

Advanced Waterproofing Strategies for Resilient Building Envelopes

A complete guide to Integral Concrete Waterproofing technologies for ensuring long-term protection



Contents

Introduction	3
The Origins of Integral Concrete Waterproofing	4
Myth-Busting Common Integral Concrete Waterproofing Misconceptions	8
10 Critical Success Factors for Integral Concrete Waterproofing	9
1. Proven Track Record	10
2. Application Type	11
3. Environmental Considerations and Challenges	11
4. System vs. Product Approach	14
5. Mix Design Considerations	15
6. Pre-Construction Planning	16
7. Spacing of Control Joints	16
8. Quality Control During Construction	17
9. Communication and Coordination	17
Integrating Maintenance and Inspection Protocols Post-Construction	18
The Future of Waterproofing	20
About Kryton	21
More Resources	22

Introduction

Waterproofing is not just about keeping water out—it's about safeguarding the structural integrity of the building itself. Unchecked water infiltration can lead to severe damage, from corrosion of steel reinforcement to freeze-thaw cycles that gradually break down concrete. The right waterproofing approach ensures that buildings remain resilient, safe, and efficient over their entire lifespan.

Integral Concrete Waterproofing, with its ability to integrate directly into the concrete matrix, has emerged as a more robust, long-lasting solution than traditional barrier methods, minimizing risks and maximizing durability.

In this guide, we explore key Integral Concrete Waterproofing strategies, drawing on insights and practical advice from the webinar [Advanced Strategies for Integral Concrete Waterproofing in Modern Building Envelopes](#), hosted by John Andersen, Territory Manager at Kryton International, and Joel Schwartz, Principal at JRS Engineering. With over 45 years of combined experience, John and Joel are recognized experts who have supported numerous high-profile construction projects with innovative waterproofing solutions.

Their shared expertise from this conversation is summarized in this resource to provide a comprehensive review on integrating Integral Concrete Waterproofing with today's building needs.

