J.P. CARRARA & SONS INC.
Precast & Prestress Manufacturer
2464 CASE STR., MIDDLEBURY, VERMONT 05753
Phone:(802)388-6361
Fax:(802)388-9010

Double-Tees | Hollow-Core Plank | Flat Panels

NEBT Girders | Box Girders | NEXT Girders

ABC Components | Stadium Components | Total Precast Components

# Non-Conformance Report Rev. 4

| | |
|---|---|
| Date Submitted: | Tuesday, July 21, 2015 |
| Job Name/No.: | Castleton / #23456 |
| Piece Mark #'s: | CT-NB2 (1) |
| Production Date: | 6/15/2015 |
| QA Inspector, Co.: | R. Hamilton, KTA & B Girouard, HRV |

In response to VTAOT email of 7/7/15 rejecting our non-conformance report submitted 7/2/15 we herein offer the following additional comments to address the concerns outlined in the email. Comments are offered in **green font**. In response to VTAOT email on 7/13/15, we offer the following additional comments identified by **blue font**. In response to our jobsite meeting with VTAOT on 7/20/15, we offer the following additional comments identified by **red font**. Additional comments are added to this NCR in response to the VTAOT email items 1 - 6 received 7/20/15 at 11:54AM and identified by **purple** font.

After placement of the final load of concrete in unit NB2 foaming was observed at the top of the finished surface. Most of the foam was floated off of the unit during the finishing of the surface. The portion of the surface that received a rake finish has small (1/16th - 1/8th inch diameter) hemispherical indentations where the foaming occurred - see attached photo.

1 The dosage of HRWR (identified as "6100" on the batch ticket) was inadvertently increased on the final load that exhibited the surface foaming - see attached tickets. The increase in water-reducer dosage reduced the viscosity of the cement paste causing a corresponding decrease in the static stablity of the coarse aggregate in the concrete. As the larger coarse aggregate sinks within the depth of the placement an air pocket is created in the location that the aggregate originally was and the air pocket floats up to the surface. This is observed as foaming when a high volume of the air pockets reach the surface in a short period of time.

2 The batch of concrete was checked visually before placement **by QC personnel** but was not sampled because the previous load had been tested and test cylinders for that load were made. Static stability can be difficult to intertpret as concrete is flowing up through the fins of the mixer and the change in dosage of the HRWR on the batch ticket was not identified by QC or QA prior to placement. JPC QC shall verify the correct dosage rates of all loads prior to placement and changes to any admixture dosage shall be verified by sampling & testing. **Further, there shall be adequate QC personnel present at future pours to ensure that the sampling, testing, and all other qc procedures can be accomplished as required.**

3 Cores from the surface of the unit were taken and evaluated for hardened air content at two locations where the subject load of concrete was placed and a third location outside of the placement of that load for comparison. **Any damage to the epoxy coating on the rebar as a result of the coring shall be touched up with two-part epoxy as provided by the rebar supplier.** Hardened air content (ASTM 457) and petrographic analysis will be performed on the cores to verify acceptability of the water-cement ratio and durability properties of the placed concrete.

4 All laitance and loose material shall be removed prior to placement of the secondary poured curb. **To**

accomplish this action JPC proposes to abrasive blast the entire top surface of the NEXT beam with two passes of coarse grit sand at maximum pressure to remove all unsound material. Curb reinforcement shall be shielded from the sand during blasting and any damage to the epoxy coating shall be touched up prior to placement of the curb. Further, underneath the curb areas where the surface grooves will have been blasted smoother we will apply Sikadur 32 Hi Mod epoxy bonding agent prior to pouring the curb. Bonding agent shall be mixed and applied per the manufacturers' instuctions - see attached data sheet. Following sandblasting of the top surface of the beam, there are additional hairline shrinkage cracks observed which JPC proposes to seal with Protectosil Degadeck CSS low viscosity reactive methylmethacrylate. John LaRosa with NICOM Coatings confirmed that there are no compatability issues with the waterproofing membrane system used on the project. The presence of less aggregate and more cementitious material in the top of the beam can result in the observance of more shrinkage cracks. JPC QC shall verify and correct dosage rates of all loads prior to placement and changes to any admixture dosage shall be verified by sampling and testing.

