

## HOW PENETRON® WATERPROOFS CONCRETE

Penetron

Crystalline  
Formation  
Penetrating



Penetron

Penepug



# Penetron

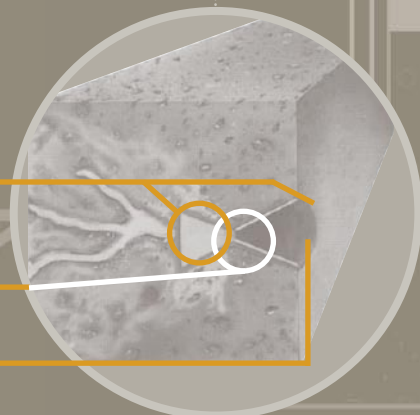
INTEGRAL CAPILLARY CONCRETE WATERPROOFING SYSTEMS

## TOTAL CONCRETE PROTECTION

Penetron

Penepug

Penecrete Mortar





ICS/Penetron International Ltd. is recognized as an international leader in the field of concrete waterproofing, protection, and repair. Over the past 20 years the Penetron family of products has established its reputation by meeting the most demanding job specifications around the globe, from the semi-arctic rigors of Norway and Russia to the torrid extremes of Saudi Arabia.

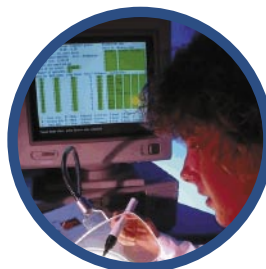
Based on Long Island, New York, the company was founded in 1979 by Robert J. Revera, a veteran of the concrete sealant industry who imbued ICS/Penetron with a strong commitment to high technical standards. As such, Penetron formulations undergo continuous refinement through the integration of the latest materials research as well as input from construction professionals in the field.

Today ICS/Penetron's sales and service network extends to more than 60 countries, providing the company a broad channel to share its experience and expertise. By combining superior product performance with exceptional client support, ICS/Penetron continues to define dependability and excellence in protective concrete treatments for engineers, architects and builders the world over.



Penetron's versatility and effectiveness have been demonstrated across a wide spectrum of critical applications, including nuclear reactors, chemical storage and mass transit tunneling. We adhere to the highest standards of environmental and ecological compliance, reflected in the numerous aquarium and reservoir projects in the company's portfolio. At the production level, the exacting quality control

process at our state-of-the-art blending facility has earned ISO 9001-2000 certification.



ISO 9001:2000



# THE PENETRON® SYSTEM

Product

Application

USAGE

3

## PENETRON

Used for waterproofing and chemical protection above and below ground level. Applied in slurry form.

- z Drinking water reservoirs
- z Sewage and water treatment tanks
- z Aquariums
- z Tunnels

## PENECRETE MORTAR

Used for filling cracks and covers at joints, and to fill form-tie holes, honey-combed areas and routed out cracks in mortar consistency.

- z Foundations
- z Elevator shafts
- z Underground vaults
- z Industrial installations

## PENETRON PLUS

A dry shake, powder formulation used for horizontal surfaces and precast. It is a selected blend designed for ease of trowel-in application.

- z Parking decks
- z Traffic-bearing structures

## PENEPLUG

Forms a rapid setting compound capable of stopping severe leaks under pressure.

- z Base slabs
- z Diaphragm walls
- z Basements
- z Concrete roofs
- z Bathrooms
- z Any concrete structure requiring protection from water or aggressive chemicals

## PENETRON ADMIX

An additive mixed into new concrete at the time of batching for complete integral waterproofing.



**Description**

Penetron cementitious capillary waterproofing products are formulations consisting of common cement, quartz sand (of special grade) and multiple activating chemicals that provide the most effective permanent concrete waterproofing

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# THE PENETRON® SYSTEM

**Effectiveness**

Penetron's waterproofing effect is achieved by the reaction of the various chemical components contained in the solution when combined with the concrete matrix. The compound penetrates deep into the capillary tracts of the concrete by pressure of osmosis and forms crystals that completely seal the capillaries and shrinkage cracks to drive out moisture. The process works with or against the pressure of water. In the absence of moisture, Penetron components lie dormant. Should moisture recur at any time, the chemical action and sealing process repeats itself automatically and advances even more deeply into the concrete. Penetron chemicals will continuously seal and reseal due to their chemical nature. Crystalline growth from capillary waterproofing has been measured as deep as nearly 1 meter from the point of application. Penetron® is 100% compatible with concrete, brick, mortar, and stone.

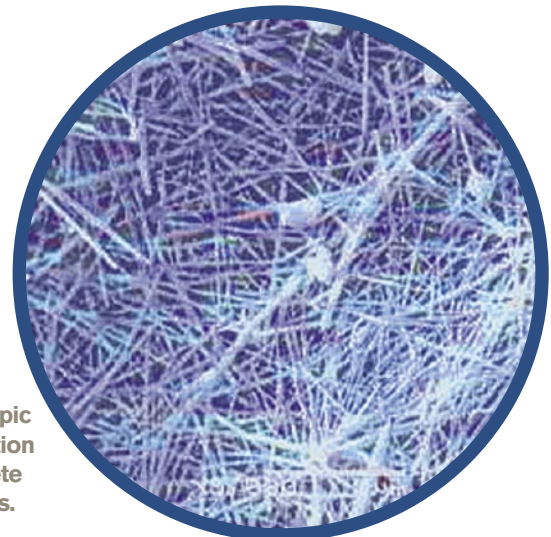
**Uses**

Penetron is recommended for use in any concrete or block structure where it is required to keep water in or out. Penetron should also be applied to concrete or block structures exposed to potential water or chemical attack and thus requiring permanent waterproofing and protection. Its applicability to either the positive side (side exposed to water) or the negative side (side opposite the water) meets all waterproofing requirements.

