SECTION 07 16 00
CEMENTITIOUS AND REACTIVE WATERPROOFING

PART 1 - GENERAL

1.01 SUMMARY (Specification writer shall add, delete or amend, as deemed necessary)

A. Furnish all labor, materials, equipment and supervision as necessary to install a composite waterproofing system consisting of a reactive penetrating primer, highly flexible membrane layer, and rigid cementitious bond coat on **(new or existing)** concrete **pool/spa/fountain** surfaces to receive **(plaster, ceramic or glass tile or other),** as shown on the project drawings and as outlined in this specification.

B. Following all applicable manufacturer's guidelines and application instructions shall be considered a requirement of this specification.

C. Related Sections: **(Specification writer shall add, delete or amend, as deemed necessary)**
1. Section 03 30 00 – Cast-in-Place Concrete
2. Section 03 37 13 – Shotcrete
3. Section 03 39 00 – Concrete Curing
5. Section 13 11 00 – Swimming Pools
6. Section 13 12 00 – Fountains
7. Section 13 13 00 – Aquariums

1.02 REFERENCES (Specification writer shall add, delete or amend, as deemed necessary)

A. ASTM C109: Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.

B. ASTM C348: Standard Test Method for Flexural Strength of Hydraulic Cement Mortars.

C. ASTM C321: Standard Test Method for Bond Strength of Chemical-Resistant Mortars.

D. ASTM E96: Standard Test Method for Water Vapor Transmission of Materials.

E. COE CRD-C48: Standard Test Method for Water Permeability of Concrete.

F. ICRI Technical Guideline No. 310.2 – 1997 (formerly 03732): Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

G. ICRI Technical Guideline No. 210.3 – 2004 (formerly 03739): Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials.

1.03 SUBMITTALS (Specification writer shall add, delete or amend, as deemed necessary)

A. General: Submit (_) number of copies each of the following items in accordance with the requirements of the Conditions of Contract and in Division 1 Specification Sections.

B. Product Data: Submit manufacturer's technical data sheets, available shop drawings, applicable installation guidelines or recommendations, and material safety data sheets for each product and/or composite system included in this specification.

C. Material and Mock-up Samples: For **initial selection**, submit manufacturer's standard color charts or cured material samples for review by the specification authority and owner's representative. For **final selection**, submit sample boards and/or perform mock-ups **(specification writer shall specify sample size)** to verify acceptable workmanship, texture, color and finish of the swimming pool composite waterproofing system.

D. Material certificates signed by the manufacturer certifying that the composite waterproofing system and all

components of the system comply with all requirements specified herein.

E. Warranties: Submit a sample of the manufacturer's standard material warranty and the contractor's standard labor warranty.

F. Project Reference List: Contractor shall submit a minimum of 5 recently completed projects that entailed a similar scope of work and include total contract value.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: The manufacturer of the products specified in this section shall have a minimum of 5 years of experience in the production of these types of products.

B. Contractor Qualifications: The contractor installing the products specified in this section shall have a minimum of 3 years of experience and have successfully completed no less than 5 projects similar in scope and complexity, and is acceptable to and has been trained by the manufacturer.

C. Substitutions: Requests for the approval of any product other than those specified in this section must be submitted to the specifying authority two weeks prior to the bid, and shall include complete application specifications and physical characteristics. Any request after this date will not be accepted. Failure of performance requires immediate removal and replacement of unapproved substituted material with those originally specified at no cost to the owner, Architect, construction manager, or general contractor.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels containing brand name, batch or lot numbers, and directions for storage and mixing with other components.

B. Store materials to comply with manufacturer's directions to prevent from damage and/or deterioration from moisture, heat, cold, direct sunlight, or other detrimental effects.

1.06 PROJECT CONDITIONS

A. Environmental Conditions: Comply with all the manufacturer's directions for maintenance of ambient and substrate temperature, moisture, humidity, ventilation, and other conditions required to execute and protect completed work. In hot and cold weather conditions or when high evaporation rates or adverse conditions may be expected, the contractor will be responsible for the quality of the completed installation. Follow all recommendations and guidelines of the American Concrete Institute, as published in ACI Committee 305 for Hot-Weather Concreting and ACI Committee 306 for Cold-Weather Concreting.

