

Wade Clark

From: Bill Light <light.bill@us.sika.com>
Sent: Thursday, October 4, 2018 9:53 AM
To: Glen Calvert
Cc: Wade Clark
Subject: Re: East Texas concrete repair project
Attachments: pds-cpd_SikaCem226CI final.pdf; pds-cpd_SikaQuickVOH-PDS 5.30.13.pdf; pds-cpd-SikaArma110EpoCem-us.pdf; pds-cpd-SikaQuick®-1000.pdf; pds-cpd-SikaTop144-us.pdf; pds-cpd-Sikadur32HiMod-us.pdf; pds-cpd-Sikadur-AnchorFix 500-us.pdf

This is to confirm our conversation earlier this week regarding possible repair solutions for the stairs.

Vestibule soffit damage

Should you choose a repair option the corrosion issue must be addressed. After proper surface preparation and cleaning of the rebar the steel should be coated with Armatec 110. Installation of the Sika Ferrogard sacrificial anodes will also increase the life expectancy of the repairs. The most efficient method to repairing the overhead spalls appears to be a low pressure, wet spray application of SikaCem 126.

Top of landing repairs

The photos of the surface scaling you sent are most likely quite wide spread. The entire area should be prepared by moderate scarification and a new topping applied. SikaQuick 1000 bonded with Sikadur 32 Hi Mod is the recommended system for the new topping

If demo and replacement of the landing is considered, Sikadur Anchor Fix 500 would be the recommendation product for anchor the new rebar in wing walls.

Stair tread and riser repairs

Assuming the top 1-1/2" to 2" of the treads is selectively removed re-top the treads using SikaQuick 1000. The use of Sikadur 32 Hi Mod as a bonding bridge is also recommended to ensure a robust bond line. Minor damage to the risers can be repaired using either SikaQuick VOH or with SikaQuick 1000 if the riser is formed and poured monolithically with the treads.

SikaTop 144 is a the recommended product to address the overall appearance and waterproofing of the stairs.

Thanks for contacting Sika regarding this opportunity. I hope this information is helpful. Please feel free to call me if you have any questions or require further information.

BUILDING TRUST



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SikaCem® 226 CI

High performance repair mortar
for wet spray application.

Description	SikaCem®-226 CI is a one-component, pre-packaged, ready-to-use, cementitious, silica fume, fiber reinforced, high strength shrinkage-compensated mortar. Formulated for application by trowel or low pressure spray. It is designed especially for repair of overhead and vertical surfaces.
Where to Use	<ul style="list-style-type: none">■ Structural repair material for water and waste water treatment plants, parking structures, industrial plants, bridges tunnels and dams, etc.■ Vertical and overhead surfaces■ On grade, above grade, and below grade on concrete and mortar
Advantages	<ul style="list-style-type: none">■ Ready-for-use, one-component material.■ Easy to use; just add water.■ Sprayable system.■ Superior workability. Can be trowelled and screeded after application.■ Labor-saving system.■ Superior abrasion resistance over conventional Portland cement mortar.■ Bond strength ensures superior adhesion.■ Compatible with coefficient of thermal expansion of concrete.■ Increased resistance to de-icing salts.■ Good freeze/thaw resistance.■ High early strengths.■ Very low shrinkage.■ Silica Fume enhanced.■ Fiber reinforced.■ contains an integral corrosion inhibitor.
Coverage	0.40 ft3 per 50 lb bag
Packaging	50 lb. bag

Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.)

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

* Mortar scrubbed into substrate.