**Benefits**

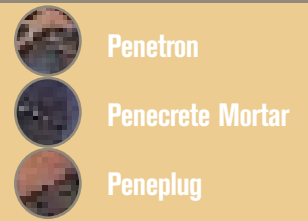
- z Becomes an integral part of the concrete, forming a complete body of strength and durability. Penetron should not be confused with a coating or membrane
- z Penetrates deeply and seals concrete's capillary tracts and shrinkage cracks
- z Can be applied from either the positive or negative side
- z Waterproofing and chemical-resistance properties remain intact even if the surface is damaged
- z Completely effective against high hydrostatic head pressure
- z More effective overall and less costly than hydrolytic membrane or clay panel systems
- z Ease of application, labor-cost effective
- z Increases concrete's compressive strength
- z Cannot come apart at the seams, tear or puncture
- z Does not require protection during backfilling, placement of steel or wire mesh, and other common procedures
- z Seals cracks of up to 0.4mm. Does not merely mask or bridge hairline and shrinkage cracks
- z Permits concrete to breathe, eliminating water vapor buildup and leaving the concrete completely dry
- z Resists chemical attack (PH 3 - 11 constant contact; PH 2 - 12 periodic contact) and provides a wide range of protection from freeze/thaw cycles, aggressive subsoil waters, sea water, carbonates, chlorides, sulfates and nitrates
- z Can be applied to moist or green concrete
- z Protects reinforcing steel
- z Nontoxic
- z Approved for potable water use
- z No extensive curing times (except in very hot or low-humidity conditions)

**Microscopic examination of concrete at 28 days.**



# THE PENETRON® SYSTEM

## LEGEND

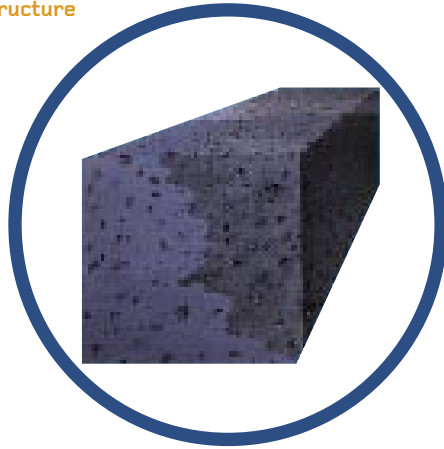


### How Penetron waterproofs concrete

### How Penetron waterproofs a crack

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Typical concrete structure with Moisture



A typical leaking crack

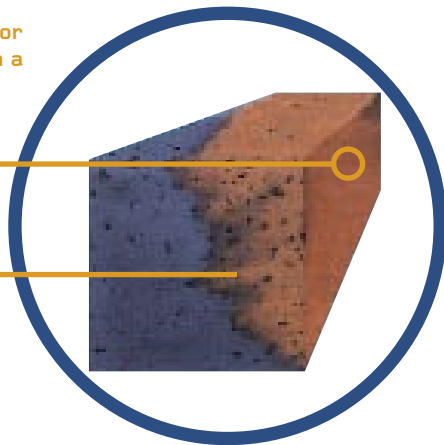


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Penetron® may be applied to Positive or Negative surface in a variety of forms.

Penetron

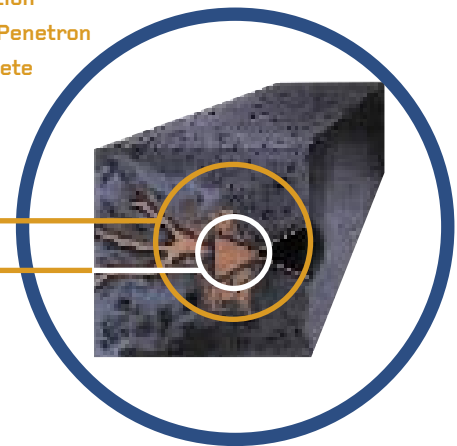
Crystalline Formation Penetrating



The chemical reaction starts as soon as Penetron is applied to concrete

Penetron

Peneplug

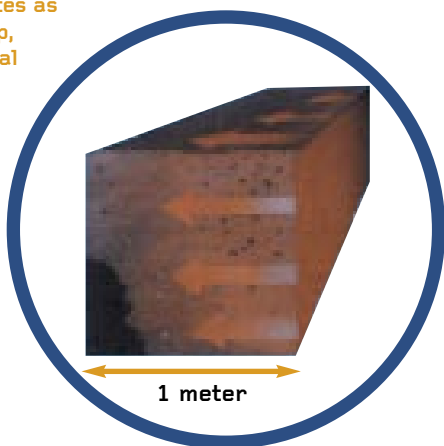


When mixed with water and applied as a coating, the active chemicals in Penetron® form nonsoluble crystals within the pores and capillary canals of concrete. The concrete becomes permanently sealed and neither water nor any other liquids are able to penetrate the concrete from any direction.