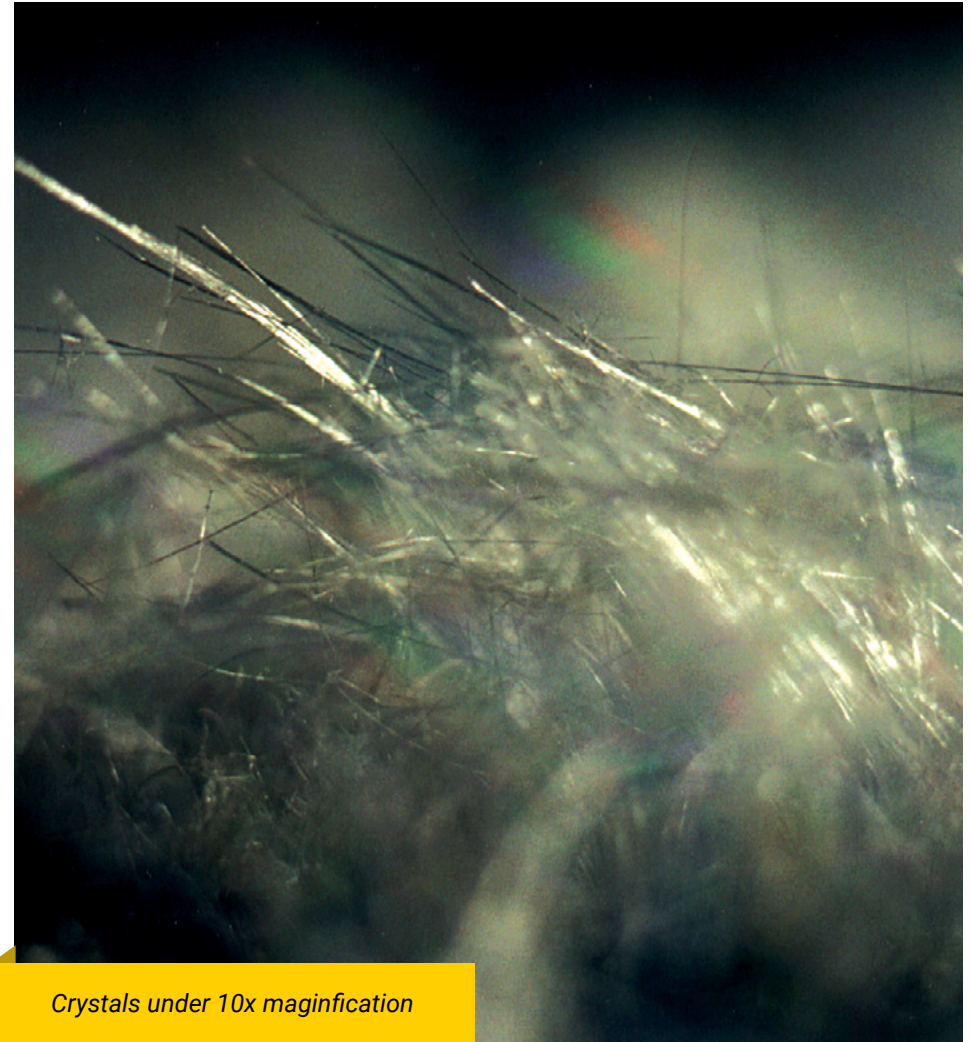


The Origins of Integral Concrete Waterproofing

In the 1970s, as construction demands grew and traditional waterproofing methods showed limitations, the concept of Integral Concrete Waterproofing gained momentum. Unlike conventional waterproofing, which relies on external membranes or coatings prone to damage, environmental degradation, or improper installation, Integral Concrete Waterproofing was designed to put a reactive system to counteract hydrostatic pressure directly into the concrete matrix. This shift offered a new approach to waterproofing that could adapt to the concrete's natural lifecycle and withstand environmental challenges.

Integral crystalline waterproofing, now a leading technology in the below-grade waterproofing space, works by introducing specialized admixtures into the concrete mix when batching. These crystalline admixtures chemically react either with unhydrated cement particles or one of the by-products of cement hydration. These two distinct chemical pathways can lead to different shapes of crystal formation and different levels of performance, but generally these reactions produce long-lasting, insoluble crystals that fill microcracks, pores, and capillaries within the concrete. As these crystals grow, they effectively block water pathways, creating a durable, watertight barrier within the structure itself.

One of the standout features of crystalline waterproofing is its self-sealing ability. If new cracks form over time, the crystalline structures reactivate upon contact with water, continue to grow and proliferate until the path of the water is cut off, minimizing repair costs in the process. This self-sealing capability makes crystalline waterproofing a robust and lasting solution, providing a level of durability and longevity that traditional methods, reliant on surface-applied barriers, cannot achieve.



Crystals under 10x magnification

Integral Crystalline Waterproofing

[Krystol Internal Membrane™ \(KIM®\)](#) is the original hydrophilic crystalline admixture. First launched in 1980, KIM is used to create permanently waterproof concrete. KIM lowers concrete permeability and is used in place of surface-applied waterproofing membranes.

By stopping the transmission of water through concrete, KIM adds durability and longevity to concrete by protecting it against chemical attack and corrosion of reinforcing steel.

The principles of crystalline technology are similar to that of concrete itself:

UNTREATED CONCRETE

Cement + Water \longrightarrow CSH* + CH**

CRYSTALLINE TREATED CONCRETE

Cement + Water \longrightarrow CSH* + CH**
+ Needle-Shaped Crystals

*Calcium Silicate Hydrate **Calcium Hydroxide

Evolving to a Systems Approach

Over the past 20 years, the approach to Integral Concrete Waterproofing has evolved into a more sophisticated and comprehensive system. As crystalline technology matured, it became clear that a systems approach was necessary to maximize effectiveness.

This meant addressing key details in the construction process, such as:

- **Cold Joints:** Areas where new concrete meets already set concrete, requiring careful treatment to prevent leaks.
- **Water Stopping at Penetrations:** Ensuring that any penetrations, such as pipes, are properly sealed to prevent water from entering the structure.
- **Tie Holes:** These small holes left behind by formwork during construction are sealed to prevent potential water pathways.
- **Concrete Repair:** Addressing defects in the concrete itself, such as cracks or honeycombing, to ensure the integrity of the waterproofing system.

This shift to a more integrated and systematized approach has significantly improved the performance of crystalline waterproofing, offering more reliable protection over the long term.

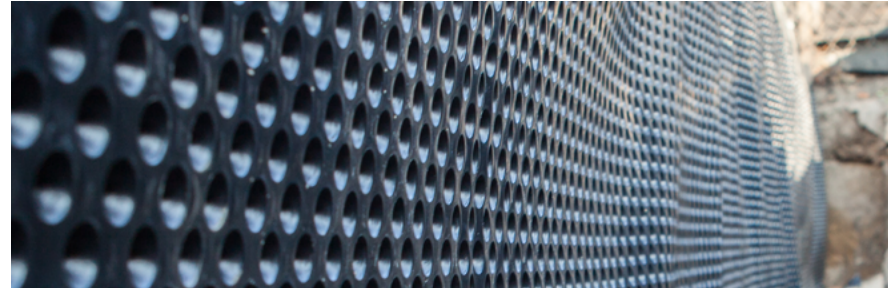


Comparing Integral Crystalline Waterproofing to Traditional Methods

Traditional waterproofing solutions generally involve applying a waterproofing membrane or coating to the exterior surface of concrete. These methods include sheet membranes and fluid-applied membranes, both of which come with certain limitations.

