

An intricate web of insoluble crystals forms in the presence of Penetron and H₂O creating a permanent protective seal

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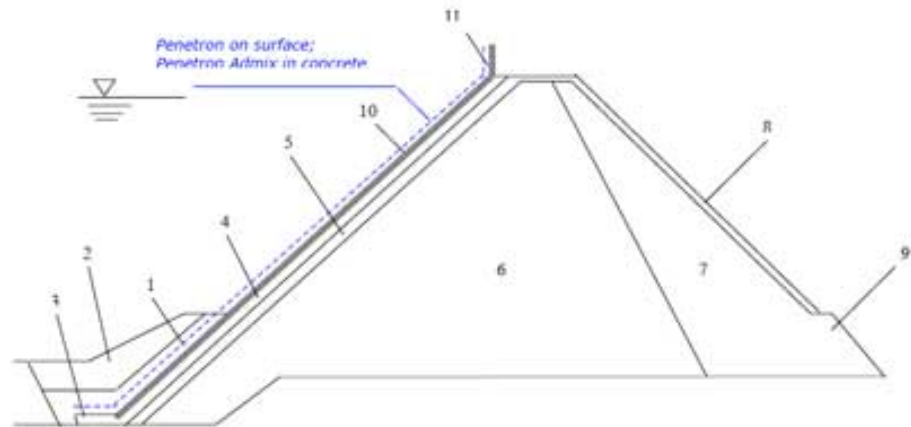


TUV Rheinland of North America



Feature - Waterproofing in the hydroelectric industry

Two of the main challenges facing hydroelectric facilities are; A. coping with high hydrostatic pressure, which will lead to water Penetration through the concrete, and B. the resulting corrosion of the reinforcement steel, which will cause deterioration of the concrete structure over time.



The Penetron system offers a comprehensive solution to both problems;

Penetron has been proven to dramatically increase the resistance of concrete to very high hydrostatic pressure (16 Bar for Penetron coating ([click here for test report](#)) and 20 Bar for Penetron Admix ([click here for test report](#)). As the insoluble Penetron crystals fill up the cracks and pores, water penetration into the concrete is virtually eliminated.



Penetron prevents corrosion of reinforcement steel

Steel will not corrode in alkaline environments, hence it can be safely used in concrete under normal conditions. However, once the alkalinity at the steel's surface drops below pH 8, the reinforcement steel will become de-passivated and corrosion will start. With the alkalinity of cured Penetron being around pH 11.5 and the presence of Penetron components both at the surface and throughout the concrete matrix, Penetron will help to maintain a highly alkaline environment and hence protect the reinforcement steel from corroding, and the concrete structure from deterioration. (for more information on how Penetron protects reinforcement steel, [click here](#))

Penetron has been used on a multitude of hydroelectric projects, among which The Glen Canyon Dam in Arizona, USA, Kiambere Hydroelectric in Kenya, Daugava Dam in Latvia, Long Tan Dam in China, Hao Binh Dam in Vietnam etc., see also case study below

CASE STUDY - Dam Focus



SAYANO-SHUSHENSKAYA HYDROELECTRIC POWER STATION, Russia

Sayano-Shushenskaya hydroelectric power station is the biggest one in Russia and features the third largest dam in the world. The dam is 240 meters high and 900 meters wide. It has a capacity of 6400 megawatt. The project is strategically very important.

The project faced a typical problem; severe deterioration of the steel reinforcements in the concrete.

Uralpromservice, Penetron distributors in Russia, came up with a detailed repair proposal and won the tender.

Since then, the Penetron system has been used extensively on this project; in 2004 the powerhouse cable sections were repaired, in 2005 major work was done on reinforced concrete elements throughout the project and 2006 will continue to see Penetron repairs on various sections of this project, including the flood-gates.



KARIBA DAM - Zimbabwe

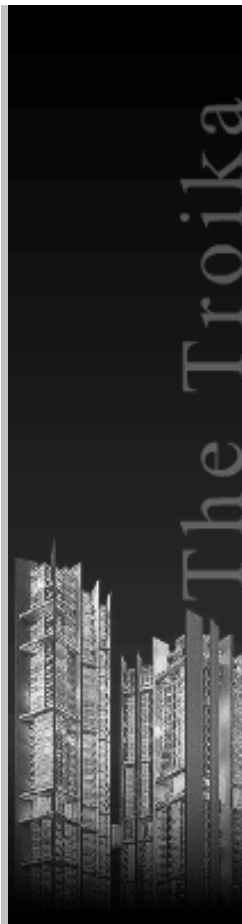
This magnificent dam was completed in 1960 and was the largest man-made dam ever built. It provides electricity to Zambia and Zimbabwe, damming Africa's fourth largest river (the Zambezi River). It also supports a thriving local fishing industry. It is a feat of both engineering and human endeavor that the 282km² dam was built at all. Through temperatures that sometimes reached 48°C cataclysmic storms and lightning floods, the wall rose, 128m high and half a mile long. The Penetron system was called in to help remedy water leakage and thoroughly moist concrete areas on the project in 1991. Areas treated with the Penetron system include parts of the main dam structure and adjacent areas as well as utility rooms.