Shelf Life	1 year from date of production if stored properly in original, unopened and undamaged sealed
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Protect from moisture. If damp, discard material.
Color	Gray
Mixing Ratio	6 - 7 pints per 50 lb. bag.
Density (ASTM C-138)	25 lb/ft ³
Application Thickness	> 3/8" (9 mm). <u>Vertical applications:</u> spray applied up to 2" thickness in one lift <u>Overhead applications:</u> max. 1 to 1.5" per pass. If >1.5", each lift should be applied as soon as the previous lift will support it.
Set Time (ASTM C-266)	Initial Set: 2 - 3 hrs Final Set: 5 - 6.5 hrs
Compressive strength (ASTM C-39)	28 days - 7,000 psi
Compressive strength (ASTM C-109)	28 days - 8,000 psi
Bond Strength (ASTM C-469)	3 days >2,000 psi
Shrinkage (ASTM C-157)	28 days <0.07%

®

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SikaQuick® VOH

Fast Setting, one component, cementitious vertical and overhead repair mortar with superior high build properties

Description	SikaQuick VOH is a fast setting, one component, ready-to-use repair mortar for vertical and overhead applications using specialty cement blends.
Where to Use	<ul style="list-style-type: none">■ Fast repairs to overhead and vertical concrete and mortar surfaces on grade, above and below grade.■ As a repair material for building facades, parking structures, industrial plants, bridges, etc.■ As a fast setting repair material for new construction defects.
Advantages	<ul style="list-style-type: none">■ Minimal time required between lifts.■ Fast finishing time■ Time/labor-saving material; application up to 3 inches on vertical surfaces in one layer■ Easy to use; just add water■ High bond strength ensures excellent adhesion■ High early and ultimate strength■ Increased freeze/thaw durability and resistance to deicing salts■ Suitable for exterior and interior applications.■ Not a vapor barrier■ Overhead thickness up to 2"■ Fiber reinforced and polymer modified■ Contains corrosion inhibitor
Coverage	~.44 cu. ft.
Packaging	44 lb bag
How to Use	
Surface Preparation	Concrete/Mortar: Remove all deteriorated concrete, dirt, oil, grease, and all bond-inhibiting materials from surface. Preparation work should be done by high pressure water blast, scab- bler or other appropriate mechanical means to obtain an exposed aggregate surface profile of +/- 1/16 in. (CSP-5). After preparation, substrate strength should be verified prior to patch placement. Substrate should be saturated surface dry (SSD) with no standing water during application.

Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.)

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS. THIS DATA REFLECTS MATERIAL TESTED AT A MIXING RATIO OF 6.25 PINTS/UNIT.

Shelf Life:	One year in original, unopened bags.			
Storage Conditions:	Store dry at 40°-95°F (4°-35°C).			
Product Conditioning:	Condition material to 65°-75°F before using.			
Color:	Concrete gray.			
Mixing Ratio:	6 - 6.5 pints/unit			
Density (Wet mix):	~ 125 lbs. / cu. ft.			
Application Time:	Approximately 20 minutes.			
Finishing Time:	20-30 minutes			
Lift Height:	Max: 3" Min: 1/8"			
Time Between Lifts:	After final set			
Splitting Tensile Strength, psi (ASTM C-496)		1 day 200	7 days 250	28 days 500
Compressive Strength, psi (ASTM C-109):	3 hrs >2000	1 day >3000	7 days >4500	28 days 5500
Flexural Strength, psi (ASTM C-293):		1 day 400	7 days 600	28 days 1000
Bond Strength*, psi (ASTM C-882 modified):		1 day 1000	7 days 1600	28 days 2000
Modulus of Elasticity, psi (ASTM C-469)			7 days >2.2 x 10 ⁶	
Bond Strength, psi - Direct Tensile (IRC1 No. 210.3):				Substrate failure >250
Shrinkage (50% R.H.) (ASTM C-157; ICRI protocol):				<.05%
Initial Set, min. (ASTM C-266)				20-25
Final Set, min. (ASTM C-266)				30-40

