PENETRON NEWSLETTER

October 2020

Welcome to the latest edition of the PENETRON Newsletter.

Roads make up some of the most critical pieces of infrastructure in any country and are often referred to as the "arteries of our economies." That makes it vital to build durable and long-lasting roads to reduce maintenance as well as subsequent repairs. In this issue, we take a closer look at how PENETRON ADMIX can contribute to increasing the service life of concrete roads – enabling substantial savings in road maintenance costs.

The global battle against COVID-19 continues and PENETRON offices are doing their part in order to put a stop to this global pandemic.

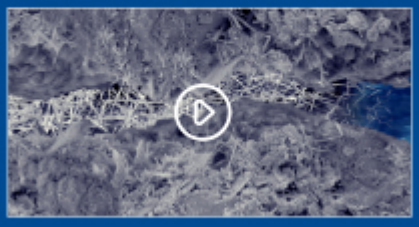
For many decades, Penetron has been known as a trusted and reliable partner when it comes to protecting concrete structures – offering durable, sustainable, and economic solutions worldwide. We close this edition with an overview of some of the latest projects that benefit from PENETRON applications in the PENETRON WORLDWIDE section below.

Remember: we are here for you. If you need to get in touch about a project, technical proposal or any questions about the PENETRON range of products, please contact us here.

Stay safe and healthy,

Florian Klouda
Director, International Account Coordination
PENETRON INTERNATIONAL LTD.

HOW PENETRON WORKS



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WITNESS PENETRON'S CRACK HEALING ABILITY

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PENETRON WORLDWIDE

Next level road concrete with PENETRON ADMIX

The 'New Normal' at Penetron

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E-60 East-West Expressway, Georgia

Pakubuwono Menteng Tower Picks Penetron for a Solid Footing in Jakarta, Indonesia

Dangote Headquarters, Ikoyi, Lagos, Nigeria

Lago Mar Texas City, USA

Deniz Mall, Baku, Azerbaijan

State Route 30 Bridge, Tishomingo, Mississippi, USA

Next level road concrete with PENETRON ADMIX

Roads and highways are a critical part of a country's infrastructure – connecting towns and cities, enabling trade and social exchange and usually accommodating the majority of goods and passenger traffic. In short, roads are vital for continued economic growth and the development of any nation.

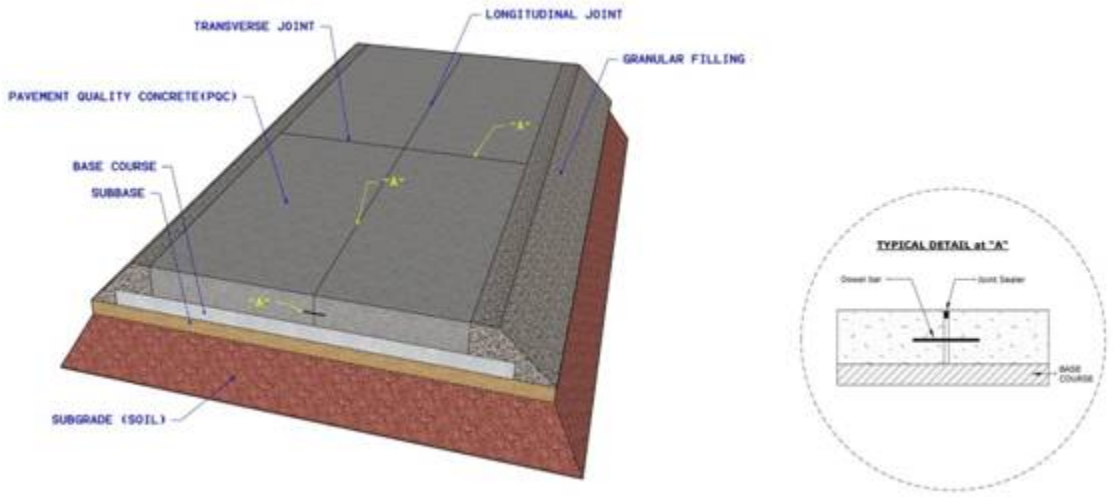
These facts underline the importance of building long-lasting and reliable road infrastructure with minimal disruption to serviceability.

Concrete is one of the world's most versatile construction materials. For example, it is more durable than asphalt and exhibits a long service life. With an average lifespan of 30-50 years, concrete roads have twice to four times the service life of asphalt roads.

And even though concrete roads are about 20% more expensive to build, the total lifecycle cost of concrete roads compared to asphalt roads is usually about 20-25% cheaper.

Enhanced service life and reduced maintenance costs provide a powerful motivation for municipalities and governments to convert more roads to concrete roads in the future. Apart from the advantages of enhanced durability and low lifecycle cost, concrete roads provide additional benefits in regard to safety, availability and fuel consumption.

Concrete roads typically consist of a compacted subgrade (existing soil), if needed, a granular subbase, a base layer (lean concrete) and a surface layer made of pavement quality concrete. The surface is usually jointed, and the joints are typically reinforced with some form of rebar.