Sheet Membranes

While effective when applied correctly, sheet membranes are vulnerable to puncturing and require precise installation. Weather fluctuations can cause the material to crack or delaminate, particularly when exposed to high temperatures in the summer and cold conditions in the winter. These membranes also present challenges in tight spaces, reducing the building's footprint, and each seam is a potential weak point that could fail if not sealed correctly.



Fluid-Applied Membranes

These are sprayed or rolled onto the concrete surface, but their success relies heavily on the installer's skill. Uneven application can lead to blistering, air bubbles, or thin spots in the membrane, all of which can compromise the waterproofing. Additionally, fluid membranes can slow down construction progress as they need time to cure before other work can proceed.

Both traditional methods require careful surface preparation and add complexity to construction schedules, often extending timelines by days or even months. Moreover, they can degrade over time due to environmental exposure, leading to future maintenance costs and potential failures.



Integral Concrete Waterproofing

In contrast, integral crystalline waterproofing is mixed directly into the concrete, transforming the concrete itself into a waterproof barrier. This method eliminates the need for external membranes, providing a more consistent and durable solution. Since the waterproofing is embedded in the concrete, it covers the entire structure uniformly, including hard-to-reach areas.

The self-sealing properties of crystalline waterproofing ensure long-term performance without the need for frequent maintenance or repairs, offering significant advantages over traditional methods.

Myth-Busting Common Integral Concrete Waterproofing Misconceptions

To fully benefit from Integral Concrete Waterproofing, it's essential to address common misconceptions that might lead to misunderstandings or misuse.

Misconception 1: Integral Concrete Waterproofing Works Instantly

While crystalline admixtures begin to react as the concrete cures, the full waterproofing effect develops over time. As water penetrates the concrete, crystalline structures grow within the capillaries, sealing off potential pathways. This gradual process allows the waterproofing system to adapt and self-seal over the concrete's life.



Misconception 2: Crystalline Admixtures Alter Concrete Appearance

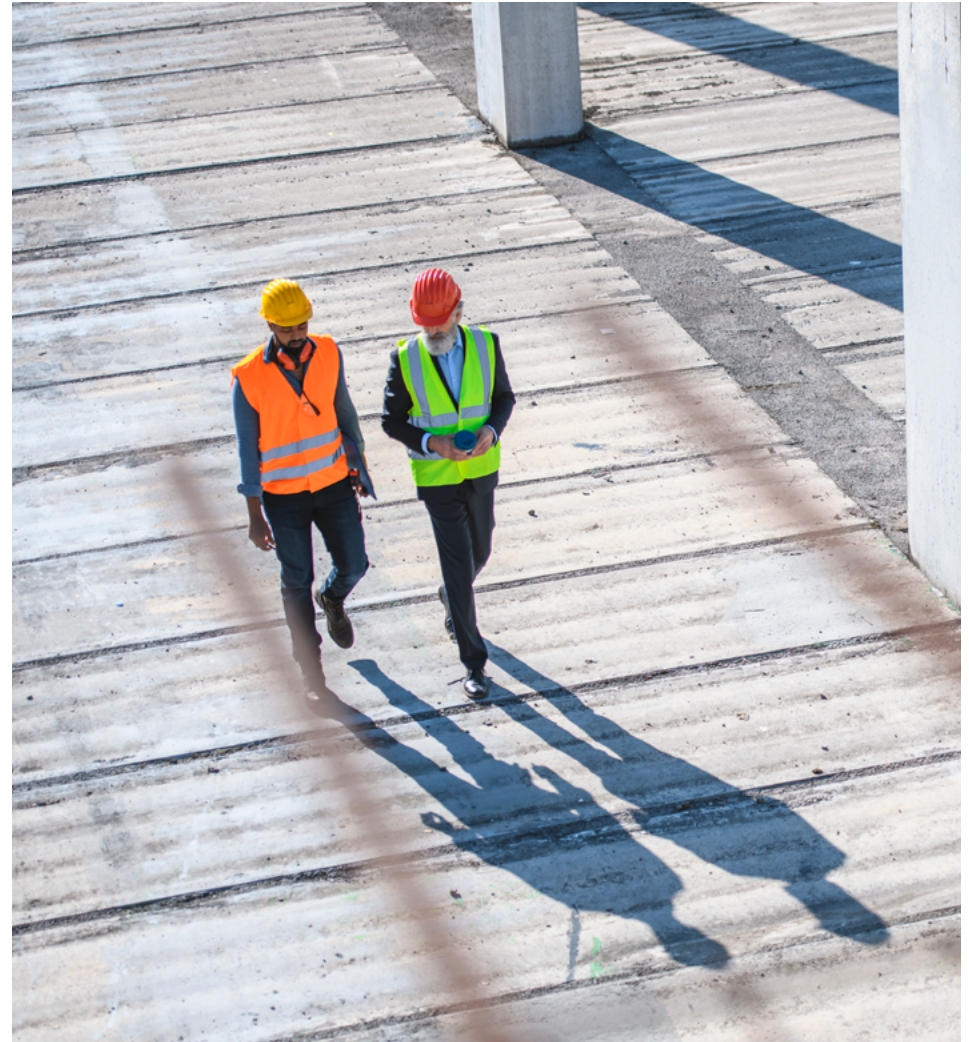
There's a misconception that crystalline admixtures may discolor or change the appearance of architectural concrete. In reality, these admixtures do not affect the concrete's visible characteristics, making them suitable for aesthetic applications.

