KWIKBOND POLYMERS

BUILDING TRUST

PRODUCT DATA SHEET

# HCSC- Hybrid Composite Synthetic Concrete

STRUCTURAL POLYMER CONCRETE MATERIAL COMPRISED OF A HYBRID CO-POLYMER RESIN BINDER AND GRADED SILICA-QUARTZ AGGREGATES WITH A HIGH MOLECULAR WEIGHT METHACRYLATE (HMWM) PRIMER

## PRODUCT DESCRIPTION

Hybrid Composite Synthetic Concrete (HCSC) is a structural polymer concrete material comprised of a hybrid co-polymer resin binder and graded silica-quartz aggregates with a High Molecular Weight Methacrylate (HMWM) primer that develops true composite action at the bond line of abrasive blasted concrete and steel substrates.

HCSC is designed for structural deck elements like closure pours, shear keyways, link slabs and structural overlays for bridge deck strengthening.

| HCSC Physical Properties | | |
|---|---|---|
| Compressive Strength | ASTM C39 | > 7,500 psi |
| Compressive Strength | ASTM C39 | > 5,000 psi @ 120°F |
| Flexural Strength | ASTM C78 | > 2,000 psi |
| Modulus of Elasticity | ASTM C469 | > 1,000 ksi @ 120°F |
| Modulus of Elasticity | ASTM C469 | < 3,500 ksi @-10°F |
| Coefficient of Thermal Expansion | ASTM T336 | <12 x 10-6 in/in/°F |
| Abrasion Resistance | ASTM C944 | < 0.3 grams loss |
| Permeability | ASTM C1202 | <10 coulombs |
| 28-day Linear Shrinkage | ASTM C157 (4-hr initial) | < 500 με |
| *All testing performed at temperature per test method unless noted above. | | |

## SPECIAL FEATURES

- 2-hour traffic return from 40-100 °F
- > 6 db rebar development length
- Exceptional adhesion at the bond line eliminates slip for true composite action
- Adhesive strength to concrete exceeds concrete strength
- Extremely abrasion resistant

## SURFACE PREPARATION

HCSC is applied to concrete or steel substrates that are sound, strong, clean, visibly dry, and abrasively blasted. Identify unsound concrete by chain-drag or hammer sounding. Remove unsound areas to sound concrete. Re-bar exposure is not required for composite action between HCSC and substrate material.
Complete removal of existing overlay materials to below the existing bond line is recommended. Existing concrete overlays that are both structurally sound and also placed below the top mat of rebar may remain in place.

Abrasive blasting is required for all substrate surfaces, including new CIP concrete, new precast concrete, existing concrete, milled concrete, diamond ground concrete and all steel. Abrasively clean concrete substrate surfaces by shot blasting to remove all visible contaminants and excess cement paste, yield an open pore structure and expose some aggregate within the concrete. Sand blasting is acceptable for patches and headers as well as vertical surfaces and boundaries of overlay areas inaccessible to the shot blasting machine.

Abrasively clean steel surfaces by shot or sand blasting to remove all visible contaminants and flash rust leaving a clean steel finish.

**PATCHING**:
Complete substrate patches with HCSC for optimal performance and material compatibility with both substrate deck and HCSC overlay. Compressive strength of any substrate material should exceed 4,000 psi. The use of a rebound hammer method to determine the compressive strength of the substrate material is acceptable.

Patches made with most cementitious materials must reach both 80% expected ultimate strength AND a minimum of 3-days open air cure after wet-curing prior to overlay.

UHPC closure pours must reach 14 ksi compressive strength prior to HCSC overlay. It is recommended that

UHPC surface is ground to remove air pockets, laitance and weak cement paste prior to surface preparation for overlay by abrasive blasting.

Avoid placing HCSC on patches with high expected shrinkage.Do not use patching materials with CTE >15x10-6 in/in/°F.

**SUGGESTED FORMING:**
Suggested materials to form expansion joint gaps include rigid foam board wrapped in polyethene sheeting or closed cell backer rod. Closed cell spray foam used for small gaps and holes must form a hard shell prior to HCSC installation. Do not use open cell spray foam.

Overlays placed with a vibratory screed can be formed with wood strips or steel set to finished grade.

Line bottom formwork for full depth HCSC elements such as patches, joints and closure pours with polyethylene sheeting or other approved bond-breaking surface.

## TOOLS & EQUIPMENT

KBP 204 ProPrime is mixed in buckets and placed with rollers, brooms and brushes.

HCSC is mixed in batches using > 9 CF paddle or drum mixers or continuously using volumetric mixing trucks specifically designed for production of HCSC or PPC 1121 material. Mix in single, double or partial batches as needed. A single batch is ~2.4 CF.

HCSC is placed to grade using a vibratory screed or automated slip form paver specifically designed for HCSC or PPC 1121. Do not use a roller screed. Finish with standard concrete finishing tools such as hand floats, bull floats and fresno trowels.

## HMWM PRIMER INSTALLATION

KBP ProPrime is a pre-promoted version of KBP 204 with the cobalt promotor pre-mixed into the HMWM resin prior to shipment. For applications that require delivery of un-promoted KBP 204 primer instead of KBP ProPrime, follow KBP 204 mixing directions.

