

CSI SPECIFICATIONS

SURFACE-APPLIED CRYSTALLINE WATERPROOFING

Section 07 16 16



This section includes Krystol T1 & T2 crystalline waterproofing, applied to new or existing concrete substrates, above or below grade, on either dry or wet side of concrete substrates.

Krystol T1 & T2 Waterproofing System is a surface-applied crystalline slurry treatment that transforms new or existing concrete into a permanent waterproof barrier. Krystol T1 & T2 Waterproofing System lowers the permeability of concrete and protects against the ingress of water and waterborne chemicals. It replaces the need for surface applied waterproofing membranes, and is often used in the remediation of failed membranes.

Part 1 General

1.1 SECTION INCLUDES

- A. Surface-applied crystalline waterproofing treatment.
- B. Crystalline compounds for the repair of leaking cracks, holes and joints found in concrete.

1.2 RELATED SECTIONS

In this article, indicate those sections that inter-rely on this section. The listing below is only partial and should be edited to include those sections specific to the project that describe subjects or products that affect this section directly.

- A. [Section 03 01 30 - Maintenance of Cast-in-Place Concrete: Patching compounds for substrate repair.]
- B. [Section 03 30 00 - Cast-In-Place Concrete.]
- C. [Section 03 37 13 - Shotcrete.]
- D. [Section 07 92 00 - Joint Sealants.]

1.3 REFERENCES

Edit this article after editing the rest of this section. Only list reference standards below, that are included within the text of this section, when edited for a project specification - delete other references that do not apply. Comparable Canadian and US are listed for some products.

- A. American Concrete Institute (ACI).
 - 1. ACI 222R-01(R2010) - Protection of Metals in Concrete Against Corrosion.
- B. American Society of the International Association for Testing and Materials (ASTM).
 - 1. ASTM C109/C109M-16a - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
 - 2. ASTM C1583/C1583M-13 - Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).
 - 3. ASTM D1411-09 - Standard Test Methods for Water-Soluble Chlorides Present as Admixtures in Graded Aggregate Road Mixes.
- C. British Standard Institution.

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1. BS EN 480-12:1998 - Admixtures for Concrete, Mortar and Grout. Test Methods. Determination of the Alkali Content of Admixtures.
 2. BS EN 12390-8:2009 - Testing Hardened Concrete: Depth of Penetration of Water Under Pressure.
- D. German Institute for Standardization (DIN).
1. DIN 1048 Part 5, Testing Concrete: Testing of Hardened Concrete Water Permeability.
- E. International Concrete Repair Institute (ICRI).
- F. NSF International.
1. NSF/ANSI Standard 61 - Drinking Water System Components, Health Effects.
- G. U.S. Army Corps of Engineers (USACE).
1. CRD C48-92 – Standard Test Method for Water Permeability of Concrete.

1.4 PERFORMANCE REQUIREMENTS

- A. Permeability:
1. When tested to BS EN 12390-8 or DIN 1048-5 at 0.5 MPa (72.5 psi) for 72 hours, permeability of treated concrete will be reduced by 51% over untreated concrete. Treated samples were cured for 28 days and treatment was mechanically removed from samples prior to testing.
 2. Passes USACE CRD C48 when tested at 1.38 MPa (200 psi) for 14 days. Permeability of treated concrete will be reduced by 90% over untreated concrete.
 3. When tested versus untreated sample to DIN 1048-5 and following 28 day curing period, depth of water penetration shall be reduced by 75%.
- B. Self-Sealing: Autogenous crack sealing of treated concrete for cracks with width of 0.5mm (0.02 inches) or greater when subjected to hydrostatic pressure of 0.44 MPa (65 psi).
- C. Chloride Resistance: When tested to ASTM D1411, the waterproofing treatment shall improve concrete resistance to chlorides below limits require by ACI 222R and demonstrate chloride ion reduction of 84% at 15 mm penetration depth and 83% at 10 mm penetration depth; performance shall be verified by independent testing. Treated samples were cured for 28 days and treatment was mechanically removed from samples prior to testing.
- D. Sulfate Resistance: The waterproofing treatment shall improve concrete resistance to sulfates by reducing permeability without affecting compressive strength; performance shall be verified by independent testing.
- E. Potable Water Containment: Products of this Section shall be certified to NSF/ANSI Standard 61 for use with potable water.

1.5 ADMINISTRATIVE REQUIREMENTS

- A. Section [01 31 00]: Project management and coordination procedures.
- B. Pre-Installation Conference:
1. A meeting shall be held prior to placement of waterproofing treatment and concrete with the Contractor, forming contractor, finisher, waterproofing installer, and Owner's testing agency and the Consultant [and waterproofing manufacturer's representative] in attendance to verify and review the following:

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1. Project requirements for waterproofing as set out in Contract Documents.
2. Manufacturer's product data.
3. Applicable application instructions which focuses on this project's specific requirements.
4. Substrate conditions and procedures for substrate preparation and waterproofing installation.

