

**TECHNICAL PROPOSITION OF REPAIRING,
PERMANENT WATERPROOFING AND
PROTECTION OF EXISTING REINFORCED
CONCRETE ELEMENTS, BASED ON EN 1504,
WITH PENETRON® SYSTEM – ACTIVE CRYSTAL
FORMATION**



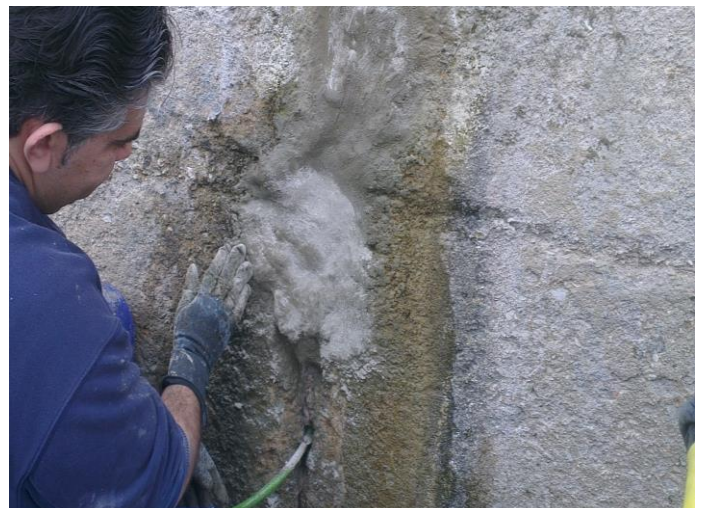
Surface preparation, repair and waterproofing existing surface of reinforced with the PENETRON® system. The system can be applied either on the external side or on the internal side (negative) of the reinforcement concrete elements.

1. System application on the walls

Depending on the working procedures, concrete surface can be treated and cleaned by a high pressure jet waterblasting (300-500 bar), for better visual contact with faulty areas.

In cases of water leaking from cracks, these cracks can be sealed with the rapid-setting crystalline waterproofing plug PENEPLUG® (mix with minimum water until the texture is as dry-earth). For a better application of PENEPLUG®, cracks should be routed out with mechanical means, up to 2 – 3 cm in width, in a conical shape, for better anchoring of the rapid-setting plug, during the application. Cold joints can be treated in a similar way, by cutting on both sides of the joint with mechanical means and creating a wedge, 3 cm in width. Next, rapid-setting plug PENEPLUG® is applied.

In some cases, depending on the work schedule, PENEPLUG® can be used as a waterplug, prior to waterblasting, but only after PENEPLUG® has reached its mechanical strength. It must be pointed out, that 1 – 2 layers of the integral crystalline waterproofing coating PENETRON®, at a mixing ratio of 5 parts PENETRON® powder to 3-3.5 parts water (by volume), must be applied on PENEPLUG®, by brush, while the latter is still “tacky” and the total consumption of PENETRON® mixture is 1.5 kg/m² in total for 2 layers (depending on the surfaces, the indicative consumption should be between 1.1 to 1,6 kg / m²).



2. Repairing and waterproofing of honeycombed and spalled areas, according to the following procedures

Cracks, honeycombed and spalled areas, of new or existing concreting, should be routed out with mechanical means, to remove dirt, loose materials and aggregates. Clean honeycombed areas with excess water, to remove loose materials and moisten the surface to a dull dampness, which is prerequisite for the application of PENETRON® integral crystalline waterproofing system. Also, clean thoroughly rust from steel reinforcement bars. When the concrete is damp, with no wet sheen on the surface, apply a slurry coat of PENETRON®, at a mixing ratio of 5 part PENETRON® powder to 3-3.5 parts of water (by volume), on the areas to be patched or repaired and 2/5" (10 mm) around them as well as the clean reinforcement bars. While PENETRON® coating is still "green" (tacky), mix PENECRETE MORTAR® with adequate amount of water, until the desired consistency is achieved [usual mixing ratio is 4.5 parts of PENECRETE MORTAR™ to 1 part of water (by volume)] and filling the cracks and spalled areas. When PENECRETE MORTAR® has set, but is still moistened, apply a second layer of PENETRON® slurry coat, at a mixing ratio of 5 part PENETRON® powder to 3-3.5 parts of water (by volume), on the repaired areas. At this stage, if waterproofing of the total construction is required, apply a slurry coat of PENETRON® on the whole surface, in two layers, while the first layer is still "green" (approx. half to one hour later).