Product Data Sheet
Edition 5.5.2011
Sika Armatec 110 EpoCem

Sika Armatec® 110 EpoCem®

Bonding Agent and Reinforcement Protection

Description	Sika Armatec 110 EpoCem is a 3-component, solvent-free, moisture-tolerant, epoxy-modified, cementitious product specifically formulated as a bonding agent and an anti-corrosion coating.
Where to Use	<ul style="list-style-type: none"> ■ As an anti-corrosion coating for reinforcing steel in concrete restoration. ■ As added protection to reinforcing steel in areas of thin concrete cover. ■ As a bonding agent for repairs to concrete and steel. ■ As a bonding agent for placing fresh, plastic concrete to existing hardened concrete.
Advantages	<ul style="list-style-type: none"> ■ Excellent adhesion to concrete and steel. ■ Acts as an effective barrier against penetration of water and chlorides. ■ Long open time - up to 16 hours. ■ Not a vapor barrier. ■ Can be used exterior on-grade. ■ Contains corrosion inhibitors. ■ Excellent bonding bridge for cement or epoxy based repair mortars. ■ High strength, unaffected by moisture when cured. ■ Spray, brush or roller application. ■ Non-flammable, solvent free.
Coverage	Bonding agent: minimum (theoretical) on smooth, even substrate 80 sq. ft./gal. (=20 mils thickness). Coverage will vary depending on substrate profile and porosity. Reinforcement Protection: 40 sq. ft./gal. (=20 mils thickness) (2 coat application).
Packaging	3.5 gal. unit. (47.6 fl. oz. Comp. A + 122.1 fl. oz. Comp. B + 46.82 lb. Comp. C) Comp. A + B in carton, Comp. C in multi-wall bag. 1.65 gal. unit. (22.7 fl. oz. A + 57.6 fl. oz. B + 4 bags @ 5.5 lb.) Factory-proportioned units in a pail.

Typical Data (Material and curing conditions @ 73°F and 50% R.H.)

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

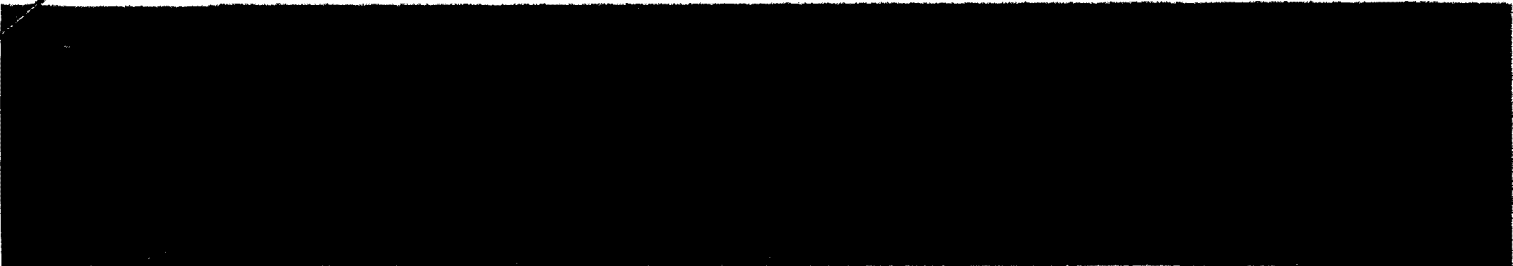
Shelf Life	1 year in original, unopened packaging.		
Storage	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F (18°-24°C) before using. If components A and B are frozen, discard. Protect Component C from humidity.		
Color	Concrete gray		
Density (Mixed)	125 lb./cu. ft. (2.0 kg.)		
Pot Life	Approximately 90 minutes		
Compressive Strength (ASTM C-109)	3 days	4500 psi	(31.0 MPa)
	7 days	6500 psi	(44.8 MPa)
	28 days	8500 psi	(58.6 MPa)
Flexural Strength (ASTM C-348)	28 days	1250 psi	(8.6 MPa)
Splitting Tensile Strength (ASTM C-496)	28 days	600 psi	(4.1 MPa)
Important Data for Sika Armatec 110 as a Corrosion Protective Coating			
Water	Water Permeability at 10 bar (145 psi)	8.92 x 10 ⁻¹⁵	ft./sec.
	Control	7.32 x 10 ⁻¹⁰	ft./sec.
	Water vapor diffusion coefficient μ H ₂ O	110	
Carbon Dioxide	Carbon dioxide diffusion coefficient μ CO ₂	14000	