**KBP ProPrime Components:**
-ProPrime HMWM Resin
-Cumene Hydro Peroxide (CHP) Initiator (3 oz per gal of ProPrime)
-ZCure Accelerator (varies based on temperature 0 to 3oz/gal)

Ensure substrate temperature is within the specified range using an infrared temperature gun. Premix the entire container of KBP 204 ProPrime to ensure that contents are well mixed before portioning out material to be used. Combine up to 4 gal KBP ProPrime HMWM resin, CHP and ZCure in a clean, dry bucket and mix for 30 seconds with a drill mixer. Follow mix ratios given by KBP technical service representative for exact mix proportions.

Within 5 minutes of mixing, empty contents onto the substrate surface. Evenly spread primer to refusal using brooms or rollers and brushes. Reapply to dry areas and redistribute excess puddling as necessary leaving a deeply saturated substrate. Application rates range from 70-120 sf/gal depending on porosity and surface texture of the deck. Place HCSC within 15-120 minutes after priming.

## HCSC MIXING

**HCSC Components:**
- HCSC Polymer Resin Binder
- HCSC Aggregate Blend
- Methyl Ethyl Ketone Peroxide (MEKP) Initiator
- ZCure Accelerator

To mix a single 2.4 CF batch of HCSC, combine 4.25 gallons of HCSC Polymer Binder Resin, (7 to 15 oz ) MEKP and (0 to 4 oz) ZCure in a clean, dry bucket and mix for 30 seconds with a drill mixer. Exact levels to be used are dependent on placement conditions, temperature, application, and dimensions. Follow KBP technical support guidance for specific mix design.

While clean mortar mixer is turning, add catalyzed HCSC Polymer Binder Resin and 6 each 50# bags HCSC Aggregate blend. Mix for 1-2 minutes and until all aggregate appears wetted. A proper HCSC mix contains 12% +/- 1% resin content by the weight of the aggregates.

Dump catalyzed material into a wheelbarrow, buggy, or other transfer device. Immediately recharge mixer with proper volume of catalyzed HCSC Polymer Resin Binder and continue mixing.

Adjust catalyst levels as needed to account for changes in temperature, application type, environmental conditions, and proper strength gain requirements and to achieve a 30-90 minute gel time. Temperature and application timing impact working time and strength development of HCSC.

Continuous volumetric mixers specifically designed for mixing HCSC or PPC 1121 may also be used for high output applications. Volumetric mixers must be properly calibrated and equipped with appropriate resin/catalyst/accelerator pumping systems as well as computer tracking system capable of meeting specifications for output tracking and calibration.

## FINISHING

Place HCSC mixture to grade using a vibratory screed, a slip form paving machine, or standard hand finishing tools for smaller areas. Strike off and fill to finished grade using concrete finishing tools as needed. Properly finished HCSC should yield a well-compacted material and surface with a slight glossy sheen without excessive bleed resin. Immediately hand broadcast top sand leaving an evenly covered finished surface free of mirroring or glossing. If specified, texture by mechanical saw-cut grooving or diamond grinding a minimum of 48 hours after installation.

HCSC can be placed at temperatures between 40-100□ with a 2-4 hour traffic return. Trial batches can be used to determine working time and set time based on anticipated application temperatures, conditions, and strength gain requirements.

## CLEANING

Clean tools, screed and mixer with acetone, or other suitable solvent prior to initial set. Cured material may have to be chipped off. Mixers in continuous operation do not need to be cleaned between batches.

## STANDARD PACKAGING

- HCSC Binder Resin: 4 gal pail, 55 gal drum, 40,000 lb tanker
- Mix Aggregates: 50 lb bags, 2 ton super sacks
- Top Sand: 50 lb bags
- KBP 204 ProPrime: 4 gal pails, 50 gal drums, 250 gal totes
- MEKP & CHP: 12 oz, 1 gal bottles
- Z Cure: 12 oz, 1 gal bottles and 5 gal pails

## SAFETY & STORAGE

Follow all OSHA, and other guidelines as well as all applicable fire codes. Refer to SDS for storage, handling, and use. Gloves, eye protection, and other protective clothing should be worn while working with HCSC and KBP ProPrime. Respirator with Organic Vapor cartridges may be desired while working with HCSC Binder Resin. Dust protection must be worn while working with neat aggregates. If liquid components come in direct contact with skin, wash off with soap and water. If any component gets in eyes, flush immediately with eye wash. If customer requests to have Cobalt promoter supplied separately from HMWM resin, extra care must be taken to avoid contact between Cobalt promoter and peroxide catalysts as a violent exothermic reaction will occur.

Store all components in a cool, dry location out of direct sunlight and in their original containers. Always protect components from moisture. Minimum shelf life is 12 months when properly stored.

The technical data furnished is true and accurate to the best of our knowledge. However, no guarantee of accuracy is given or implied. We suggest that customers evaluate these recommendations and suggestions in conjunction with their specific application. Kwik Bond Polymers, LLC warrants its products to be free from manufacturing defects conforming to its most recent material specifications. In the event of defective materials, Kwik Bond Polymers, LLC.'s liability will be limited to the replacement of material or the material value only at the sole discretion of Kwik Bond Polymers, LLC. Kwik Bond Polymers, LLC assumes no responsibility for coverage, suitability of application, performance or injuries resulting from use.

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