Misconception 3: Crystalline Waterproofing Eliminates All Risk of Water Ingress

While crystalline waterproofing significantly reduces water ingress risk, no system is entirely foolproof. Integral Concrete Waterproofing minimizes vulnerabilities, but careful design, proper application, and regular maintenance are essential to ensure maximum protection. Supplementary measures, such as hybrid waterproofing systems, may be recommended in mission-critical environments.

10 Critical Success Factors for Integral Concrete Waterproofing

When implementing Integral Concrete Waterproofing, several critical factors determine the project's success. Understanding and addressing these factors ensures that the waterproofing system functions as intended, providing long-term protection and reducing the risk of water ingress.



1. Proven Track Record

For any new technology, stakeholders need confidence in its performance. Integral Concrete Waterproofing has a well-established track record, and a review of its success across various projects provides reassurance to both teams and clients.

Case Study: Early Adoption and Due Diligence in Orlando

Joel Schwartz, a principal at JRS Engineering, was one of the early adopters of crystalline waterproofing technology. His first major experience with the system was doing due diligence on a high-risk project in Orlando, where the construction site was located 30 feet below the water table. The project required a waterproofing solution that could withstand constant hydrostatic pressure, and the team was initially skeptical about relying on a relatively new technology.

To ensure the solution was viable, Schwartz and his team conducted thorough research, seeking out similar projects around the world to examine how crystalline waterproofing had performed over time. After reviewing case studies from Ireland, Australia, and Orlando, they visited the Orlando project site and spoke with contractors, engineers, and facility managers to confirm the effectiveness of the technology.

Lessons from this project emphasize the importance of rigorous pre-installation testing and due diligence when working in high-water environments. This due diligence gave them the confidence to proceed with crystalline waterproofing, and the project was a success. The crystalline system not only provided reliable waterproofing in challenging conditions but also offered long-term performance with minimal maintenance, reinforcing the value of this approach in high-risk environments.



2. Application Type

The type of concrete application impacts the waterproofing strategy. For example, shotcrete (sprayed concrete) applications are more prone to voids and irregularities than cast-in-place concrete, which can compromise waterproofing. Understanding how each application affects the crystalline admixture's ability to seal is crucial.

Shotcrete

Quality control during application is critical, as the sprayed concrete can create irregularities that increase water ingress risks. Skilled nozzle operation, quality inspections, and repairs during construction help address potential voids.

Cast-in-Place Concrete

This method offers more control over concrete density and reduces the risk of rock pockets, voids and rebar shadowing, allowing crystalline admixtures to work optimally.

3. Environmental Considerations and Challenges

The environment surrounding a construction site can significantly impact waterproofing strategy, especially when using integral systems. High water tables, soil composition, and climate conditions each pose unique challenges that must be addressed during design and implementation to ensure long-term performance.



Water Tables and Soil Conditions

In these areas, “tanking” a building—designing it as a watertight tank—may be necessary to prevent water infiltration. This approach involves creating a comprehensive waterproofing system across the entire foundation and walls to withstand external water pressures, making it essential in basements, and other below-grade structures.