Illustration 2 shows a cut-out crack which has been packed with Peneplug and sealed with Penetron.

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Penetron® penetrates as far as 1 Meter deep, becoming an integral part of concrete.

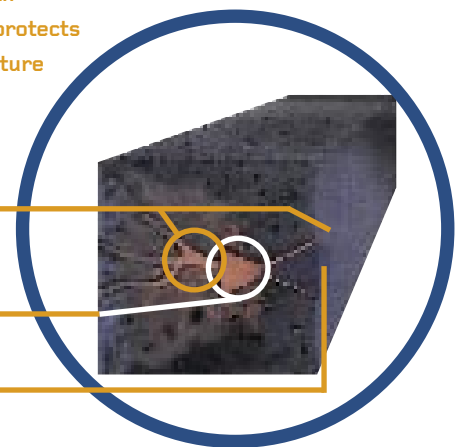


Penetron's in-depth effect completely protects the concrete structure

Penetron

Peneplug

Penecrete Mortar



Penetron® crystals spread throughout the concrete substrate, increasing compressive strength and continuing to protect concrete from intrusion by water or chemicals permanently.

Illustration 3 shows how Penetron not only stops leaks at the plug point, but continues to force crystals deeper into the crack and surrounding concrete, forming a complete seal.

3

## THE PENETRON® SYSTEM

### 6 Description

Penecrete Mortar is a cementitious, ready-mixed waterproof repairing and sealing mortar

Used in conjunction with Penetron for:

- z Installation of seal strips, reglets and coves at joints to assure water tightness
- z Patching of tie holes and faulty construction joints
- z Filling of routed out cracks
- z Waterproof sacking of concrete "bugholes"
- z Repairing of spalled and honeycombed areas

#### Benefits

- z Can be skim coated or feather edged
- z Can be applied to moist concrete
- z Fast setting
- z Inorganic: no polymers
- z Nonflammable
- z Resists abrasion and mechanical wear
- z Freeze/thaw resistant
- z Certified for use in contact with potable water
- z Can be applied by hand pointing, trowel or brush

All data are average values obtained under laboratory conditions.

Impractical use, temperature, humidity and absorbance of the substrate may influence given values.

### Technical Data

#### CONSUMPTION AND YIELD OF 50LB. (22.68KG) BAG

	Size	Consumption	~Yield/bag
	inch (mm)	lb/ft (kg/m)	ft (m)
Cracks, U-shaped	1x1 (25x25)	1/0 (1.3)	50 (15.3)
Reglets	1x1 (25x25)	1.0 (1.3)	50 (15.3)
Coves, Triangular	1.5x1.5 (38x38)	1.0 (1.3)	50 (15.3)
Tie Holes	1x1x1 (25x25x25)	- -	~600 nos

Honeycomb patching approximately 0.4ft<sup>3</sup> (0.011 m<sup>3</sup>)/bag  
All above values are approximate depending on surface conditions.

#### PHYSICAL DATA

Aggregate State	Powder
Color	Cement Grey
Bulk Density	112 lbs/ft <sup>3</sup> (1.81 kg/1)
Pot Life	30 minutes
Setting Final	Approximately 2 hours
Potable Water	Approved

#### TECHNICAL DATA

	Compressive Strength ASTM C-109	Tensile Strength ASTM C-190
1 day	1600 psi (11 MPa)	320 psi (2.2 MPa)
2 days	2400 psi (16 MPa)	520 psi (3.6 MPa)
7 days	5800 psi (40 MPa)	730 psi (5.0 MPa)
28 days	6900 psi (47 MPa)	900 psi (6.2 MPa)



# THE PENETRON® SYSTEM

**Description**

Penetron Plus is a special formulation designed specifically for dry shake application on horizontal concrete prior to finishing



**Benefits**

- Improves the abrasion resistance of the concrete
- Ease of application and labor-cost effective
- Increases concrete's compressive strength
- Approved for potable water use



**Technical Data**

Penetron systems have been tested against many standards, including:

- Compressive Strength ASTM C-39
- Microscopic Examinations ASTM C-457
- Chloride Content AASHTO T260
- Chemical Analysis (Infrared Spectroscopy) Perkin Elmer Method 990-9647
- Water Permeability – Handbook of Concrete Engineering
- Chemical Resistance ASTM C267-77
- Bond Strength of Chemical Resistant Mortar ASTM C-321
- Permeability U.S. Army Corps of Engineers CRD-C-48-73
- Freeze/Thaw and De-icing Chemical Resistance ASTM C-672-76
- Radiation Resistance U.S.A. Standard
- Radiation Resistance Russian Republic

**Description**

Penepug is a fast-setting cementitious waterstop

recommended for:

- Plugging/stopping water leaks
- Sealing of leaky joints, form tie holes or cracks

**Benefits**

- Ease of application
- Inorganic
- Nonflammable
- No odor or fumes
- Approved for potable water use



**Kariba Dam**  
Zimbabwe,  
Africa

**Penepug**

## THE PENETRON® SYSTEM

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### Description

Penetron Admix is added to the concrete mix at the time of batching. The concrete then becomes permanently sealed against the penetration of water or other liquids from any direction and is also protected from deterioration due to harsh environmental conditions.