In lots of applications, to save time, the first layer of PENETRON® is applied post to surface preparation and dampening and approx. half an hour later, while the product is still "green", the repairing mortar PENECRETE MORTAR™ is applied. Approx. half to one hour later, and while PENECRETE MORTAR® is still "green", the second layer of PENETRON® slurry coat is applied. The total consumption of the two layers of PENETRON® is 1.5 kg/m² (depending on the surfaces, the indicative consumption should be between 1.1 to 1,6 kg / m²).

Alternatively, instead of PENECRETE MORTAR®, apply the economy efficient repairing mortar with modified polymers for general concrete repairs, PENETRON® MULTI PATCH. It can be applied as long as PENETRON® is still "green" (tacky). Usually, mixing rating is 3,1 kg to 3,4 kg of clean water per bag or 25 kg of PENETRON® MULTI PATCH mortar.

Alternatively, instead of PENECRETE MORTAR®, apply the repairing mortar with modified polymers for vertical and overhead surfaces, PENETRON® V/O PATCH, for application thickness up to 50 mm. It can be applied as long as PENETRON® is still “green” (tacky). PENETRON® V/O PATCH needs from 3,3 to 4,3 Lt of clean water per 22,68 kg bag or 0,6 to 0,8 Lt of clean water, per 4,75 kg pail. Mix the needed quantity of product, necessary for the application of the next 20 minutes.

Note: It is clarified that PENETRON® MULTI PATCH and PENETRON® V/O PATCH are conventional repairing products, while PENECRETE MORTAR® is a crystalline repairing mortar.

3. Crack repairs with PENETRON® INJECT, crystalline water cut-off injection grout. The system applied with cementitious grout machine.

Prepare crack to receive repair materials by sawcutting along the length of the crack at a width of approximately $\frac{3}{4}$ " to 1" (20 to 25 mm). Sawcut should be in a reverse “V” or “U” shaped channel to avoid repair materials from popping out. Remove the concrete in the crack area to a depth equal to the width of the sawcut or 50% deeper [e.g., if a 1" (20 mm) wide sawcut is made, a 1 $\frac{1}{2}$ " (20-30 mm) depth channel should be cut out]. Clean the sawcut channel with a water pressure washer (3,000 psi minimum) and drill holes to receive the injection packers. Diameter and depth of the holes will be as defined by the type and style of injection packer used. Holes should be spaced out at 10" to 15" (25 to 35 cm).

Place and tighten the injection packers. Partially fill the bottom of the channel and around each injection packer with PENEPLUG® so that escaping water is able to flow only through the injection packers. Brush on a slurry of PENETRON® on PENEPLUG®. Allow PENEPLUG® to completely set and dry for 24 hours. During this time, water may flow freely through the injection packers. Start injecting PENETRON INJECT® from the lowest injection packer. Pump until PENETRON INJECT® starts to flow from the next highest injection packer or until the pressure rises (maximum pressure - 5 bar). Close the first injection port and begin filling from the second injection packer. Follow this sequence until the entire length of the repair is filled. Allow PENETRON INJECT® to cure and harden for at least 2 days. At this point, a visual inspection can confirm that all leaks have been stopped and the injection packers can be loosened and removed. Dry pack all holes left by the injection packers with PENECRETE MORTAR®. Use a dowel to tightly compress PENECRETE MORTAR® into the holes.



Mixing of PENETRON INJECT®: Put PENETRON INJECT® - PART B (Liquid) into the mixing bucket. Add water to the bucket and mix. Remove 10% of this mixture and store for later re-addition. Slowly add PENETRON INJECT® - PART A (Powder) to the 90% mixture mixing continuously with a suitable mixing tool. Mix for at least 2 minutes until a smooth, homogeneous, lump free mix is achieved. Add the stored 10% mixture to the combined powder/liquid mix and continue to mix for an additional one minute. This completed mixture should have a viscosity of approximately 30 seconds in a DIN 4 mm cup. In cases where an extremely low viscosity mix is

needed (e.g., to fill very fine cracks), additional water [an additional 0.5 Lt (0.5 quart) to a maximum of 1 Lt (1 quart)] can be added until a viscosity of 18 DIN-seconds is reached. Once this mix is poured into the funnel of the injection pump, it is ready to be injected. It is helpful to slightly agitate the mix from time to time (about each 10 to 15 minutes) in case all of the mix is not used immediately. Initiation of the curing reaction can be noted by an increase in the viscosity. To avoid solidification in the equipment, the remaining mix should be cleaned out of the funnel, pump and injection tubes. Pot life times are based on a temperature of 68 °F (20 °C). In higher temperatures the pot life and workability will be reduced. In such cases more of PENETRON INJECT® - PART B (Liquid) can be added with a corresponding and equal reduction in mix water.