B. Lighting: Permanent lighting will be in place and working before installing the proposed **pool/spa/fountain** waterproofing system.

C. Protection: Protect newly installed waterproofing system from rain or other potentially harmful climatic conditions for a minimum of 24 hours, from potential damage due foot or vehicular traffic and/or from the work of other trades.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Approved Manufacturer: Miracote Division of Crossfield Products Corp., 3000 E. Harcourt Street, Rancho Dominguez, CA 90221, (310) 886-9100; also 140 Valley Road, Roselle Park, NJ 07204, (908) 245-2800, www.miracote.com.

B. Substitutions: Requests for the approval of any product other than those specified in this section must be submitted to the specifying authority two weeks prior to the bid, and shall include complete application specifications and physical characteristics. Any request after this date will not be accepted.

2.02 MATERIALS

A. Miracote **pool/spa/fountain** waterproofing system is a multi-layered, fracture-resistant, waterproofing membrane system consisting of a concrete substrate primer, highly flexible cementitious waterproofing layer, cementitious protective bond coat and other optional accessory materials.

B. System Components Required:

1. MiraPrime Aqua-Blok XL - Single-component, water-based colloidal silicate primer.
2. MiraFlex Membrane C – Two-component, polymer-modified, cementitious, waterproofing membrane.
3. Miracote BC Pro – Single-component, polymer-modified, rigid cementitious bond coat.

C. Accessory Components Optional:

1. Miracote Poly Fabric - Polypropylene, alkaline-resistant, woven mesh reinforcement fabric.
2. MiraPatch WP – Single-component cementitious hydraulic water plug.
3. Miracote Latex – Latex admixture for use with thin set mortars, mortar beds and other cement mixes.
4. MiraPrime Conditioner – Single-component, water-based concrete alkaline conditioner.

2.03 PROPERTIES

A. MiraPrime Aqua-Blok XL Physical Properties:
Provide a single-component, reactive penetrating colloidal silicate integral waterproofing primer that meets the following physical properties or characteristics.

Vehicle Type:	Water-based solution
Reactive Agent:	Potassium Silicate
Color:	Clear
Flash Point:	None
Flammability:	None
Specific Gravity:	1.10
Odor:	None
pH:	11 - 12
Weight/Gal:	10.5 lbs./4.76kg
VOC (grams/liter):	0.0

B. MiraFlex Membrane C Physical Properties:
Provide a two-component, SBR polymer-modified, highly flexible, and crack-bridging cementitious waterproofing membrane that meets or exceeds the listed minimum physical property requirements.

Two Component Product	Liquid Polymer and Bagged Powder
Bagged Powder Color:	Gray and White
Liquid Polymer Type:	Styrene Butadiene Co-polymer
Working Time:	30 – 45 minutes
Elongation (ASTM D 638)	65%
Tensile Strength (ASTM D 638)	750 psi (7 days dry / 21 days wet)
Adhesion to Peel in Concrete:	8.3 lbs./in. width
Moisture Vapor Transmission (ASTM E 96)	2.5 grams (g/sq. meter/24 hrs.)
Water Vapor Permeability (ASTM E 96):	0.75 perms/inch
Impact Resistance: (MIL-3134) Para. 4.7.3	No cracking or detachment

C. Miracote BC Pro Physical Properties: (If required)
Provide single component, polymer-modified, rigid cementitious bond/protection coat.

Single Component Product	Bagged Powder
Mixing Liquid:	Potable water
Compressive Strength (ASTM C 579, Method A):	4,100 psi
Tensile Strength (ASTM C 307):	465 psi
Flexural Strength (ASTM C 580)	780 psi
Adhesion (ASTM C 932 Modified, No priming):	>250 psi (substrate failure)
Shrinkage (ASTM C 531):	0.015%
Water Vapor Permeability (ASTM E 96):	1.96 perms/inch
Impact Resistance: (MIL-3134) Para. 4.7.3 (2# steel ball dropped from 8' height onto coated steel plate)	No cracking or detachment

D. Miracote Poly Fabric Physical Properties: (As required)
Provide polypropylene, open weave reinforcing fabric for crack and transition zones.