### Uses

- Reservoirs
- Sewage and water treatment plants
- Subway and other tunnel systems
- Underground vaults
- Foundations
- Swimming pools
- Pre-cast components

### Benefits

- Resists extreme hydrostatic pressure from either positive or negative surfaces
- Becomes an integral part of the substrate
- Highly resistant to aggressive chemicals
- Can seal hairline cracks of up to 0.4mm
- Allows concrete to breathe
- Nontoxic
- Less costly to apply than most other methods
- Permanent
- Added to the concrete at time of batching and therefore not subject to climatic restraints
- Increases flexibility in construction scheduling

### Technical Data

Note: The Penetron Admix has been specially formulated to meet varying project and temperature conditions (see Setting Time and Strength). Consult with a Penetron Technical Representative for the most appropriate Penetron Admix for your project.

Penetron Admix has been tested against many standards, including:

- Compressive Strength ASTM C-39
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**Setting Time and Strength** The setting time of concrete is affected by the chemical and physical composition of ingredients, temperature of the concrete, and climatic conditions.

Retardation of set may occur when using Penetron Admix. The amount of retardation will depend upon the concrete mix design and the dosage rate of the Admix. However, under normal conditions the Admix will provide a normal set concrete. Concrete containing Penetron Admix may develop higher ultimate strength than plain concrete. **Trial mixes should be carried out under project conditions to determine setting time and strength of the concrete.**

**Limitations** When incorporating Penetron Admix, the temperature of the concrete mix should be above 40°F(4°C).

**Technical Services** For more instructions, alternative application methods, or information concerning the compatibility of the Penetron treatment with other products or technologies, contact the Technical Department of ICS/Penetron International Ltd. or your local Penetron representative.

**Dosage rate:** Penetron Admix 0.8% of cement by weight

**Note:** Under certain conditions the dosage rate may be between 2-3% depending on the quantity and type of total cementitious materials.

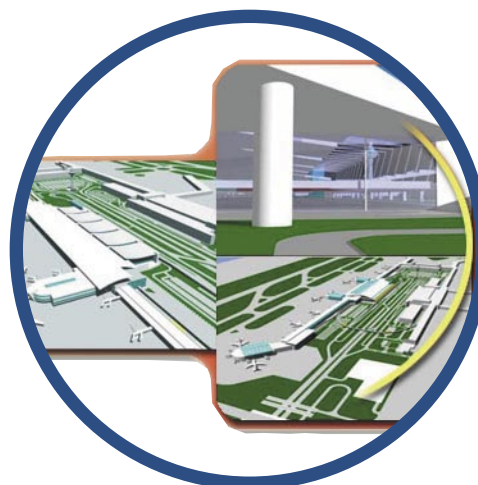
Consult with Penetron's Technical Department for assistance in determining the appropriate dosage rate and for further information regarding enhanced chemical resistance, optimum concrete performance, or meeting the specific requirements and conditions of your project.

**1. Ready Mix Plant - Dry Batch Operation** Add Penetron Admix in powder form to the drum of the ready-mix truck. Drive the truck under the batch plant and add 60% - 70% of the required water along with 300 - 500 lb. (136 - 227 kg) of aggregate. Mix the materials for 2-3 minutes to ensure the Admix is distributed evenly throughout the mix water. Add the balance of materials to the ready-mix truck in accordance with standard batch practices.

**2. Ready Mix Plant - Central Mix Operation** Mix Penetron Admix with water to form a very thin slurry (e.g., 40 lb./18 kg. of powder mixed with 6 gallons/22.7 liters of water). Pour the required amount of material into the drum of the ready-mix truck. The aggregate, cement and water should be batched and mixed in the plant in accordance with standard practices (taking into account the quantity of water that has already been placed in the ready-mix truck). Pour the concrete into the truck and mix for at least 5 minutes to ensure even distribution of the Penetron Admix throughout the concrete.

**3. Precast Batch Plant** Add Penetron Admix to the rock and sand, then mix thoroughly for 2-3 minutes before adding the cement and water. The total concrete mass should be blended using standard practices.

**Note** It is important to obtain a homogeneous mixture of Penetron Admix with the concrete. Therefore do not add dry Admix powder directly to wet concrete as this may cause clumping and hinder thorough dispersion.



**Changi Airport Terminal 3 Singapore**



## THE PENETRON® SYSTEM

### General Instructions

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#### Surface Preparation

The concrete or concrete block surface to receive the Penetron system must be structurally sound and free of dirt, soil, oil, release agents, laitance or any other foreign materials that may impair the bond, penetration and/or overall performance of Penetron materials.

- Extremely smooth concrete surfaces must be waterblasted, sandblasted or acid etched to make sure the concrete surface has an open capillary system. The surface to be treated should never have a shiny appearance.
- Rout out visible cracks exceeding 0.4mm in size to a depth of 20mm to 25mm. Also rout out honey-combed pockets, holes and faulty construction joints to sound concrete. Construction joints should be routed out with a formed 25mm x 25mm reglet.
- Wet down dry surfaces lightly prior to the application of the Penetron system. Moisture must be present in the concrete strata to ensure maximum chemical penetration. Surfaces should be damp when Penetron products are applied.

