
ECO Friendly

Description

A dry powder admixture ,effective in creating waterproofing concrete & cement mortars (no fines grade). It consist of O.P.C, and active chemicals. These active chemicals react with moisture and by products of cement hydration to generate insoluble crystals throughout the pores and capillary tracts of the concrete. Thus the concrete became permanently sealed against water, water bore contaminants from any direction

Where to use

- Reservoirs
- Sewage and water treatment plants
- Tunnels & subway systems
- Foundations & basements
- Swimming pools , decks
bathrooms & elevators

Advantages

- Permanently waterproof concrete
- Resist both positive & negative hydrostatic pressure (up to 50 m)
- Resistant to chemicals (sulphates & chlorides)
- Easy of application
- Seal hairline cracks up to 0.4 mm
- Breathable
- Less cost and save time
- Increase flexibility in construction schedule
- Safe in contact with potable water

Properties

Appearance	Grey
Specific Gravity	2.6
Compressive strength (28 days) It complies with ASTM C-39	40 - 50 MPa
Water permeability DIN 1048 ASTM) D-4068 , CRDC 48-92) pressure ≈ 50 m	No leakage
Seal hairline cracks It complies with ASTM C1585, C 1202	0.4 mm

How to use

- For ready mix plant (Dry Batch), the admix. Is added in powder form to the drum and then add the concrete materials and mix for 5 minutes
- For ready mix plant (central mix),load the admix in powder form to the drum prior to adding the other components. Mix the concrete for 5 minutes on high speed
- For precast batch plant , add the admix to the aggregates , mix for 2-3 minutes before adding cement and water , then blend the concrete
- Do not add admix. powder to wet concrete

Theoretical Dosage rates

1-1.5% by weight of cement (No fines grade)

Packaging

15,5 kg/bag

Shelf life & Storage

One year in its sealed packs stored under proper conditions

Health and Safety

- **Crystal seal admixture** is non-toxic
- Use gloves to avoid contact with skin
- If skin comes in contact, wash immediately with soap and water.
- Do not use solvents
- Eye contamination must be immediately washed with water, then seek medical treatment.

Additional Information

PROKEM provides the construction industry with a comprehensive range of construction chemicals and specialty products answering the queries of modern engineers for trouble free durable structure.

PROKEM designs tailor made products should there be critical application that requires specific properties rather than our main range. For our customer's satisfaction, **PROKEM** reserves the right to change the properties of its products.

All orders are accepted subject to our current term of sale & delivery.

Users must always refer to the most recent issue of the local product data sheet for the product concerned, copies of which will be supplied on request.

PROKEM extends technical services to include after sales support to assist users in a proper handling of our products.

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