Type:	Polypropylene
Compatibility:	Alkaline Resistant
Weave:	Open woven mesh

E. MiraPatch WP Physical Properties: (As required)
Provide single component, fast-setting, cementitious hydraulic repair mortar and water plug.

Single Component Product	Bagged Powder
Compressive Strength (ASTM C 109):	4,120 psi (7 days)
Tensile Strength (ASTM C 307):	380 psi
Initial Set (ASTM C 266):	90-120 second

F. Miracote Latex Physical Properties: (* As per typical mix design of cement, aggregate, water and latex)
Provide latex admixture for use to modify and enhance properties of cement-based mortars/thin sets.

Single Component Product	Synthetic polymer latex emulsion
Solids Content:	49%
Compressive Strength (ASTM C 109):	3,610 psi
Tensile Strength (ASTM C 307):	817 psi
Flexural Strength (ASTM C 580):	1,425 psi
Adhesion (ASTM C 932 Modified, No priming):	>250 psi (substrate failure)
Water Absorption (Mil-D-3134):	< 3.5%
*Typical Mix Design:	Yield (Volume) 170 sf @ ¼" depth
Miracote Latex:	1 Gallon
Potable Water:	3 Gallons +/- .5
Portland Cement – Type I or II:	94 lbs.
Graded Mineral Aggregates:	250 lbs.

G. MiraPrime Conditioner Physical Properties: (As required)
Provide single component, water-based concrete alkaline conditioner.

Vehicle Type	Water-based solution
Reactive Agent:	Modified Sodium Bicarbonate
Color:	Clear to white
Flash Point:	None
Flammability:	None
Odor:	None
pH:	10.2

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine all construction substrates and conditions to which the proposed composite waterproofing system is to be installed. Notify the Specifying Authority of any unsatisfactory conditions that may be detrimental to the proper and timely completion of the work.

B. Do not proceed with the work until all such deficiencies have been corrected by the Contractor in an acceptable manner, and as approved by the Specifying Authority.

C. Existing Concrete: When installing the specified waterproofing system to existing aged concrete perform pH testing to verify the substrate has sufficient alkalinity for the application of the reactive primer. If the pH reading is below 10 immediately contact manufacturer for assistance and directions on how to proceed.

D. New Concrete: Surfaces shall not be burnished as this will negatively impact penetration of the reactive primer. Acceptable finishes include, but are not limited to, bull float, float and trowel, broom and textured finishes, and any other finish resulting in a textured open pore structure. The use of high fly ash content, latex additives, curing compounds, evaporation retardants, and crack reducing sprays are prohibited.

3.02 PREPARATION

A. Protect all surrounding areas, walls, window glass, landscaping and other adjacent surfaces from the execution of each item of work including, but not limited to, surface preparation and all application steps involved in the installation of the waterproofing system.

B. Composite **pool/spa/fountain** waterproofing system must be applied to a clean, sound and properly prepared concrete substrate exhibiting a minimum **(Specification writer shall choose between CSP-2 to CSP-4)** surface profile, in accordance with the International Concrete Repair Institutes (ICRI) Technical Guideline No. 310.2 - 1997 (formerly 03732), **Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays**.

C. **(As an optional requirement for this project document the specification writer can include the following when deemed necessary)** Contractor shall perform on site mock-up of the complete waterproofing system, and conduct tensile bond tests prior to proceeding, as directed by the Specification Authority, in accordance with International Concrete Repair Institutes (ICRI) Technical Guideline No. 210.3 - 2004 (formerly 03739), **Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials.**

3.03 EXECUTION

A. General: Follow all manufacturers' directions, as published in their product technical data sheets and/or available installation guidelines regarding the application of the composite waterproofing system, as specified herein.

B. New Concrete: Upon evaporation of all bleed water and concrete has hardened enough to walk on without damage, power wash at low pressure to remove laitance, form release agents, dust, debris and other pore blocking substances that may inhibit penetration of the reactive primer. For new gunite concrete it is acceptable to evacuate dust and debris by vacuums or blowers.

