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INTEGRAL CONCRETE WATERPROOFING; USING A UNIQUE LIQUID CRYSTALLINE-BASED ADMIXTURE

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Developing a watertight concrete structure is a combination of appropriate design detail, proper construction practices, and high-performance products working together to minimize and eliminate water migration through concrete.

Integral waterproofing admixtures can play an important role in developing watertight concrete. A unique, dual mechanism, liquid crystalline-based waterproofing admixture, MasterLife 300L admixture, from Master Builders Solutions is commercially available to help meet this challenge. It meets ASTM C494/ C494M requirements for Type S, Specific Performance, admixtures and meets the requirements of ICC-ES AC531, Acceptance Criteria for Crystalline-Based Permeability-Reducing Chemical Admixtures Used in Concrete.

Integral waterproofing admixtures are categorized as Permeability-Reducing Admixtures (PRAs) as described in the American Concrete Institute (ACI) 212.3R-16, Report on Chemical Admixtures for Concrete. MasterLife 300L admixture is intended to be used in, and complement, well-proportioned concrete mixtures, not to compensate for a poorly proportioned concrete

mixture. It provides a dual level of waterproofing performance in concrete and functions by a) helping to reduce permeability, thereby inhibiting fluid transport, and b) helping to seal hairline cracks by forming non-soluble crystals in hairline crack space.

Concrete Production: Another key distinct feature of this waterproofing admixture is that it is a liquid formulation allowing for automated, enclosed dispenser batching using patented, next generation Accurate Volume Control (AVC) technology. The AVC admixture dispenser system consistently and precisely measures and dispenses the liquid crystalline waterproofing admixture into concrete during production. This smart dispenser has been engineered with a specific System Design Qualification (SDQ) to ensure rapid response. The system also contains an alarm feature to prevent out-of-spec batches from being used in production.

In addition, the dispenser system incorporates a proprietary admixture inventory management system designed to provide automated tank level monitoring. Sensors transmit data nightly via cellular and satellite networks so product orders can be placed automatically based on pre-set tank parameters. Automatic reordering ensures product availability and project efficiency. A photo of the innovative dispensing system is shown in the graphic.

With powder-based water-proofing admixtures, operations like lifting bagged product, climbing onto trucks or platforms to batch product, dust created during handling, exposure to rotating mixers, or moving conveyors/other mechanical batching equipment during batching, tripping hazards with pallets can all be problematic potentially compromising safety. Alternatively, concrete producers can appreciate the benefits of a liquid waterproofing admixture including extremely accurate dosing, easy charging, batching, and mixing, batch ticket visibility, and enhanced safety during the production process as it is a “hands off” operation.

Concrete Placement and Installation: Concrete contractors value that the integral crystalline waterproofing admixture does not alter the concrete’s inherent properties—aside from imparting waterproofing capability—and does not affect the color or emit any odor. Standard ACI guidelines for concrete placement remain applicable, and conventional tools and practices may be used without modification. Concrete incorporating the crystalline waterproofing admixture shall be cured in accordance with ASTM C309 using an appropriate curing compound, or alternatively, by means of water curing.

Specifications: Project specifications for integral waterproofing typically contain requirements for hydrostatic testing following DIN 1048-part 5 and/or the Army Corp of Engineers CRD C48 test methods. The results shown in Table 1 illustrate the typical performance of the MasterLife 300L liquid crystalline admixture using a quality concrete mixture suitable for waterproofing applications. It should be noted that these relative results can vary based on mix proportions, local materials, curing conditions, and other parameters.

Table 1

MasterLife 300L admixture is commonly used in conjunction with high-range-water-reducing admixtures, supplementary cementitious materials (SCMs), synthetic fibers, and shrinkage-reducing admixtures to produce high-quality, crack-resistant concrete for producing watertight concrete structures. Applications for integral waterproofing admixtures include sewage and water treatment plants, water tanks and reservoirs, foundations, swimming pools, underground vaults, tunnels and subway systems, secondary containment structures, below-grade parking structures, precast components, water features, geotechnical grouting, and ground improvement, and tinted concrete elements to name a few. Watertight concrete helps to increase service life providing owners with longer-lasting, reduced maintenance, quality concrete structures.

Mix I.D.	Reference	MasterLife 300L
Cement Content	600 lb/yd ³ [356 kg/m ³]	
Water:Cementitious Materials Ratio	0.42	
Dosage, gal/yd ³ [L/m ³]		1.25 [6.2]
DIN 1048 - Water Penetration Depth, % Reduction Compared to Reference Concrete		33%
CRD-C48-92 - Water Permeability (Flow), % Reduction Compared to Reference		74%