

Durable Concrete Emerges as a Critical Tool To Avoid Membrane Failure in Tunnel Construction

Waterproofing admixtures can provide 100-year durability for infrastructure and mixed-use projects that serve transportation, pedestrians, utilities and sewage

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tunnel construction accelerates to support growing transportation, utility, and urban infrastructure demands, project owners are scrambling to repair leaks due to membrane failure and finding that such complex projects may be more expensive than originally drawn up with basic materials.

A recent study from [Advances in Engineering Innovation \(R. Wang, 2025\)](#) highlights these issues, calling out the potential for loss of adhesion, difficulty conforming to irregular surfaces, and separation at lap joints as typical

modes of failure.

[Kryton International](#), the global leader in concrete waterproofing and durability solutions, has been on the front lines of this trend, integrating its advanced admixtures and crystalline technologies that chemically block water pathways within the concrete matrix, itself, eliminating the need for external membranes that can tear, delaminate, or fail over time.

“Traditional reliance on waterproofing membranes, alone, is no longer sufficient, as membrane failures and long-term leakage continue to plague tunnels of all types,” said Kari Yuers, President and CEO of Kryton International. “As we build tunnels designed to last a century or more, incorporating integral waterproofing systems from the start can prevent billions in repair costs and extend the life of critical assets.”

From vehicular and rail tunnels to pedestrian walkways, utility conduits, stormwater systems, wastewater networks, and sewer tunnels, the risks posed by water intrusion are consistent—and costly. When membranes fail, moisture can penetrate liners, degrade structural components,

accelerate corrosion of reinforcement, and require expensive repairs or operational shutdowns.

Kryton was recently brought in to repair damaged membranes on tunnel projects shortly after they were completed using a different company's materials. Several of them were in New York City, including the retail center at the World Trade Center, a pedestrian tunnel at JFK International Airport, and the ConEdison utility lines deep beneath 2nd Avenue.

Kryton's Krystol technology reacts with moisture to form needle-shaped crystals that fill capillary pores and micro-cracks in the concrete and block the pathways for water and waterborne contaminants. Unlike

other solutions whose effectiveness may deplete over time, Krystol technology cannot be used up and will continue to provide self-sealing performance for the life of the concrete. Any moisture introduced over the lifespan of the concrete will initiate crystallization, ensuring permanent waterproofing and watertightness protection.

"Whether it's a train tunnel running under a dense urban core or a sewage line carrying corrosive flows, every type of tunnel faces water challenges," Yuers said. "Selecting the right concrete solution from the start is the best insurance against leaks, failures, and costly remediation."

Kryton has also supplied its Krystol Internal Membrane (KIM) in countless projects going back more than 40 years. Notable tunnel projects include:

- Allston Science and Engineering Complex at Harvard University, which provides separate tunnel lines for utilities, pedestrians, automobiles, and sewage.
- [George Bush Intercontinental Airport in Houston](#), which has a critical inter-terminal train tunnel connecting all parts of the airport and a hotel.
- Marina Bay Sands (MBS) in Singapore, which is considered one of the most complex underground networks in the world, linking its convention center and retail outlets with utilities and transportation systems at a resort which sees more than 100,000 daily visitors.

Such tunnels are continuously exposed to hydrostatic pressure, fluctuating groundwater levels, and chemical exposure. Traditional concrete, while durable, is porous — allowing water and contaminants to penetrate over time, corroding reinforcement steel and compromising long-



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term integrity.

The push for waterproof concrete has accelerated as climate change drives heavier rainfall and rising groundwater levels. Urban areas are particularly vulnerable, where underground transit systems and utility corridors must withstand greater environmental stress while maintaining uninterrupted service.

"We're seeing a growing recognition among design-build teams and public agencies that waterproof concrete enhances both safety and lifecycle performance," Yuers said. "As budgets tighten and sustainability standards rise, durable, low-maintenance materials are becoming the foundation of responsible engineering."

For more information, visit www.kryton.com or join its webinar, Water, Wear & Shutdowns: The Triple Threat to Your Concrete, to learn about avoiding a costly shutdown.

ABOUT KRYTON

Kryton International Inc. is the inventor of the crystalline waterproofing admixture and has been waterproofing concrete structures with its proprietary Krystol® technology since 1973. Kryton has won awards for innovation, manufacturing, best place to work, and entrepreneurship. Kryton is an active member of the American Concrete Institute, International Concrete Repair Institute, American Shotcrete Association, and many other thought-leading organizations. Kryton exports its Smart Concrete products to more than 50 countries globally. www.kryton.com

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