#### Mixing

##### • Penetron

**Brush application:** 0.8kg./sq.m. 5 parts Penetron to 2 parts water (5:2).  
1.1kg./sq.m. 3 parts Penetron to 1 part water.

**Spray application:** 0.8kg./sq.m. 5 parts Penetron to 2.75-to-3.25 parts water (varies with climate and spray equipment). Stir the slurry mixture frequently during the application and prepare only as much as can be applied within a 25-minute period.

##### • Penecrete

Add water to Penecrete powder, until a medium stiff consistency is obtained. Prepare only as much Penecrete mortar as can be applied within a 25-minute period.

##### • Peneplug

Pour a handful and mix in a small container (bowl/pail). Gloves must be worn. Add just enough water (drops) to form a mix that has a dry pack/dry earth consistency.

#### Penetron Application

- Apply Penetron coating by masonry-type brush (artificial fibers, if available). For spray applications, drop hopper or piston pump type equipment is recommended.
- Prior to application of Penetron coatings, fill form tie holes, routed out cracks, honeycombed pockets, reglets and seal strips at construction joints with Penecrete in laminating layers of 2.5cm to 3cm. Prime concrete surfaces of these areas with one slurry coat of Penetron prior to applying Penecrete mortar.
- Penetron slurry must be applied to damp concrete and concrete block surfaces only in specified quantities: First coat should have a thickness of just under 1.0 mm; second coat should be applied when first coat is dry to the touch. A light misting of water may be required between coats in hot/dry climates.  
**Horizontal concrete surfaces:** Apply Penetron slurry in one (1) coat with stiff bristle brush/broom or squeegee.
- Dry sprinkle Penetron or Penetron Plus on "still plastic" concrete by broadcasting or use of a fine mesh sieve, in quantities that are specified. Work Penetron powdered slab surface with wood float or power trowel until required finish has been achieved. If working (mud) slab applications, contact Penetron representative.

#### Penecrete Application

- Mix Penecrete by hand or paddle mixer to a stiff mortar consistency
- Apply by brush the bonding coat of Penetron slurry
- Apply Penecrete mortar
- Depth of Penecrete application should not exceed 3cm
- Time elapsed between bonding coat and Penecrete mortar should not exceed six hours

#### Peneplug Application

- After following mixing procedure, quickly form into a wedge and force it into the leak
- Apply as much pressure as possible by standing on and/or tapping hard with a wedge of wood and a hammer
- After leak has stopped, fill void to surface with Penecrete mortar.

#### Coverage

- Horizontal concrete surfaces: Penetron at 1.4kg. to 1.6kg./sq.m. Applied in one (1) slurry coat or powder application, when concrete reaches initial set. Trowel or float to specified finish. Penetron Plus powder application at 0.5kg./sq.m., when concrete reaches initial set. Trowel or float to specified finish
- Vertical concrete or block surfaces: Penetron at 1.4kg. to 1.6kg./sq.m. total. Applied in two (2) coats (0.8kg. per coat)

#### Curing

- Except for extremely hot weather and very low humidity, curing of the Penetron system is not required. In these extreme conditions curing – using a light water misting – must begin as soon as the Penetron coating has hardened sufficiently so as not to be damaged. Under most conditions it is sufficient to mist the areas treated with Penetron three times a day for the first day. In extremely hot climates spraying may be required more frequently and for several days
- Penetron Plus (trowel applied): Follow concrete specifications for curing procedures

#### Neutralization

- Treated surfaces to receive paints or other protective coatings should be neutralized with a vinegar/water solution or a muriatic acid/water solution (1 to 10). Rinse all treated surfaces thoroughly with water
- For application on cisterns and drinking water reservoirs, follow EPA requirements. Regarding special tanks, aquariums and industrial or processing installations, please contact a Penetron representative

#### Temperature Requirement

- The Penetron system can be applied in coating or in mortar form when the temperature is above 32°F (0°C).
- Penetron Plus (trowel applied) can be applied in temperatures where concrete can be placed. Follow concrete specifications for protection requirements according to standard concrete procedures



## THE PENETRON® SYSTEM

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Cavity-Fill Method

### Penetron Slurry and Penecrete Mortar

**Proven Performance** The slurry-filled cavity allows the active chemicals in Penetron to react with moisture, creating a nonsoluble crystalline formation within the concrete pores and capillary canals. In this way the wall eventually becomes permanently sealed and water and dampness are excluded from any direction. The system actually improves over time as the crystals reach greater depth and increase in density. It may be necessary in cases of matrix deterioration to drill adjoining holes and fill the cavities with fresh cement mortar to allow Penetron something of substance to work on, and then fill the adjoining hole as per Penetron method.