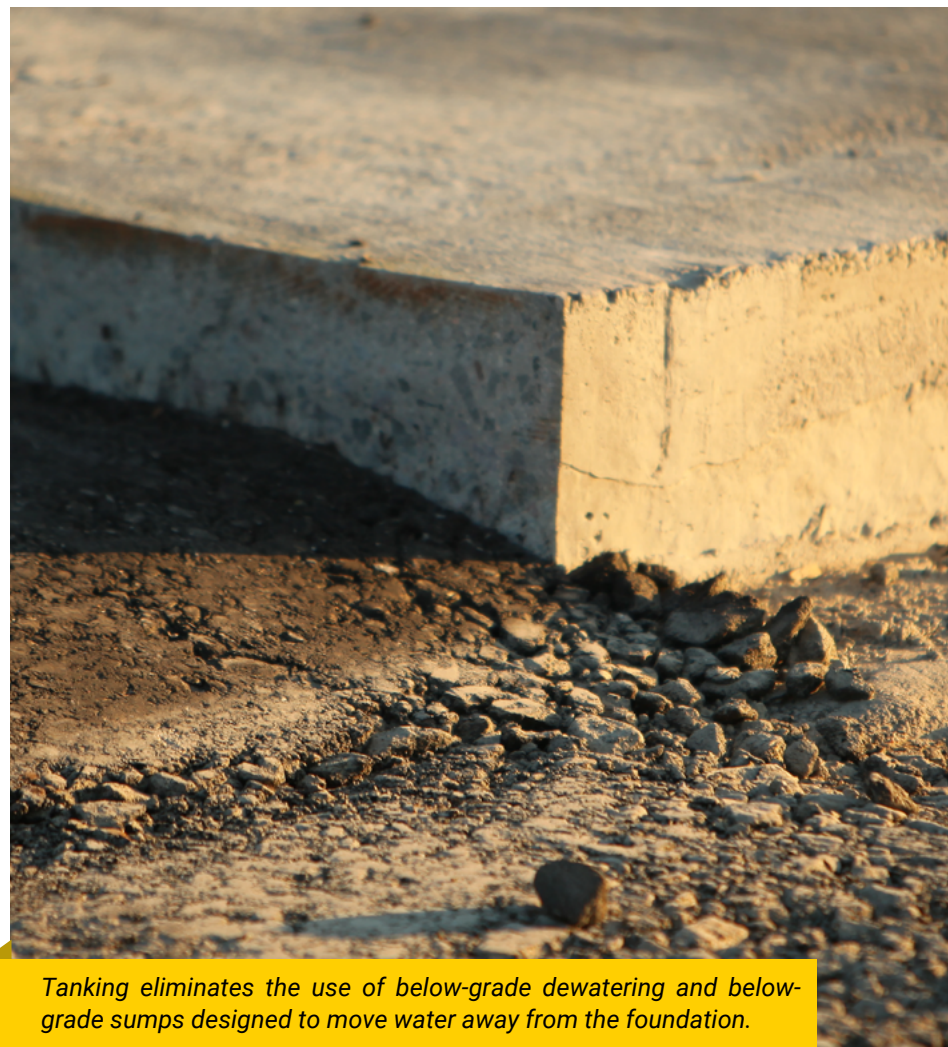
What is Tanking?

The term “tanking” comes from the idea of creating a “tank-like” waterproof barrier around the structure. Tanking is typically applied to below-ground structures, where water pressure from the surrounding soil can push water into the building.

Crystalline waterproofing is particularly effective for tanked buildings due to its self-sealing properties and ability to resist hydrostatic pressure. As an integral part of the concrete matrix, crystalline waterproofing doesn’t rely on external membranes, which can degrade under constant water pressure. Instead, it offers a permanent solution that blocks water ingress even as concrete shifts or cracks over time.

Climate Impacts on Concrete Performance

Extreme climates introduce further challenges to waterproofing systems. In cold regions, freeze-thaw cycles can lead to expansion and contraction within concrete, causing microcracks that allow water ingress. Crystalline waterproofing, with its self-sealing properties, provides a defense against these microcracks, reactivating to form crystals that block water pathways when water is present.



Tanking eliminates the use of below-grade dewatering and below-grade sumps designed to move water away from the foundation.

In coastal areas, exposure to saltwater can accelerate corrosion in concrete reinforcement, threatening structural integrity. Integral Concrete Waterproofing helps mitigate this by blocking saltwater from reaching reinforcing steel, reducing corrosion risk and extending the lifespan of the concrete.

Case Study: The Erikson's Solution to Hydrostatic Pressure

Joel Schwartz, a principal at JRS Engineering, was one of the early adopters. The Erikson is a luxury, 20-story concrete and steel-trussed building with glass on all sides and an undulating shape that rises from the edge of False Creek in downtown Vancouver, surrounded by water on three sides.

The project team chose Kryton's Krystol Internal Membrane (KIM) admixture in all below grade concrete. KIM was used for all below-grade perimeter walls. In addition to the waterproof concrete, the builder also applied thousands of lineal feet of Kryton's Krystol Waterstop System to seal the below-grade construction joints, giving the joints the same level of crystalline protection that is in the concrete.

The Krystol Waterproofing System eliminated any need for exterior waterproof membranes, saved time and labor costs, and ensured a guaranteed leak-free building that can proudly bear the Arthur Erickson name.

[Read more about below-grade waterproofing.](#)



The Erikson is a luxury, 20-story concrete in Vancouver, Canada

4. System vs. Product Approach

Traditional waterproofing often views membranes or coatings as independent products that are applied externally after the concrete has been poured. In contrast, Integral Concrete Waterproofing is integrated directly into the concrete itself. This shift requires a mindset change—one that acknowledges that waterproofing is an ongoing, multifaceted process involving more than simply adding an admixture to the concrete mix.