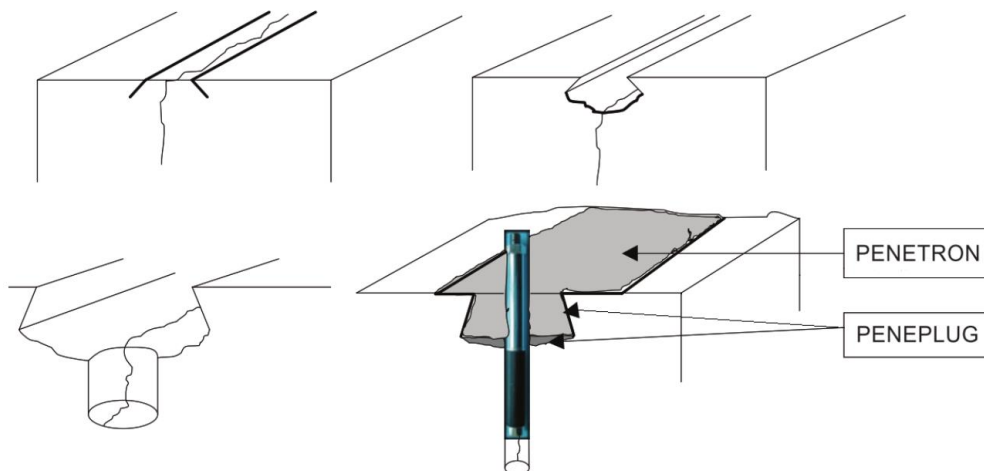
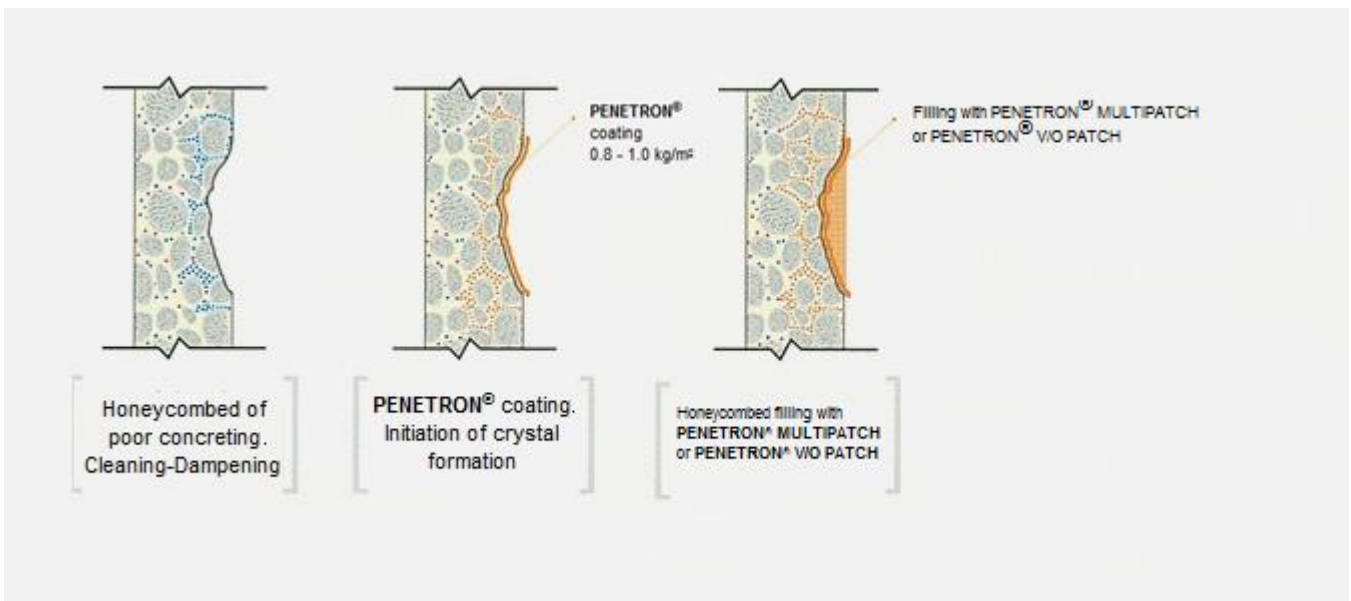
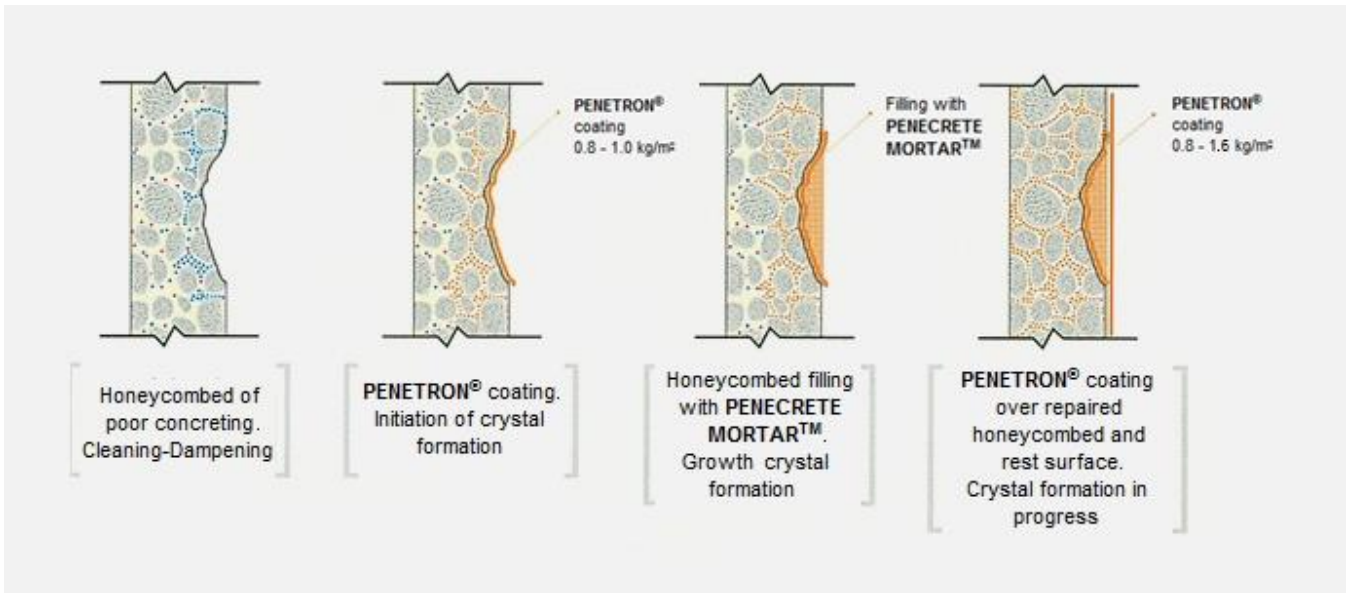
Alternatively, for sealing of capillary cracks without water leakage, can be used the cementitious repairing injection grout PENETRON® GROUT INJECT.

Mixing of PENETRON GROUT INJECT®:

Mix 1.6 – 1.7 gal (6 – 6.5 Lt) clean water per 55 lb (25 kg) bag PENETRON® GROUT INJECT. Mix with a mixing drill for approx. 2 – 3 minutes, at low speed, until a smooth, homogeneous, lump free mix is achieved. In cases where an extremely low viscosity mix is needed (e.g., to fill very fine cracks), additional water of about 0.5 quart (0.5 Lt) can be added until a viscosity of 18 DIN-seconds is reached. Once the mixture has the required fluidity, is ready to be injected, using the injection pump.

A schematic description of repaired services with PENETRON® integral crystalline waterproofing system is depicted below:







The description texts mentioned above are not subject of a case study, but technical propositions, according to our best of knowledge and based on our experience and knowledge up to date. For more information, regarding the safe use, treatment and storage of our products, contact PENETRON HELLAS and refer to the *Product Data Sheet* and *Material Safety Data Sheet* of every product you use.

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