

PENETRON
INTEGRAL CAPILLARY CONCRETE WATERPROOFING SYSTEMS

1. Product Name

Penetron® Integral Capillary Concrete Waterproofing System, including the following:

- Penetron®
- Penetron Plus
- Penecrete Mortar
- Peneplug
- Penetron Admix
- Peneseal Pro™

2. Manufacturer

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3. Product Description

BASIC USE

ICS Penetron International Ltd. is recognized as an international leader in the field of integral crystalline concrete waterproofing, protection and repair. Over the past 30 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 and to the humid, tropical climates of the Caribbean and Southeast Asia.

Penetron® Cementitious Crystalline Waterproofing products are formulations consisting of common cement, quartz, special grade sand and multiple activating chemicals that provide an effective, permanent concrete waterproofing system. The Penetron chemicals work by penetrating into the capillary tracts of concrete through pressure of osmosis, Brownian movement and dry particle reactions. The active ingredients of Penetron react with various concrete minerals, forming insoluble crystals that fill out cracks, pores and voids up to a width of at least 1/64" (0.40 mm).

Penetron in its many forms is suitable for use in reservoirs, tunnels, tanks, foundation floors and walls, parking decks, manholes and sewer pipes, sewage and water treatment structures,

swimming pools, precast components and underground vaults. It is equally effective if applied on either side of a concrete structure or placed integrally at the time of concrete pour and can be applied to both old and new concrete, and concrete block.

Penetron

Penetron is a surface-applied material that waterproofs and protects concrete in-depth. Penetron can be applied to all structurally sound concrete, new or old. It may be applied to either the pressure or non-pressure concrete face (i.e., with or against water pressure). Penetron needs only to be mixed with water prior to application.

Penetron Plus

Penetron Plus is a unique chemical treatment for the integral waterproofing and protection of concrete. Penetron Plus is a special formulation designed specifically for a dry-shake application on horizontally concrete surfaces where greater resistance to impact and abrasion is required.

Penecrete Mortar

Penecrete Mortar is a cementitious, ready-mixed waterproof repairing and sealing mortar applied in conjunction with Penetron. The active chemicals combine with the free lime and moisture present to form insoluble crystalline complexes.

Peneplug

Peneplug is a cementitious, ready-mixed, rapid setting compound to stop water and moisture ingress. It can be used internally or externally as waterproof plugging mortar or where rapid setting and early strength gain is required.

Penetron Admix

Penetron Admix is added to the concrete mix at the time of batching. Its active chemicals react with the moisture in fresh concrete and the by-products of cement hydration to cause a catalytic reaction, which generates a non-soluble crystalline formation throughout the pores and capillary tracts of the concrete, thus waterproofing it.

Peneseal Pro™

Peneseal Pro™ is a spray-applied liquid sealer that forms a subsurface barrier that protects concrete against water penetration and seals existing cracks up to 1/25" (1.02 mm). When sprayed onto a thoroughly cleansed concrete surface, it will react with the concrete to form a subsurface barrier.



Easy to apply - spray or brush-on applications

COMPOSITION & MATERIALS

- Penetron - Consists of Portland cement, specially treated quartz sand and a compound of active chemicals
- Penetron Plus - Consists of Portland cement, various active proprietary chemicals and a synthetic aggregate hardener that has been crushed and graded to particle sizes suitable for concrete floors
- Penecrete Mortar - Consists of Portland cement, specially treated quartz sand and compound of active chemicals, which resist water pressure
- Penetron Admix - Consists of Portland cement, very fine treated silica sand and various active, proprietary chemicals

4. Technical Data

APPLICABLE STANDARDS

ASTM International

- ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
- ASTM C267 Standard Test Methods for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes
- ASTM C672 Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals



Certified for potable water applications

- ASTM C1202 (AASHTO T 277) Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- ASTM D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

New York State Department of Transportation (NY DOT) - NY DOT Method 502-3P - Freeze/Thaw Durability

U.S.A. Standard No. N69 - Protective Coatings for the Nuclear Industry

NSF International - NSF/ANSI 61 Drinking water system components - health effects

U.S. Army Corps of Engineers (USACE) - CRD-C-48-73 Standard Test Method for Water Permeability of Concrete

PHYSICAL/CHEMICAL PROPERTIES

Penetron

- Aggregate state - Powder
- Color - Cement grey
- Bulk density - 1.25 kg/L
- Pot life - 30 minutes
- Setting time - Approximately 2 hrs
- Potable water - Approved
- Shelf life - 12 months in unopened, undamaged bags
- Packing - 50 lb (22.7 kg) bags or 55 lb (25 kg) pails

Penecrete Mortar

- Aggregate state - powder

- Color - Cement grey
- Bulk density - 112 pcf (1.81 kg/L)
- Pot life - 30 minutes
- Setting time - Approximately 2 hrs
- Potable water - Approved
- Shelf life - 12 months in unopened, undamaged bags
- Packing - 50 lb (22.7 kg) bags or 55 lb (25 kg) plastic pails

Compressive strength (ASTM C109)