● Penetron ● Penecrete



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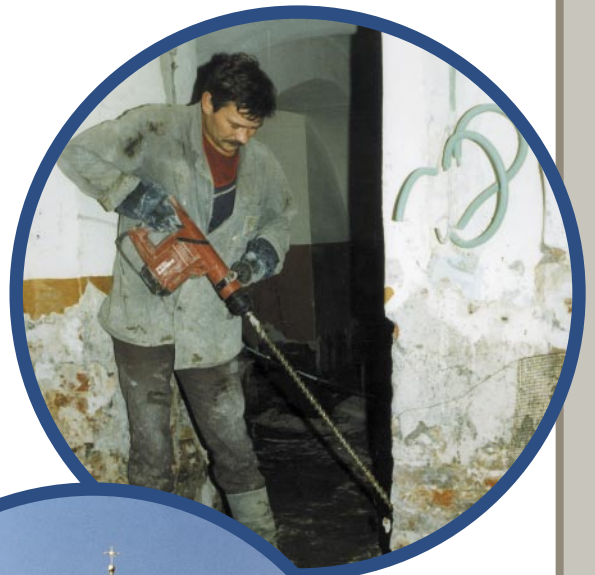
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Cavity-Fill Method

### Solving the Problem of Rising Damp

Wash out holes. Remove free-standing water from holes with a vacuum or blow out with air. Using a funnel or pump, pour loose slurry to fill drilled out cavity. Gently tap each drilled hole with sized wood dowel or steel bar. Close cavity (drilled hole) off with Penecrete Mortar.

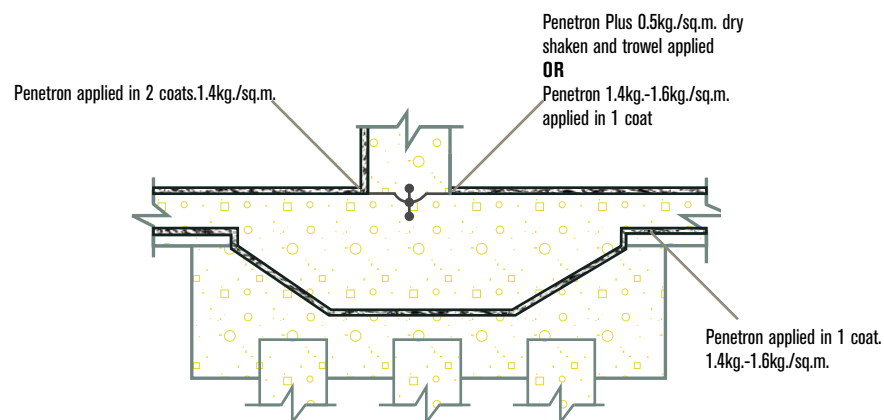
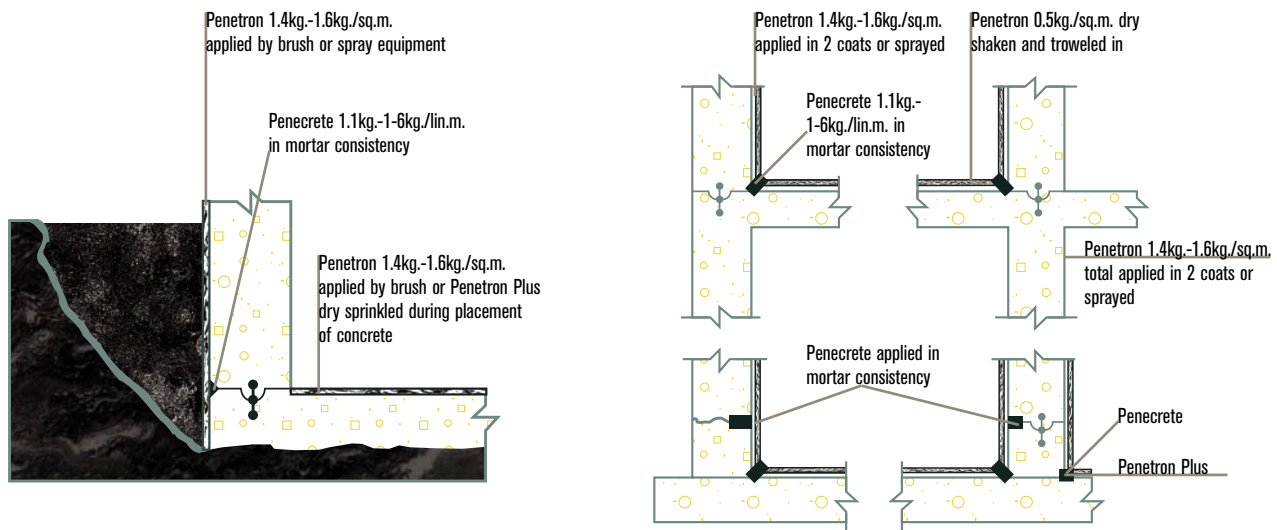
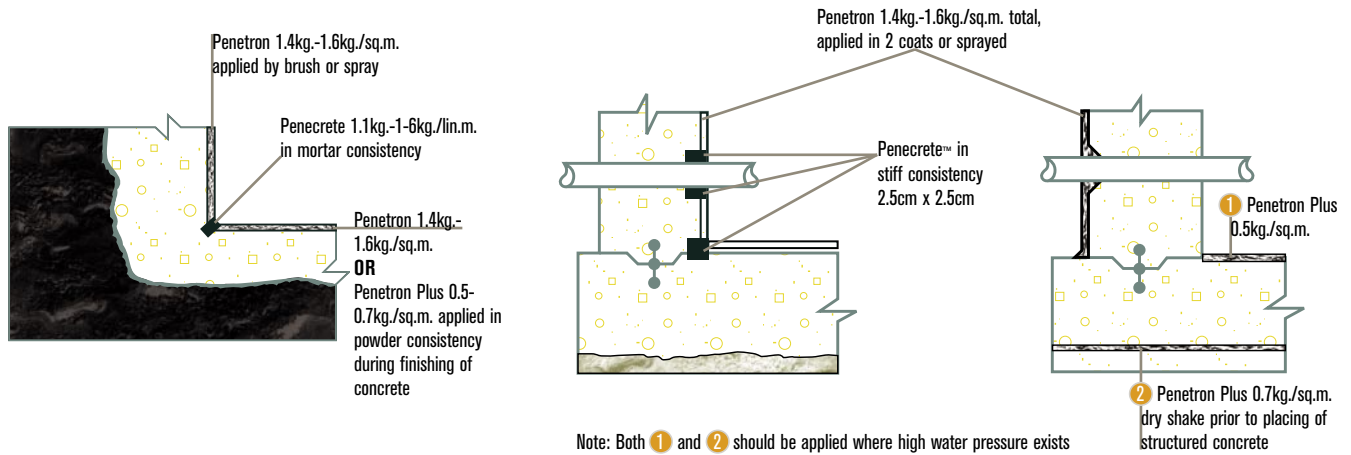
Drill holes 2.0cm to 2.5cm in diameter in a 15 to 20cm on center pattern at an angle of 40° to 80° up to three-quarters of the way through the wall.