An effective waterproofing system includes not only the crystalline admixture but also the treatment of other key elements, such as construction joints, penetrations, tie holes, and any areas susceptible to water ingress. Treating waterproofing as a system ensures that every aspect of the structure is designed and constructed with waterproofing in mind, leading to better overall performance and fewer potential weak points.

A systems approach also reduces the risk of errors that may occur when different teams treat waterproofing as a discrete task. By integrating waterproofing into the design and construction phases from the outset, stakeholders can avoid issues like improper application or incomplete coverage that can occur with traditional methods.

Case Study: The Concord's Systematic Approach to Waterproofing

Located in Calgary, Alberta, The Concord is a luxury residential development designed by renowned Canadian architect Arthur Erickson.



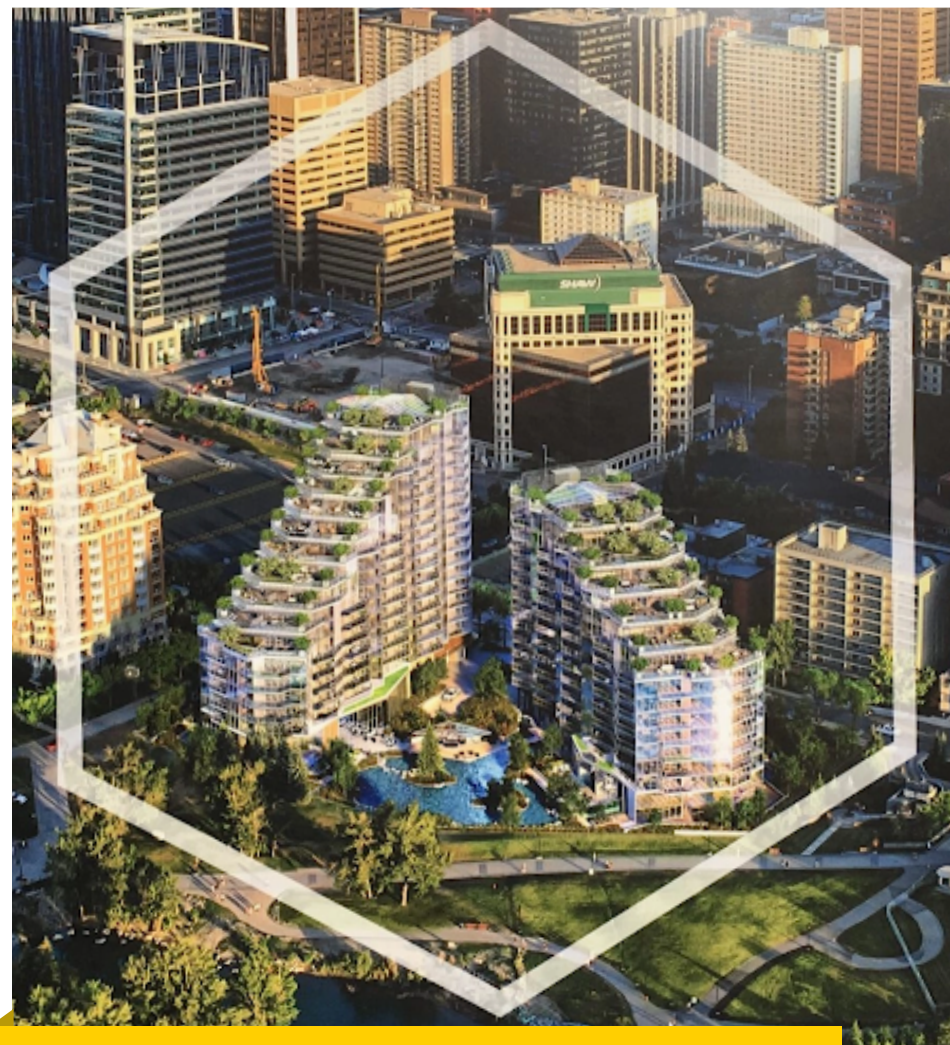
Comprising two towers near the Bow River, the project faced significant waterproofing challenges due to its proximity to a high water table and its location within a flood zone. To address these concerns, the construction team employed Kryton's Smart Concrete® solutions, including Krystol Internal Membrane (KIM) admixture, Krytonite Swelling Waterstop, and Krystol Waterstop Treatment. This Integral Concrete Waterproofing system was incorporated into the concrete mix and construction joints, providing a durable barrier against water ingress.

The successful implementation of these solutions has been recognized as a key component in the project's state-of-the-art flood protection system.