Typical concrete road construction (cross section)

While concrete roads usually have a longer service life compared to asphalt roads, it's important to note that concrete is not immune to deterioration either. Microcracks, pores, and capillaries render concrete a permeable material. Water and waterborne contaminants can enter the concrete through these pores. If the concrete is not treated, this process will set in motion a variety of deterioration effects in the concrete that will directly affect concrete durability and service life.

For example, severe environmental conditions can cause cracking of concrete roads. Water penetrating the concrete matrix speeds up the deterioration of concrete road surfaces. Roads in freezing conditions are exposed to spalling and scaling of the concrete surface, exposing the aggregates and resulting in parts of the concrete simply breaking off. In addition, untreated, permeable concrete allows road salts and other deicing chemicals to enter and accelerate the deterioration process by attacking any embedded reinforcement steel. Finally, concrete roads in maritime environments are exposed to chloride penetration. Chlorides enter concrete in an aqueous solution and lower the pH/alkalinity of concrete. Once a certain chloride threshold around the steel reinforcement is reached, the passivation of the steel is affected, and corrosion will begin. Corroding steel expands in volume, exerts internal pressure on the concrete and results in cracking.

Due to these and other factors, the durability of concrete roads can be significantly increased by making concrete impermeable and preventing water from penetrating the surface course.

PENETRON ADMIX enhances the durability of conventional concrete and road concrete on many levels. Adding Penetron's durability admixture to road concrete directly addresses the main deterioration issues of conventional road surfaces and enhances performance in regard to:

- Increased compressive strength
- Increased tensile strength
- Significantly reduced permeability
- Reduced chloride penetration

In addition, the distinctive self-healing properties of PENETRON ADMIX actively support durability and extend service life. The permanent self-healing of new cracks prevents the entry of water and maintains a completely impermeable concrete matrix; this can extend the service life of concrete by 60 years or more in critical environments.

This makes PENETRON ADMIX the number one contender for effectively future-proofing critical road infrastructure around the globe – enhancing service life, reducing operating costs and keeping traffic flowing.

Read the full article here.

The 'New Normal' at Penetron

In every regard, 2020 is a special year for all of us. Unfortunately, the world continues to fight a pandemic that has affected every corner of our lives. And while for many of us this still means or has meant our very own, individual battle, there is no denying that we are in this together.

Countries around the world have introduced measures to further curb the spread of the virus and it looks as if these measures are going to remain (in some form) for the foreseeable future. Many of the resulting changes to our economies and communities have become our 'new normal.'

In an effort to keep contributing to the wellbeing of our families, friends and neighbors, PENETRON branches around the world have adapted to and introduced daily health and safety measures in our production facilities, offices and on jobsites in line with government regulations.

In many countries these measures include wearing masks in the workplace and on construction sites, regular temperature checks, contact tracing, social distancing in offices and production facilities, and increased hygiene (washing and disinfection of hands, regular disinfection of workplaces, vehicles, storage facilities, etc.).

Thank you for doing your part. Together we will beat COVID-19.

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E-60 East-West Expressway, Georgia

The East-West Highway is the main corridor for transit through Georgia. This 390-km high-speed highway is part of the European Highway system (E60) and connects China to France in what is also known as the new "Silk Route."

Financed by the World Bank and other international organizations, including the European Union, European Investment Bank, Asian Development Bank, Kuwait Fund and Japan International Cooperation Agency (JICA), the project is being built by Sinohydro, a Chinese contractor, and set to be completed by 2022.

The design of the East-West Expressway consists of a reinforced concrete layer (40cm thick), which is covered by an asphalt layer as the final surface course to all road segments including bridges and tunnels.

Following a route through mountainous terrain, the E60 road structure is exposed to deterioration from aggressive environments. PENETRON ADMIX was specifically added to the reinforced concrete layer to protect the road against the elements, reduce maintenance and repair due to deterioration, and significantly increase the service life of one of Georgia's most vital pieces of infrastructure.

Pakubuwono Menteng Tower Picks Penetron for a Solid Footing in Jakarta, Indonesia

The official June 2020 opening of the Pakubuwono Menteng luxury condo tower raises the standard with its location in the center of Jakarta and extensive list of amenities. The construction site, faced with high groundwater, demanded a reliable waterproofing solution. PENETRON met the challenge.

Designed by PT Airmas Asri Architects, the Pakubuwono Menteng is a 38-floor (>162 m / 534-feet tall) luxury condo tower with unobstructed views of the city of Jakarta, the Java Sea and the surrounding region. The 340 residential units, available in 2- and 3-bedroom layouts, cover a total floor area (GFA) of 71,000 m^2 / 764,238 ft^2, and include amenities like a sky gym, sauna & steam rooms, a jacuzzi, tennis court, outdoor & rooftop swimming pools, BBQ area, spa & health clinic, a library, a business center, a guest function room, and underground parking.

The challenge of the high groundwater level at the construction site was compounded by sporadic local flooding and seawater from the nearby Java Sea. Chloride ions in seawater are a major cause of concrete deterioration. To effectively protect the projects' substructure, PENETRON was dry-shake applied to the projects basement slab. The retaining walls, groundwater tanks and on-site sewage treatment plant were also treated with PENETRON coating. Altogether, a total surface area of 12,000m^2 was protected with PENETRON to prevent water ingress. In addition, PENEBAR SW-55 waterstop strips (530 m) were applied to the construction joints.