- 1 day - 1600 psi (11 MPa)
- 3 days - 2400 psi (16 MPa)
- 7 days - 5800 psi (40 MPa)
- 28 days - 6900 psi (47 MPa)

Tensile strength

- 1 day - 320 psi (2.2 MPa)
- 3 days - 520 psi (3.6 MPa)
- 7 days - 730 psi (5.0 MPa)
- 28 days - 900 psi (6.2 MPa)

Penepug

- Aggregate state - Powder
- Color - Grey
- Bulk density - About 1.2 kg/L
- Application temperature - 0 degrees C - 25 degrees C (allow for mixing water and substrate temperatures)
- Application time - About 30 seconds (after mixing)
- Shelf life - 12 months in unopened, undamaged bags
- Packing - 40 lb (18 kg) 4-ply bags; 55 lb (25 kg) plastic resealable buckets

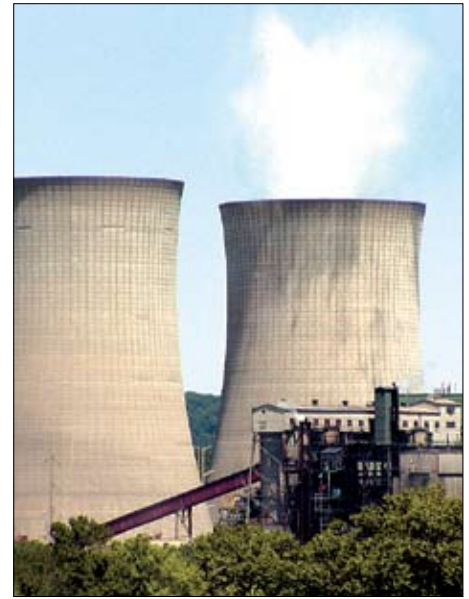
Penetron Admix

The setting time 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.

- Dosage rate - 1% of cement by weight
- Shelf life - 12 months in unopened, undamaged bags
- Packing - 40 lb (18 kg) bags, 55 lb (25 kg) pails. For large projects, customized packaging is available

Peneseal Pro

- Packaging - 6.7 gal (25 L) or 53 gal (200 L) drums
- Color - Transparent
- Specific gravity - Approximately 1.12
- Shelf life - No limit in sealed drums



Formulated for the most demanding projects

LIMITATIONS

- Penetron cannot be used as an additive to concrete or plasters
- Penecrete Mortar is not recommended for use in expansion or construction joints
- Peneseal Pro should not be used as a replacement or a solution for poor design, detailing or workmanship
- Peneseal Pro is not suitable for repair of structural or design cracks. For cold joints, expansion joints, penetrations and pour joints, products such as Penecrete, water-stops and elastomeric sealants should be applied in addition to Peneseal Pro

5. Installation

PREPARATORY WORK

Penetron

- All concrete to be treated with Penetron must be clean and have an "open" capillary system
- Remove laitance, dirt, grease, etc., by means of high pressure water jetting, wet sandblasting or wire brushing
- Faulty concrete in the form of cracks, honey-combing, etc., must be chased out, treated with Penetron and filled flush with Penetron Mortar
- Surfaces must be carefully watered prior to the Penetron application. The concrete surface must be damp but not wet

Penecrete Mortar

- All surfaces to be patched, repaired or sealed with Penecrete Mortar must be sound
- Remove all dirt, cement laitance, form release agents, curing compounds, paints, etc., by means of wet or dry sandblasting, a high pressure water jet or other suitable mechanical means
- Surfaces must be well moistened to a dull dampness at the time of application
- Cracks should be routed out to a U-shaped configuration, approximately 3/4" (19.1 mm) wide and a minimum of 3/4" (19.1 mm) deep
- Tie holes should be roughened prior to filling
- Spalled and honeycombed areas must be thoroughly cleaned and chiseled back to sound concrete prior to repair
- Penecrete Mortar should be mixed with clean water to a trowelable mortar consistency. Approximate mixing ratio (by volume) is 4 1/2 parts powder to 1 part water. For glove pointing, add small amount of water. Mix only as much material as can be used within 20 minutes

Peneplug

The substrate must be clean, sound and free of any surface contamination. Leaks must be cut out back to sound material, leaving an appropriate chase for receiving the Peneplug.

Peneseal Pro

- Surface damage, such as honeycombs, voids, etc., must be routed out and repaired with Penecrete mortar
- Surface should be minimum 14 days old (28 days is recommended), clean, free of dust and dry (no damp areas)
- Any formwork oil, curing compounds or previous treatments should be completely removed
- Temperature should be between 5 degrees C - 35 degrees C
- Avoid application when rain is imminent or in heavy wind
- Old concrete and concrete affected by carbonation may need to be treated with calcium for adequate reaction

MIXING

Penetron

Penetron is mechanically mixed with clean water to a creamy consistency. Approximate mixing ratio is 0.8 parts of water to 2.0 parts of powder (by volume). Mix only as much material as can be used within 20 minutes and stir mixture frequently. If the mixture starts to set, do not add more water; re-stir to restore workability.