TEST DATA: Time-to-Corrosion Study

- Sika Armatec 110 more than tripled the time to corrosion
- Reduced corrosion rate by over 40%

Important Data for Sika Armatec 110 as a Bonding Agent

Bond Strength (ASTM C882)	14 days moist cure, plastic concrete to hardened concrete:		
	Wet on Wet	2600 psi	(18.3 MPa)
	24 hr. Open Time	2600 psi	(17.9 MPa)
Bond of Steel Reinforcement to Concrete (Pullout Test):			
	Sika Armatec 110 Coated	625 psi	(4.3 MPa)
	Epoxy Coated	508 psi	(3.5 MPa)
	Plain Reinforcement	573 psi	(3.95 MPa)



PRODUCT DATA SHEET

SikaQuick®-1000

RAPID HARDENING REPAIR MORTAR WITH EXTENDED WORKING TIME

PRODUCT DESCRIPTION

SikaQuick®-1000 is a one-component, rapid hardening, early strength gaining, cementitious, patching material for concrete.

USES

- Use on grade, above, and below grade on concrete
- Highway overlays and repairs
- Structural repair material for concrete roadways, parking structures, bridges, dams and ramps
- Full depth patching repairs
- Economical patching material for horizontal repairs of concrete and mortar

CHARACTERISTICS / ADVANTAGES

- Specially suited for hot weather applications when extended working time is required
- Epoxy coatings can be applied as early as 6 hours. On site testing is recommended for verification. Please consult coatings manufacturer for recommendations
- Freeze/thaw resistant
- Easy to use, labor-saving material
- Not gypsum-based
- High early strength
- Open to foot traffic in 4 hours; to vehicle traffic in 6 hours (at 73 °F, 23 °C)
- Easily applied to clean, sound substrate

APPROVALS / STANDARDS

- Rapid hardening as defined by ASTM C-928

PRODUCT INFORMATION

Packaging	50 lb. (22.7 kg) bag
Appearance / Color	Gray powder
Shelf Life	12 months from date of production if stored properly in original, unopened and undamaged sealed packaging
Storage Conditions	Store dry at 40–95 °F (4–35 °C) Protect from moisture. If damp, discard material

TECHNICAL INFORMATION

Compressive Strength	3 hours	1,250 psi (8.6 MPa)	(ASTM C-109) 73 °F (23 °C) 50 % R.H.
	1 day	4,000 psi (27.6 MPa)	
	7 days	5,000 psi (34.5 MPa)	
	28 days	7,000 psi (48.2 MPa)	

Product Data Sheet

Edition 10.6.2014

SikaTop® 144

SikaTop® 144

Polymer-modified portland-cement coating

Description	SikaTop® 144 is a polymer-modified, 2-component, cementitious coating. Designed for use on concrete, mortar, and masonry substrates. Easily applied by brush, roller, or spray equipment. This fine-textured, abrasion-resistant coating is used for protection against deicing salts and for damp-proofing/waterproofing.
Where To Use	<ul style="list-style-type: none">■ Use on grade, above, and below grade on concrete, masonry, and mortar.■ Use on horizontal, vertical, and overhead surfaces, both interior and exterior.■ Potable water tanks.■ Use as a coating over newly repaired concrete to provide a monolithic/uniform appearance.■ Use as a protective coating to reduce the affect of deicing salt on concrete.■ Use as a protective coating for waterproofing, damp-proofing, and improved resistance to weathering.■ Use on concrete and masonry substrates to improve abrasion resistance to foot traffic and light pneumatic-tire traffic.■ Use to coat the backside of architectural curtain wall panels to prevent water intrusion from the outside.
Advantages	<ul style="list-style-type: none">■ Bond strength ensures superior adhesion.■ Increases resistance of substrate to deicing salts.■ Does not create a vapor barrier.■ No mix water needed, liquid co-polymer triggers special blend of cements, fillers, and admixtures.■ Superior abrasion resistance.■ No batching, factory proportioned unit ensures consistent composition and high quality. Non-flammable; low odor.■ Easily applied to clean, sound substrates.■ Approved for use in contact with potable water.■ USDA-approved for incidental food contact.■ May be overcoated with Sikagard® protective coatings.
Coverage	First Coat 100-150 ft./gal. Second Coat 150-200 ft./gal. Coverage is dependent upon substrate texture and porosity.
Packaging	5-gal. unit consisting of 3.5-gal. plastic pail of Component 'A' and a 45-lb. multi-wall bag of Component 'B'.