1.6 SUBMITTALS FOR REVIEW

- A. Section [01 33 00]: Submission procedures.
- B. Product Data: Manufacturer's product data and general recommendations for waterproofing applications.
- C. Independent Test Reports: Provide reports certifying compliance of waterproofing products with specified performance requirements.

1.7 SUBMITTALS FOR INFORMATION

The following submittals are for information only.

- A. Section [01 33 00]: Submission procedures.
- B. Installation Data: Manufacturer's special installation requirements.
- C. Qualification Statements:
 1. Written notice from installer confirming project experience.

1.8 CLOSEOUT SUBMITTALS

The following submittals are for project close-out purposes.

- A. Section [01 78 10]: Submission procedures.
- B. Warranty Documents: Manufacturer's warranty documentation for specified coverage executed in the Owner's name.

1.9 QUALITY ASSURANCE

- A. Source Quality Control: Obtain all waterproofing products from a single manufacturer including construction joint details and leak repair products.
- B. Manufacturer:
 1. Company specializing in manufacturing the Products specified in this section with minimum [twenty-five (25)] years [documented] experience.
- C. Installer:
 1. Company specializing in performing the work of this section with minimum [three (3)] years documented experience.

1.10 DELIVERY, STORAGE, AND PROTECTION

- A. Section [01 61 00]: Transport, handle, store, and protect products.
- B. Deliver packaged waterproofing materials in original undamaged containers, with manufacturer's labels and seals intact.
- C. Store materials in dry environment at a temperature above 7 degrees C (45 degrees F).

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- D. Do not use materials stored for more than twenty-four (24) months from date of manufacture.

1.11 ENVIRONMENTAL REQUIREMENTS

- A. Application should not be made when the surface temperature is below 4 degrees C (40 degrees F).

1.12 WARRANTY

- A. Section [01 78 10]: Warranties.
- B. Manufacturer's Warranty: Provide warranty limited to waterproofing materials for a period of [ten (10)] years from date of Substantial Performance of the Work.

The following extended warranty will add cost to the Project. Consider extended warranty when the project requirements cause considerable interruptions to Owner's operations, ex. Shutdown of a liquid storage structure that limits production and subsequently, revenue. Consult with Owner.

- C. [Extended Warranty: Provide a [five (5)] year warranty to include coverage for failure to meet specified requirements, including defects caused by faulty workmanship.]

Part 2 Products

2.1 MANUFACTURERS

- A. Manufacturer - Basis of Design:
 - 1. Kryton International Inc.
Toll Free: 1.800.267.8280
E-mail: info@kryton.com
Website: www.kryton.com
- B. Substitutions: Not permitted.

2.2 WATERPROOFING MATERIALS

- A. Crystalline Surface-Applied Waterproofing: dry powder mixed with water.
 - 1. Working Time (20°C/ 68°F, 50% RH): 60 minutes.
 - 2. Performance Properties:
 - 1. Pull off Strength (ASTM C1583): 3.1 MPa (450 psi).
 - 3. Shape of crystal: The shape of the crystal when observed under 30x magnification will be long and needle shaped allowing them to grow deeper and pack more tightly.
 - 4. Acceptable Product: Krystol T1 and T2 Surface Applied Waterproofing System.
- B. Water: Potable, clean, free from salt.

2.3 MIXES

- A. Mix ingredients in clean containers to achieve performance requirements specified.
- B. Mix only quantities that can be applied before mixture begins to set, in accordance with manufacturer's written recommendations.

2.4 ACCESSORIES

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- A. Water Stop Plug: Fast-setting, dry powdered, hydraulic cement compound for concrete leak repair and patching.
 - 1. Working Time (20°C/ 68°F, 50% RH): 1 minute.
 - 2. Hardening Time (20°C/ 68°F, 50% RH): 2 minutes
 - 3. Performance Properties:
 - 1. Compressive strength (ASTM C109): 50 MPa (7250 psi) @ 7 days
 - 4. Acceptable Product: Krystol Plug.
- B. Repair Grout: Fast-setting, dry powdered, non-shrink, fiber reinforced, crystalline waterproof cement compound for concrete leak repair and patching.
 - 1. Working Time (20°C/ 68°F, 50% RH): 30 minutes.
 - 2. Hardening Time (20°C/ 68°F, 50% RH): 60 minutes
 - 3. Performance Properties:
 - 1. Hydrostatic head resistance: 140 m (460 ft.)
 - 2. Compressive strength (ASTM C109):
 - 1. 24 MPa (3480 psi) @ 24 hrs
 - 2. 30 MPa (4351psi) @ 7 days
 - 3. 35 MPa (5076 psi) @ 28 days
 - 4. 40 MPa (5801psi) @ 56 days
 - 3. Pull off Strength (ASTM C1583): 2.8 MPA (400 psi).
 - 4. Acceptable Product: Krystol Repair Grout.

Part 3 Execution

3.1 EXAMINATION

- A. Section [01 70 00]: Verify existing conditions before starting work.
- B. Verify that concrete surfaces are sound and clean, and that form release agents and materials used to cure the concrete are removed prior to applying waterproofing treatment.
- C. Examine surfaces that are to receive waterproofing treatment for formwork tie holes and structural defects such as honeycombing, rock pockets, faulty construction joints and cracks.