Dangote Headquarters, Ikoyi, Lagos, Nigeria

Dangote, a West-African conglomerate active in various sectors (including cement, sugar, salt, condiments, flour, energy, fertilizer, etc.), will move into its new headquarters by mid-2022. The new location in Ikoyi, Lagos features an 18-floor, grade A office tower worthy of one of Africa's most renowned business ventures.

Dangote Industries engaged the internationally acclaimed James Cubitt Architects to design their new headquarters. The project incorporates two identical towers at varied heights abutting each other on two sides to create a radiating petal form. The complex incorporates offices, a 200-seat auditorium, a 300-seat banquet hall and a four-level, above-ground parking garage.

Dangote Projects, the main contractor on this project is set to complete the construction work within a challenging schedule of only 24 months.

Emmanuel De-Graft, project manager of the Dangote HQ project, confirmed that a waterproofing solution was critical to fully protect the concrete substructure elements that come in contact with the area's corrosive groundwater – and the high hydrostatic pressure.

Subsequently, 3,000m³ of concrete used for the pile caps, beams, floor slabs, columns and retaining walls was treated and sealed with PENETRON ADMIX. Form-tie holes were plugged with a combination of PENETRON and PENECRETE MORTAR. Over 600 meters of PENEBAR SW-55 swellable waterstop strips were applied to protect against any leakage through the non-moving construction joints.

Lago Mar Texas City, USA

In August 2020, the first of 14,000 residents moved into their new homes at the Lago Mar Texas City community. Penetron crystalline technology was used to waterproof the beach area of the community's enormous artificial concrete lagoon.

Located about 45 miles (72 km) southeast of Houston, Texas on the shores of Galveston Bay, Lago Mar Texas City is a planned community with approximately 4,000 homes, several lakes, open areas, parks and walking trails spread across 2,033 acres.

The centerpiece of the new community is the 12-acre Crystal Lagoon that lies in the middle of Mar Lago Texas City's entertainment district. The Lagoon includes multiple white sand beaches, a floating obstacle course, a swim-up bar, and an integrated beach club with a cabana pool. The Crystal Lagoon concept combines an innovative design of an artificial lagoon with a low environmental impact water treatment technology.

PENETRON slurry was applied to the surface of the Crystal Lagoon's beach area along the Ploy Lock system to help prevent water penetration.

Deniz Mall, Baku, Azerbaijan

Delayed by the Covid-19 pandemic, the June 1, 2020 opening of the Deniz Mall, a stunning shopping and entertainment center on the shores of the Caspian Sea, was cause for celebration in Baku, Azerbaijan. Penetron crystalline technology ensured waterproof protection to a structure threatened by a leaking membrane installation.

Chapman Taylor, a global architectural and planning firm that has completed over 2,000 projects in 90 countries, designed a sculptural form for the Deniz Mall with a series of shell roofs that reflect off the waters of the surrounding Caspian Sea. The eight star-shaped wings are inspired by Azerbaijan's national emblem and the building's central 'flame' tower creates a visual focus when illuminated at night. Inside are five floors (120,000m²/1.32 million square feet) of entertainment, leisure, and dining areas with over 70 shops and restaurants.

Located on land reclaimed from the Caspian Sea, the project was faced with several challenges, including high levels of groundwater and saltwater penetration. Even more problematic was a compromised membrane system, which formed the basis of a much-needed waterproofing solution. Faced with flooding basement structures, the project developer and contractor, Pasha Construction, contacted Penetron Azerbaijan for a more reliable solution.

Facing leakages from a damaged membrane system halfway through the construction schedule, the client urgently needed a new solution. To protect the new reinforced concrete structures of the Deniz Mall from deterioration caused by the penetration of chloride ions in saltwater, the local PENETRON team proposed the immediate addition of PENETRON ADMIX to the concrete mix and the application of PENECRETE MORTAR to repair cracks larger than 0.5 mm (1/51”) in the concrete. The Penetron System was used to waterproof and protect the project’s two underground parking garage floors, all below-grade retaining walls, the foundation slab, the elevator shafts, and the elevator pits.

State Route 30 Bridge, Tishomingo, Mississippi, USA

Over the years, the concrete surface of the State Route 30 bridge in Tishomingo, MS had been severely damaged.

The Mississippi Department of Transportation (MS DOT) approved a $1.76 million project budget for the repair and renewal of the State Route 30 bridge, a two-lane structure that traverses Mackeys Creek in the northeastern corner of Mississippi. Initially, the damaged concrete surface of the bridge (two-lanes wide) was hydro-blasted to expose the top layers of reinforcing steel. The exposed concrete structure was then covered with the PENETRON ADMIX-treated concrete, ensuring a high degree of impermeability and optimal protection against any future intrusion of water and de-icing salts.

The project was completed on time and on budget. The layer of PENETRON ADMIX-treated concrete now covering the bridge will help to avoid any further damages that would make a costly bridge replacement necessary in the future.

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