Penetron Worldwide



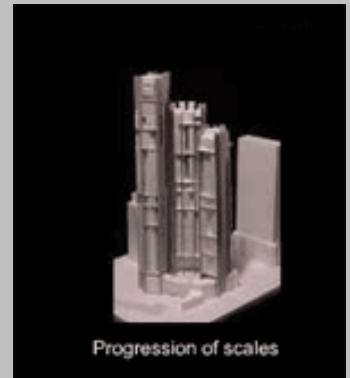
TROIKA, Kuala Lumpur, Malaysia



The Troika is the stuff of dreams. A dream that was BRDB's – to create the city's most beautiful and desirable condominium, right in the country's most sought-after location. The vision required imagination and craft to be realized. And so it was decided to engage Norman Foster and Partners to create a new residential landmark for Kuala Lumpur to complement Caesar Pelli's Petronas Twin Towers. The project features three soaring towers and a four level basement structure. Penetron Admix was the only system that performed according to the specification and was chosen to waterproof the basement slab. Visit www.troika.com.my to learn more about this project.



Early sketch by Foster's



Progression of scales



KARACHI PORT TRUST FOUNTAIN, Pakistan

Karachi Port Trust Chairman Admiral Ahmed Hayat came up with the idea to build the highest sea water fountain in the world and selected the Oyster Rocks site facing Clifton beach area for this project of national pride. The project started in March 2005 and was inaugurated by President Pervez Musharraf on January 12, 2006. The fountain shoots seawater 188 meters (620 feet) high! Penetron Admix was selected out of all available waterproofing materials after several tests. Over 6 tons of Penetron Admix were used in the piles as well as the concrete structure for protection against aggressive seawater for many years to come.



(Click above for larger image)



Penetron Sponsors National Concrete Canoe Competition, USA

Each year, the American Society of Civil Engineers' (ASCE) National Concrete Canoe Competition gives students the opportunity to learn teamwork, challenge themselves mentally and physically, and apply the engineering knowledge they gained in the classroom to a fun, "real world" project. More than 250 teams work throughout the year to qualify for the national competition and, in the process, gain hands-on experience working with concrete mix designs, and learn the properties of various materials that can be added to concrete to influence performance.

The same kinds of high-tech concretes and admixtures used by students in the competition are changing the building industry. Engineers use them every day to construct new roads, bridges, buildings and even homes that are stronger, more durable and less expensive. The students will apply the ingenuity and innovation they learn from the competition when solving the construction challenges of tomorrow.

In June, hundreds of civil engineering students from across the country will converge on Stillwater, OK, for the 19th annual competition, where they will make the impossible a reality: design, build and race canoes made of concrete. The best and brightest from the top engineering schools will compete for scholarships by posting the best overall score in categories; aesthetics and structural integrity, a written paper detailing their design and construction process, a business presentation and finally, the races.

"We are very proud to be a sponsor of the Concrete Canoe Competition and for the opportunity to invest in our industry's future." said Robert G. Revera, Chief Executive Officer and Managing Partner of ICS/Penetron International Ltd. "Giving these students the chance to innovate with new and existing products and technologies will allow them to expand the boundaries of our industry. These same individuals will be the ones leading our profession in 20 years from now and an investment in their success today will ensure a solid foundation for the future."



HVAC & UTILITY TUNNEL, Utah, USA

Located in Utah this project involved waterproofing a building where the foundation formed the exterior perimeter of a tunnel system that provided air return to a number of HVAC systems throughout the building.

These tunnels were originally formed by casting a concrete "trough"; the perimeter being the building foundation with

the "floor" and "interior wall" being separate components. The exterior perimeter foundation wall was waterproofed only on the inside by application of a tar-like coating. The finished foundational "tunnels" were approximately 2 feet tall and 3 feet wide and extended up to 175 feet. Water intrusions were present in several areas with standing water present. The contract involved cleaning, waterproofing and protecting the tunnel components from further water intrusion and water damage. To start the actual repair process, steps were first taken to clean loose debris and then a cryogenic blasting was used to remove the previous bituminous coating and rust on the existing metal "ceiling" deck.

Once all non-concrete surfaces were treated, the concrete walls and floors were waterproofed with Penetron via spray application and all penetrations and non-moving joints packed with Pencrete Mortar.

"This project proved a particular challenge because of the confined spaces, pumping distances and limited access. Notwithstanding all of this, the tunnels are now waterproof." said Loran Hubbard of Lindhart Technical Services "We were able to complete the project at a nice profit significantly under the next highest bidder. We applaud your fine product."



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Penetron products are currently available in over 60 countries. Should you wish to be contacted by a local representative and learn how Penetron can solve your concrete problems, please [contact us](#).