Typical Data (Material and curing conditions @ 73°F and 50% R.H.)

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

Shelf Life	1 year in original, unopened packaging.
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Condition material to 60°-75°F before using. Component 'A' must be protected from freezing. If frozen, discard.
Color	White and cement-gray.
Mixing Ratio	Factory proportioned unit. Mix entire contents.
Pot Life	Approximately 4 hours.
Tack-Free Time	Approximately 30 minutes.
Recoat Time	Allow 2 hours minimum between coats.
Application Thickness	8-16 mils/coat.
Abrasion Resistance (ASTM D-968 modified)	7 day 55 liters/mil
Bond Strength (Elcometer)	7 day concrete substrate failure
Water-Vapor Transmission: (ASTM E-96)	7 day 1 coat 27 grains/hr./ft. ² 2 coats 24 grains/hr./ft. ²

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Product Data Sheet

Edition 8.1.2011

Sikadur 32, Hi-Mod

Sikadur® 32, Hi-Mod

High-modulus, high-strength, epoxy bonding/grouting adhesive

Description	Sikadur 32, Hi-Mod, is a multi-purpose, 2-component, 100% solids, moisture-tolerant structural epoxy adhesive. It conforms to the current ASTM C-881, Types I, II, and V, Grade-2, Class C and AASHTO M-235 specifications.
Where to Use	<ul style="list-style-type: none">■ Bond fresh, plastic concrete to hardened concrete and steel.■ Grout horizontal cracks in structural concrete and wood by gravity feed.■ Machinery and 'robotic' base-plate grout.■ Structural adhesive for concrete, masonry, metal, wood, etc.
Advantages	<ul style="list-style-type: none">■ Super-strength bonding/grouting adhesive.■ Tolerant to moisture before, during and after cure.■ Excellent adhesion to most structural materials.■ Convenient easy-to-mix ratio A:B = 1:1 by volume.■ Easy-to-use for bonding/grouting applications.■ Fast initial set; rapid gain to ultimate strengths.■ USDA-certified for use in food plants.
Coverage	Bonding Adhesive - 1 gal. covers approximately 80 sq. ft. on smooth surface. Base Plate Grout - 1 gal. mixed with 1.5 parts oven-dried aggregate by loose volume yields approximately 420 cu. in. of grout. Anchoring grout - 1 gal. yields 231 cu. in. of grout.

Typical Data (Material and curing conditions @ 73°F (23°C) and 50% R.H.)