**House of Rest  
Burial Place of  
Czar Nicholas II**  
St. Petersburg,  
Russia

# THE PENETRON® SYSTEM

## Penetron 1.4kg.-1.6kg./sq.m. applied by brush or spray



# THE PENETRON SYSTEM

The Penetron® System has been successfully used in projects in over 60 countries worldwide.

For more examples, contact your Penetron® representative or visit [www.penetron.com](http://www.penetron.com)



**Project:** Seabrook Nuclear Power Project

**Location:** Seabrook, NH, USA

**Date:** 1986

**Description:** Seabrook is a 1,160-megawatt pressurized-water nuclear reactor that provides about 7% of the electricity used in the six New England states—enough electricity for about 1,000,000 homes.

Two underground tunnels used to carry steam-condensing water three miles from the Ocean to the plant, together with foundations of the plant, underground facilities and all protective spillways were treated with the Penetron® system in 1986. Apart from the guaranteed waterproofing and chemical resistance performance protecting the concrete, the client was pleased with Penetron's additional benefit of significant reduction in gamma radiation in case of accident. Products used include Penetron®, Penecrete™ and Peneplug™.



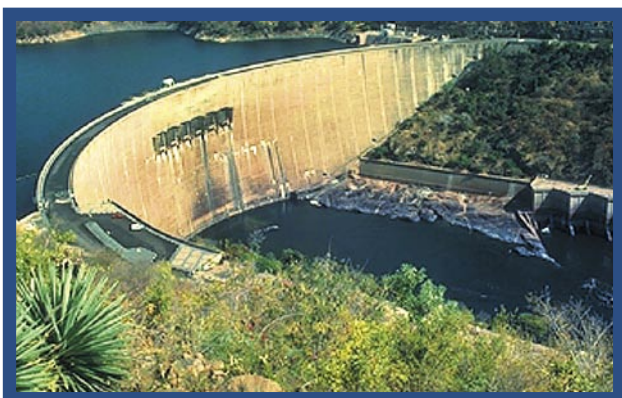
**Project:** Statue of Liberty

**Location:** New York, USA

**Date:** 1986

**Description:** Located in New York Harbor, the Statue of Liberty is one of the most universal symbols of political freedom and democracy. The Statue was extensively restored in time for her spectacular centennial on July 4, 1986.

Although a heating system was installed in the base of the statue in 1949, the huge mass of stone, concrete, and earth progressively chills through Winter and is at its coldest in March when the air outside becomes warmer. The moist air coming off the water routinely saturated the walls, resulting in moisture inside the pedestal, causing deterioration of the structure and its fixtures. This problem has now been eliminated by the use of the Penetron® system in the restoration. Underground vaults and utility rooms were also treated.



**Project:** Kariba Dam

**Location:** Zimbabwe

**Date:** 1960

**Description:** This magnificent dam was completed in 1960 and was the largest man-made dam ever built. It provides electricity to Zambia and Zimbabwe, damming Africa's fourth largest river (the Zambezi River). It also supports a thriving local fishing industry.

The Penetron® system was used in 1991 to remedy water leakage and thoroughly moist concrete areas. Areas treated with the Penetron® system include parts of the main dam structure and adjacent areas as well as utility rooms.



**Project:** Monterey Bay Aquarium

**Location:** Monterey, CA, USA

**Date:** 1982

**Description:** The Monterey Bay Aquarium is one of the main tourist attractions in the U.S.A.. More than 1.7 million people visit the aquarium annually. It was completed in 1982 and is dedicated to conservation of the oceans.

The Penetron system was used to successfully waterproof and protect all tanks from the effects of seawater, including the dolphin and sea lion pools..