C. Existing Concrete: Refer to Section 3.02 Preparation – B and C.

D. Apply Reactive Primer: Thoroughly agitate or shake material well before use. Apply uniformly at a rate of 100 to 150 square feet per gallon, and avoid ponding of material in slab depressions and low lying areas. When applying to vertical surfaces use low pressure sprayers with a fan tip nozzle and begin applying from

the bottom and work up the vertical face with north/south and east/west spray patterns. Saturate the host surface thoroughly until excess material forms a rundown pattern of 6 to 8 inches below the spray contact point. On horizontal substrates, apply a flood coat with enough material to maintain a wet condition for 3 to 5 minutes. If material ponds in shallow depressions use a broom or roller to evenly distribute material to surrounding areas. For maximum function and performance on both vertical and horizontal surfaces, a second wet-on-wet application within 20 to 40 minutes is required. Apply the second application at right angles from the first in a crisscross pattern. During hot weather conditions, pre-wet the substrate to saturated surface dry (SSD) state to cool the surface down prior to application. As a final step, apply two light mist-coats of potable water to the entire treated surface 30-40 minutes apart. This helps transport any uncured inorganic colloidal silicate minerals near the surface and drive them down into the concrete capillary network. This also leaves the near surface concrete pores open for the uninhibited application of subsequent coatings, stains and sealers.

E. Perform surface and crack repairs as necessary to re-profile, re-level or to restore the integrity of the concrete substrate or other surfaces in general. Concrete surface repair and levelling mortars shall be from the same manufacturer of the composite cementitious waterproofing system. Parge coats, brown coats, render coats, and/or mortar beds consisting a Portland cement and aggregate mixed on site are acceptable provided these materials are modified with the manufacturers acrylic latex admixture. Follow the manufacturers recommendations for proper ratio of latex admixture to potable water.

F. Joint Sealants: At the direction of the specifying authority and as shown on plans, install polyurethane or polyether sealant only at joints, transitions, and penetrations. Follow sealant manufacturers recommendations regarding the use of backer rod, bond breaking tape, priming, required cure time, proper detailing of concrete cracks and other installation requirements.

G. Detailing: Apply a coat of cementitious membrane material and embed 10” wide reinforcement fabric at all vertical and horizontal transitions, cracks, construction joints, pipe and drain penetrations, changes of plane and any other types of existing discontinuities that could undermine waterproofing integrity. Immediately apply an additional coat of cementitious membrane over the embedded poly fabric to lock it in, and smooth out any wrinkles and voids. Allow to dry before proceeding to the next installation step.

H. Apply Cementitious Membrane: Membrane material must be mixed mechanically to a uniform consistency in a clean mixing vessel using a low-speed drill (300-450 rpm) with a “Jiffy-type” or similar approved mixing paddle. Pre-mix membrane liquid component to re-disperse any polymer solids that may have settled on the bottom of the pail. When mixing membrane components pour the liquid component into the mixing pail first and gradually add the powder component while mixing. Thoroughly mix the complete unit for a minimum of three minutes or until a uniform consistency is achieved that is free of lumps and pockets of dry powder. Apply mixed membrane over the concrete substrate and previously detailed areas at a rate of 160 SF per kit by roller. Immediately when dry, apply a second coat of MiraFlex Membrane C at a rate of 160 SF per gallon. Consult manufacturer if a 3rd coat is recommended under certain conditions. Allow cementitious waterproofing membrane to cure for a minimum of 24 hours before application of the cementitious bond coat if applying plaster for final finish.

I. Apply Cementitious Bond Coat: Follow all instructions for mixing and applying the cementitious bond coat. Once mixed apply by loop roller or spray equipment such as hopper gun, rotor-stator pump or peristaltic pump. Bond coat application requires a single coat at the recommended coverage rate for the desired application method being employed. Allow bond coat to cure a minimum of 48 hours prior to proceeding with plaster, tile or other finishes. Consult manufacturer regarding weather conditions that may allow for application in less than 48 hours.

J. Allow completed cementitious membrane waterproofing system and protective bond coat to cure for 48 hours before subjecting to foot traffic and work of other trades.

3.04 CLEANING

A. Clean work area and remove/discard all debris resulting from the application of the raised access floor waterproofing system to the acceptance of the specifying authority or the owner.

3.05 PROTECTION

A. Protect all completed work of the application during the specified cure time of the material from vehicular or pedestrian traffic, or any exposure to solid or liquid spillage or any other form of contamination.

END OF SECTION

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