3.2 PREPARATION

- A. Concrete surfaces must be clean and free of paint, sealers, form release agents, curing compounds, dirt, laitance or any other contaminants.
- B. Provide minimum ICRI CSP 1 surface profile using sandblasting, high pressure water blasting (minimum 3,000 psi), scarifying, shot blasting or other method of mechanical surface preparation to remove loose concrete and surface contaminants.
- C. Repair leaking cracks or joints in accordance with manufacturer's written instructions and as follows:
 - 1. Chase the length of joints and cracks. Provide rectangular-shaped chase that is 40 mm (1.5 inch) deep x 25 mm (1 inch) wide.
 - 2. Use water stop plug to stop water leakage.

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3. Use repair grout to completely fill the chase flush with adjacent surfaces.
- D. Repair form-tie holes, rock pockets, honeycombing, and other concrete defects in accordance with manufacturer's written instructions and as follows:
1. Rout out defective areas to sound concrete. Leave edges square, do not featheredge.
 2. Remove loose material and saturate with water.
 3. If defect is actively leaking, install water stop plug to a maximum depth of 1/3 of the defect.
 4. Fill defect with repair grout.

3.3 APPLICATION - WATERPROOFING

- A. Saturate the surface by high pressure water blasting. Remove all standing water so the surface is saturated-surface-dry (SSD) condition.
- B. Apply crystalline waterproofing uniformly to concrete surfaces to manufacturers written instructions.
- C. First Coat of Waterproofing Treatment:
1. Coverage: Apply 0.8 kg/m² (1.5 lb./sq. yd.).
 2. Push coating into any voids in the concrete surface to ensure a good bond.
- D. Second Coat of Waterproofing Treatment:
1. The second coat can be applied as soon as the first coat has set hard, usually 6-24 hours depending on conditions.
 2. Wash and rinse the hardened first coat to remove surface bloom before applying second coat.
 3. Some exposed aggregate in the first coat is ideal.
 4. Ensure the hardened first coat is damp (SSD).
 5. Install second coat by following the same procedure used to install first coat.
- E. Each coat will be approximately 1 mm to 1.5 mm thick.
- F. Curing:
1. Wet cure waterproofing treatment for at least three (3) days and in accordance with manufacturer's written instructions.
 2. Cover the waterproofing with tarps or plastic to prevent water loss due to evaporation.
 3. Wet curing should begin when waterproofing has hardened enough not to be damaged by the application of curing water, usually 6-24 hours depending on conditions.
 4. Do not allow water to pool on the surface during the first 24 hours or until the waterproofing is hard.
 5. Keep protective coverings in place during the curing period to retain moisture.
 6. Protect from frost, rain and traffic for at least 24 hours. Heavy traffic must be avoided during the curing period.

3.4 FIELD QUALITY CONTROL

Only include this article if special field inspection services are required. Section [01 45 00]: Field [inspection] [and testing].

- B. Provide free access to Work and cooperate with appointed firm.
- C. Do not conceal installed waterproofing treatment before review by Consultant [and waterproofing

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manufacturer's representative].

- D. If leaks are discovered, verify with manufacturer whether time period for self-sealing properties of the treated concrete has been exceeded. Make repairs as recommended by the manufacturer and repeat test until no leaks are observed.

3.5 CLEANING

This article is intended to supplement cleaning requirements specified in Division 01 sections. Edit this article to supplement Division 01 statements.

- A. Section [01 74 00]: Cleaning installed work.
- B. Clean spillage and soiling from adjacent surfaces using manufacturer recommended cleaning agents and procedures.

3.6 PROTECTION OF FINISHED WORK

- A. Section [01 78 40]: Protecting installed work.
- B. Protect completed waterproofing from damage after application.
- C. Backfill:
 - 1. Do not backfill for at least thirty-six (36) hours after application of waterproofing.
 - 2. If backfill occurs within seven (7) days after application of waterproofing, take precautions to prevent dry fill material from absorbing moisture from finished waterproofing.
- D. Do not apply paint or coating over waterproofing until the waterproofing has cured and set for a minimum of twenty-one (21) days.
- E. Wait at least 7 days before filling treated tanks and reservoirs. For reservoirs that will contain drinking water, cure longer if possible, and then rinse with fresh water several times. Initially, the drinking water may need pH adjustment using citric acid or similar water treatment chemicals.

3.7 SCHEDULES

The following article will assist in preparing a schedule crystalline waterproofing locations for the project. The following schedule includes are EXAMPLES only. Edit the paragraphs below to create a project specific schedule. Do not repeat statements that may exist on drawings.

- A. Provide crystalline waterproofing in the following locations:
 - 1. Elevator pits, [sump pits]: Positive side.
 - 2. Tunnels, underground vaults, dry wells, and manholes: Negative side.
 - 3. Water tanks, flumes, clarifier tanks, digester sections, reservoirs and wet wells: Positive side.
 - 4. Planters and swimming pools: Positive side.

END OF SECTION