Peneplug

Setting time is dependent largely on the amount of mixing water used. Standard value (at 20 degrees C) is 2.5 lb (1.14 kg) Peneplug and approximately 1 cup (0.24 L) of water.

The Peneplug must be added to the water and mixed swiftly. Mixing time is about 15 seconds. After mixing, setting is in about 30 seconds. In cold weather, use lukewarm water. In higher temperatures, use cold water. To avoid wastage, only small quantities of Peneplug should be mixed.

APPLICATION

Penetron

- Slurry consistency - Apply Penetron in one or two coats according to specification by masonry brush or appropriate power spray equipment. When 2 coats are specified, apply the second coat while the first coat is still "green"
- Dry powder consistency (for horizontal surface only) - The specified amount of Penetron is distributed in powder form through a sieve and trowelled into the freshly placed concrete once this has reached initial set
- Post-treatment - The treated areas should be kept damp for a period of 5 days and must be protected against direct sun, wind and frost by covering with polyethylene sheeting, damp hessian or similar method

Penetron Plus

- Fresh concrete is placed, consolidated and leveled
- Wait until concrete can be walked on leaving an indentation of 1/4" - 1/3" (6.4 - 8.4 mm). Concrete should be free of bleedwater and be able to support the weight of a power trowel. Then, float open the surface
- Immediately after floating open the surface, apply one-half of the dry shake material by hand or mechanical spreader. The dry shake material must be spread evenly
- As soon as the dry shake material has absorbed moisture from the base slab, it should be power floated to the surface
- Immediately after power floating, apply remaining dry shake material at right angles to the first application
- Allow remaining dry shake material to absorb moisture from the base slab and then power float the material into the surface
- When concrete has hardened sufficiently, power trowel surface to the required finish

Penecrete Mortar

- Cracks/seal strips (reglets and coves) - After

proper surface preparation and routing to appropriate configuration, prime areas to be patched or repaired with a slurry coat of Penetron and while "green" (tacky), fill cavity flush to surface with Penecrete Mortar in mortar consistency

- Spalled and honeycombed areas - Prepare surface and chisel back to sound concrete. Prime area to be repaired with a slurry coat of Penetron and while "green" (tacky), apply Penecrete Mortar in layers of 1/2" (12.7 mm) until desired profile is obtained

Peneplug

- After mixing, apply the Peneplug to the appropriate area immediately. Work the mixture well into the area and then hold firmly in place for about 30 seconds
- Maintain pressure without disturbing the material until it has set
- Remove excess material
- After lightly pre-wetting, apply a normal Peneplug waterproofing coating. In certain circumstances, Peneplug may be applied as dry powder. Place and hold the powder directly over the leak for 30 - 60 seconds

Penetron Admix

Penetron Admix must be added to the concrete at the time of batching. The sequence of procedures for addition will vary according to the type of batch plant operation and equipment.

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.

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 gal (22.7 L) 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.

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.

Peneseal Pro

- Always agitate the product before use
- Flood cracks with Peneseal Pro at approximately 1 gal/17 lineal feet (1 L/5 linear m)
- Apply product to surface at the recommended coverage rate. Spray at low pressure and in low wind conditions
- When surface is dry to the touch (2 - 6 hours after application), flood surface with abundant water. If it rains before the product is dry, a second application is required after drying
- 24 hours later, flood surface with abundant water again
- Another 24 hours later, flood surface with abundant water yet again
- After third flooding, the treated area can be ponded to verify the waterproofing performance

PRECAUTIONS

- Penetron - Do not apply at temperatures below 40 degrees F (4 degrees C)
- Penecrete Mortar - Do not apply at temperatures below 40 degrees F (4 degrees C) or to a frozen substrate
- Penetron Admix - When incorporating Penetron Admix, the temperature of the concrete mix should be above 40 degrees F (4 degrees C)
- Do not spray Peneseal Pro onto glass, aluminum, wood or painted surfaces. Remove the product with water if this should happen

6. Availability & Cost

AVAILABILITY

Contact ICS Penetron International Ltd. for information on local availability.

COST

Contact ICS Penetron International Ltd. to review details of individual projects and for guidance on material costs.

7. Warranty

ICS Penetron International Ltd. warrants that the products manufactured by it shall be free from material defects and will be consistent with its normal high quality. Should any of the products be proven defective, the liability of the manufacturer shall be limited to the replacement of the product ex-factory. The manufacturer makes no warranty as to the merchantability or fitness for a particular purpose and this warranty

is in lieu of all other warranties expressed or implied. The user shall determine the suitability of the product for his intended use and assume all risks and liability in connection herewith.

8. Maintenance

Once properly installed, Penetron requires no maintenance.

9. Technical Services

For more detailed information, project references, product literature, test results, technical assistance, special constructions specifications or onsite supervision, please contact ICS Penetron.

10. Filing Systems

- SmartBuilding Index
- MANU-SPEC®
- Additional product information is available from the manufacturer upon request.