[Read the full case study.](#)

5. Mix Design Considerations

The concrete mix itself plays a critical role in how well the crystalline technology performs. A proper mix design, including the right water-cement ratio, ensures that the admixture can fully react and form the crystalline structures needed to block water pathways. The mix must be carefully balanced to provide the right amount of permeability reduction while maintaining the necessary structural integrity.



The Concord is a luxury residential development in Calgary, Alberta

6. Pre-Construction Planning

Successful Integral Concrete Waterproofing begins well before concrete is poured. Pre-construction planning allows project teams to address potential waterproofing challenges early on, reducing risks and setting up the project for success.

This planning can include mock-ups or small test pours give the project team an opportunity to assess the performance of the chosen waterproofing mix design and ensure that it meets project specifications. These tests simulate real-life conditions, helping identify any adjustments needed in the mix or application process before full-scale implementation.

7. Spacing of Control Joints

Control joints help manage the natural cracking that occurs as concrete shrinks and expands. Properly spacing these joints is crucial in reducing the chances of uncontrolled cracking, which can lead to water ingress. With Integral Concrete Waterproofing, these joints need to be designed with the understanding that the waterproofing is embedded in the concrete. Careful coordination is needed to ensure that the joints do not become points of failure in the system.



8. Quality Control During Construction

Construction schedules often demand efficiency, but quality must not be compromised, especially in waterproofing. Rushing through waterproofing steps—such as mixing, placing, or curing—can lead to costly issues down the line. Project managers should build in time buffers for quality control measures, allowing inspections at key intervals and adjusting for seasonal impacts, such as extreme heat or cold, that could affect curing times and mix performance.

Quality control measures must be in place at every stage, from batching to curing. This includes:

- Monitoring the mix
- Ensuring proper consolidation of the concrete through vibration
- Inspecting cold joints and penetrations for proper sealing

Diligent oversight prevents minor construction flaws from leading to water ingress later on.

9. Communication and Coordination

Because Integral Concrete Waterproofing affects multiple aspects of the building process, from mix design to construction techniques, close collaboration is essential to avoid potential pitfalls.

Architects and Structural Engineers must ensure that the waterproofing system is integrated into the overall design of the building. This means not only considering the concrete mix but also the placement of control joints, penetrations, and other design elements that could impact the waterproofing.



Concrete Producers are critical in ensuring that the specified waterproofing admixtures are incorporated correctly. They must carefully follow the project's mix design requirements, including the appropriate water-cement ratio, admixture dosage, and quality controls during batching. Open communication with the project team is essential to verify that the mix meets the necessary specifications, and producers should be ready to adapt the mix based on site conditions or specific project needs. Additionally, they can offer insights into batching best practices and troubleshoot potential issues with mix performance.

Contractors need to be fully informed about the waterproofing system and its requirements. This includes understanding the mix design, proper installation techniques, and the importance of thorough quality control during the concrete pouring process. Pre-construction meetings that involve all stakeholders can help align the team on expectations and responsibilities, ensuring that everyone is on the same page before construction begins.

Integrating Maintenance and Inspection Protocols Post-Construction

While Integral Concrete Waterproofing provides long-lasting protection, regular maintenance and inspection are essential to ensure the system's continued effectiveness, particularly in high-risk environments or where hydrostatic pressure is present.



Post-Construction Maintenance Plans

Even though Integral Concrete Waterproofing is embedded in the concrete and designed for minimal upkeep, a maintenance plan can help identify potential issues early, extending the structure's lifespan. Routine inspections should check for visible signs of water ingress, cracks, or areas of wear. The self-sealing properties of crystalline waterproofing are beneficial here, as any cracks that allow water ingress will trigger the formation of new crystals, automatically sealing the path.

Training for Facility Managers

Providing training sessions or guides for facility managers ensures that they understand the specific maintenance needs of Integral Concrete Waterproofing. This includes how to identify and respond to signs of water ingress, when to schedule inspections, and best practices for addressing any issues that arise. Educating managers can help maintain the concrete's performance over time and reduce costly repairs or maintenance.



The Future of Waterproofing

Waterproofing will play an increasingly critical role as buildings are designed to endure more extreme environmental challenges, meet higher sustainability standards, and ensure lasting performance.

With the broader adoption of Integral Concrete Waterproofing, the construction industry gains access to structures that are safer, longer-lasting, and easier to maintain. Building owners, engineers, and architects can anticipate an era where waterproofing technology not only safeguards concrete but also elevates the value and sustainability of buildings, shaping the future of resilient, high-performance infrastructure.

To learn more about advanced Integral Concrete Waterproofing, visit kryton.com.