For more project information, visit [www.penetrone.com](http://www.penetrone.com)



**Project:** House of Rest, burial place of Czar Nicholas II

**Location:** St. Petersburg, Russia

**Date:** 1995

**Description:** This cathedral is of immense importance in Russia as most of Russia's pre-revolutionary rulers from Peter the Great onwards are buried here. The cathedral complex, which dates back to 1718, has had a tumultuous history, suffering extensive damage from fire, storms and looting,

In 1995 this project underwent a major repair and maintenance treatment in preparation for the burial of the last Russian Czar Nicholas II and his family in St. Catherine Chapel (80 years after his death). The Penetron® system was chosen as the best solution to protect and waterproof all above and below grade masonry for this important project.



**Project:** Singapore Changi Airport Terminal 3

**Location:** Changi, Singapore

**Date:** 2003

**Description:** Changi Airport is a symbol of national pride, a worldwide benchmark of excellence built at a cost of \$1.5 billion. Terminal 3 incorporates the most innovative systems and facilities to ensure hassle-free movement of passengers while aiming for an architecture of synthesis and expression.

The Penetron® System was chosen for the waterproofing and protection of the entire foundation and slab of T3. 140'000 m<sup>3</sup> of concrete were treated with Penetron® Admix, with sporadic use of other components of the Penetron® system such as Penetron® Slurry and Penecrete™ mortar. The crack bridging abilities of the Penetron® system have been superbly demonstrated on this project.



**Project:** Lutetian Garden

**Location:** JinZhou, China

**Date:** 2002

**Description:** Prior to Penetron® application on this huge development 4 hours north of Beijing, abundant cracking had occurred, resulting in serious leakage. All leaks were stopped with Penepug™ and cracks repaired with Penecrete™ Mortar. The entire sub-structure was then double-coated with Penetron® and the underground carpark connecting the two buildings treated with the Penetron® system. The project, finished in 2002, is now considered the city's top residential property. The owner was so pleased with the results that he had his own penthouse terrace waterproofed with Penetron® rather than the product originally specified for exposed areas.



**Project:** Rigas Udens Biological treatment plant

**Location:** Riga, Latvia

**Date:** 1996

**Description:** Municipal enterprise "Rigas Udens" supplies the city with drinking water from abstraction sites located outside of Riga City, including surface water intakes (The Daugava) and ground water intakes (Baltezers area, Zakumuiza and others).

All aerotanks and channels were treated with the Penetron® system in 1996-97. Products used include Penetron®, Penecrete™ and Penepug™. The Penetron® system was chosen for its ability to protect concrete against chemical attack in addition to its guaranteed waterproofing performance.

# Technical Data

Penetron and Penetron Admix		Penetron and Penetron Admix will meet or exceed the following physical properties:
Penetron Admix		
Water Permeability	DIN 1048	after 56 days = $< 5.35 \times 10^{-13}$ m/sec
Compressive Strength	(ASTM C39)	After 28 days = $> 6\%$
Penetron Coated Concrete		
Water Permeability	(CRD-C-48-73)	After 28 days = $< 1.9 \times 10^{-14}$ cm/sec (before treatment $1.8 \times 10^{-11}$ cm/sec)
Water Permeability under head pressure	(CRD-C-48-73)	Can withstand = $> 232$ PSI (514 ft. head water pressure, or 156.78m) or 1.54 MPa (16 Bar) with no measurable leakage
Compressive Strength	(ASTM C39)	After 28 days = $> 6\%$
Freeze/Thaw Cycle Test	(ASTM C-672-76)	50 Cycles - Marked decrease in erosion compared to untreated samples
Chemical Resistance	(ASTM C-267-77)	Resistant to alkaline/acid conditions, pH range 3-11 constant contact
Radiation Resistance	(ASTM N69-1967)	No effect from gamma radiation = $> 5.76 \times 10^4$ Rads
	(ISO 7031)	No effect from gamma radiation 50 M Rads
Chloride Content	(AASHTO T-260)	Negligible amounts of chlorides are contained in waterproofing substance. Penetron's waterproofing effects are NOT related to chlorides
Nontoxic	(BS 6920: Section 2.5)	PASSES European Union Environmental Lic
	(16 CFR 1500)	PASSES European Union Environmental Lic
Approved for potable water use	U.S. EPA and State of New York DOH	






Registered Facility

### Distributor

**CAUTION** Use rubber gloves during mixing and application. Use goggles during spraying and overhead applications. The effect of Penetron on the skin can be neutralized with a vinegar (household strength) and water solution. **PENETRON PRODUCTS ARE NONTOXIC.**

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**WARRANTY** ICS/PENETRON INTERNATIONAL LTD. warrants that the products manufactured by it shall be free from material defects and will conform to formulation standards and contain all components in their proper proportion. Should any of the products be proven defective, the liability to ICS/PENETRON INTERNATIONAL LTD. shall be limited to replacement of the material proven to be defective and shall in no case be liable otherwise or for incidental or consequential damages. ICS/PENETRON INTERNATIONAL LTD. makes no warranty as to merchantability or fitness for a particular purpose and this warranty is in lieu of all other warranties expressed or implied. User shall determine the suitability of the product for his intended use and assume all risks and liability in connection therewith.

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