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

Shelf Life	2 years in original, unopened containers.		
Storage Conditions	Store dry at 40°-95°F (4°-35°C). Condition material to 65°-75°F (18°-24°C) before using.		
Color	Concrete gray		
Mixing Ratio	Component 'A': Component 'B' = 1:1 by volume.		
Viscosity	Approximately 3,000 cps.		
Pot Life	Approximately 30 minutes. (60 gram mass). Approximately 22 minutes. (350 gram mass, 8 oz.)		
Contact Time	40°F (4°C)*: 12 hrs.	73°F (23°C)*: 3-4.5 hrs.	90°F (32°C)*: 1.5-2 hrs
Compressive Modulus, psi	7 day	2.1 X 10 ⁵ psi (1,449 MPa)	
Tensile Properties (ASTM D-638)			
7 day	Tensile Strength	6,900 psi (48 MPa)	
	Elongation at Break	1.9%	
14 day	Modulus of Elasticity	5.4 X 10 ⁵ psi (3,726 MPa)	
Flexural Properties (ASTM D-790)			
14 day	Flexural Strength (Modulus of Rupture)	7,000 psi (48.3 MPa)	
	Tangent Modulus of Elasticity in Bending	6.9 X 10 ⁵ psi (4,800 MPa)	
Shear Strength (ASTM D-732)	14 day	Shear Strength	6,200 psi (43 MPa)
Water Absorption (ASTM D-570)	7 day (24 hour immersion)	0.21%	
Heat Deflection Temperature (ASTM D-648)			
7 day	[fiber stress loading 264 psi (1.8 MPa)]		122°F (50°C)
Bond Strength (ASTM C-882):			
2 day (moist cure)	Plastic Concrete to Hardened Concrete	1,700 psi (11.7 MPa)	
	Hardened Concrete to Hardened Concrete	2,000 psi (13.8 MPa)	
	Hardened Concrete to Steel	1,900 psi (13.1 MPa)	
14 day (moist cure)	Plastic Concrete to Hardened Concrete	2,200 psi (15.1 MPa)	
	Plastic Concrete to Steel	2,000 psi (13.8 MPa)	
	Hardened Concrete to Hardened Concrete	2,000 psi (13.8 MPa)	

Compressive Properties (ASTM D-695)

	Compressive Strength, psi (MPa)		
	40°F* (4°C)	73°F* (23°C)	90°F* (32°C)
8 hour	-	140 (1.0)	1,700 (11.7)
16 hour	-	4,800 (33.1)	7,300 (50.3)
1 day	30.0 (0.2)	5,700 (39.3)	7,300 (50.3)
3 day	5,300 (36.6)	11,300 (77.9)	10,400(71.7)
7 day	9,600 (66.2)	11,800 (81.4)	10,400(71.7)
14 day	11,900 (82.1)	12,200 (84.1)	10,400(71.7)
28 day	12,600 (86.9)	12,200 (84.1)	10,500(72.4)

Sika® AnchorFix 500

High Performance, two component adhesive anchor system

Description	Sika® AnchorFix 500 adhesive anchor system has been specially formulated as a high performance, two component adhesive anchor system for threaded rods and reinforcing bars in uncracked concrete to suit transport applications.
Where to Use	■ Uncracked concrete.
Advantages	■ Fixing close to free edges. ■ Versatile range of embedment depths. ■ Anchoring without expansion forces. ■ Component volume ratio of 1:1. ■ Extended working time.
Packaging	20 & 55 fl. oz. cartridges.
Testing	Sika® AnchorFix 500 has been tested according to ASTM C 881 Type IV, Class C, Grade 3.

Typical Data

RESULTS MAY DIFFER BASED UPON STATISTICAL VARIATIONS DEPENDING UPON MIXING METHODS AND EQUIPMENT, TEMPERATURE, APPLICATION METHODS, TEST METHODS, ACTUAL SITE CONDITIONS AND CURING CONDITIONS.

Shelf Life	When stored correctly, the shelf life will be for 24 months from the date of manufacture.
Storage Conditions	Cartridges should be stored in their original packaging, the correct way up, in cool conditions (+50°F to +77°F) out of direct sunlight.

Working & Loading Times		
Cartridge Temperature	T Work (minutes)	T Load (hours)
+50°F	75	24
+68°F	30	8
+86°F	15	4
+104°F	7.5	4
T Work is the typical time to gel at the highest temperature in the range T Load is the typical time to reach full capacity		

*The design professional on the job is ultimately responsible for the interpretation of the data provided above.

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