About Kryton

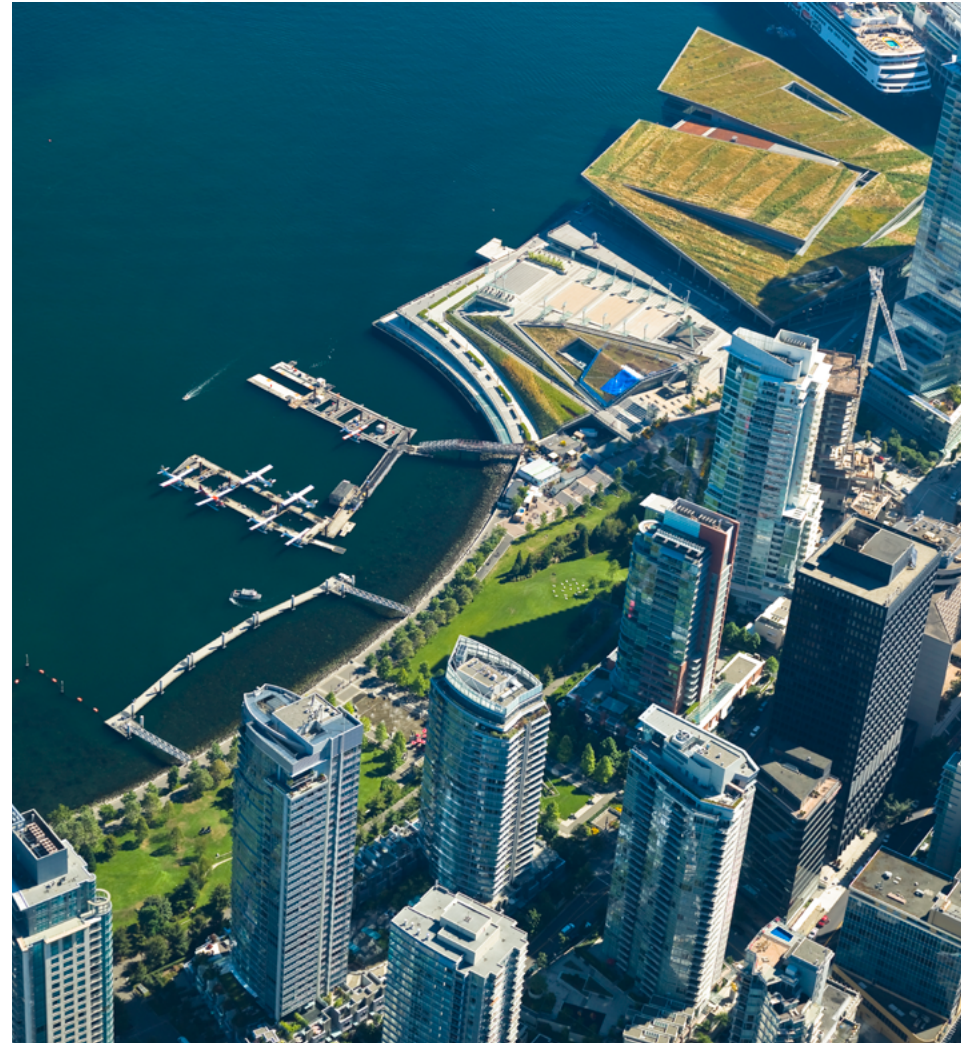
Kryton is an international manufacturer of innovative products for concrete waterproofing and durability. Founded in 1973 in Vancouver, BC, Canada, Kryton is a family-owned and operated business that operates in over 50 countries around the world.

- Inventor of the original and only permanent crystalline waterproofing admixture (Krytol)
- Innovator of unique, integral durability-enhancing technology that increases the concrete's resistance to highly abrasive and erosive forces
- Multi-year winner of Most Innovative Product of the Year Award
- Independently accredited proof of performance from the International Code Council Evaluation Service (ICC-ES), NSF International, CE, and more
- World-class customer success, training, and warranties
- Dedicated testing and R&D center of excellence in Vancouver, Canada



More Resources

- Kryton Webinar: [Advanced Strategies for Integral Concrete Waterproofing in Modern Building Envelopes](#)
- Kryton Guide: [Waterproofing Concrete Parking Structures](#)
- Kryton Blog: [Insights on Waterproofing Concrete Foundations from World of Concrete 360 Series](#)
- Kryton Blog: [Microcracks: The Invisible Threat to Concrete Durability](#)
- [ACI 515.1R-85](#): Guide to the Use of Waterproofing, Dampproofing, Protective, and Decorative Barrier Systems for Concrete
- [ACI PRC-546-14](#): Guide to Concrete Repair
- [ASTM D5385](#) for waterproofing membranes
- [British Standard 8102](#): Protection of below-ground structures against water ingress. Code of practice
- Sustainability of Concrete, Aitcen and Mindess, Spon Press, 2011
- Properties of Concrete, A.M. Neville





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