5 To address VTAOT's concerns relative to the unknown compressive strength of the concrete in the subject flange, JPC has evaluated the beam based on a concrete strength of 7,000 psi, less than the design strength of 10,000 psi. JPC finds that the top tension in the beam at release of 477 psi is less than the limit of 627 psi, and the longitudinal reinforcement in the top mat of steel in the flange is sufficient. In service the top flange is in compression and the stress is less than the limit. The evaluation of the beam in service is conservative as the effect of integral abutments is neglected. Please see attached beam stress analysis calculations dated 7/20/15. Based on test cylinders, the concrete strength of concrete placed in the stems of the subject beam is 10,776 psi. JPC believes that the actual concrete strength of the flange is 10,000 psi, as the camber of the subject beam matches the camber of the other fascia beam with known compressive strength, indicating uniform performance between the two beams.

6 Surface treatments shall be performed at the precast plant prior to placement of the curb and delivery of the unit. They shall be supervised by JPC QC and witnessed by the QA Inspector.

7 1. As noted in paragraph one of the NCR, over dosing of HRWR results in instability of the concrete mix creating a layer of mortar at the top of the beam. As drying shrinkage occurs within the cementitious paste of concrete, the lack of coarse aggregate in this layer increases the tendency of shrinkage cracks at this location.

8 2. Within the industry, a hairline crack is characterized as a crack having a width less than 0.013" as per the attached PCI Northeast Bridge Member Repair Guideline #14. As per the attached JPC crack map diagram of the subject beam all cracks are measured as less than 0.006" prior to the sand-blasting of the top surface of the beam. Following sandblasting of the top surface of the beam, it was observed that the sandblasting enlarged the width of the cracks at the surface. The crack map was generated by JPC QC personnel in the presence of the VTAOT QA. As per the design calculations, the top tension at the end of the beams is 477 psi which exceeds the limit of 200 psi, above which supplemental reinforcement is required to control tension cracks. Tension cracking is observed in all beams. Micro shrinkage cracks may exist throughout the beam, especially in areas of higher cementitious content, and the presence of tension exacerbates the likelihood and frequency of these cracks. Locations of discontinuity, such as lifter recesses, also tend to be areas where increased shrinkage cracking is likely.

9 3. A crack map from JPC QC records for beam CT-NB2 is attached to this NCR.

10 **4. JPC contacted Sterling Lloyd, the manufacturer of the deck membrane system, The Eliminator. JPC spoke with company representative David Lite (508-942-2704) regarding the compatibility of our proposed MMA sealer with their system. Mr. Lite confirmed that The Eliminator is an MMA technology-based system, therefore the sealer is fully compatible. Mr. Lite recommends that JPC apply our MMA sealer prior to the shot-blasting procedure.**

11 **5. As per JPC Quality System Manual, final inspection of the unit was performed by Mr. Ben Cota and witnessed by the VTAOT QA. Upon completion of top flange sand-blasting operations, shrinkage cracks were better defined and were recorded on the crack map. The maximum width of cracks observed was 0.007" and in accordance with the JPC standard repair for sealing cracks submitted 7/13/15, which is in accordance with VTAOT subsection 510.08(l), the cracks were sealed with MasterProtect H 1000, a 100% penetrating silane sealer. JPC verified compatibility of the application of the MMA sealer over the silane sealer with the proposed MMA manufacturer with Mr. Peter Denicola of Evonik Corporation (732-981-5462).**

12 **6. JPC's QC Manager, Mr. Ben Cota will apply the sealer in the field in accordance with manufacturer's recommendations, refer to previously submitted product literature.**

For Ben Cota Date: 7/21/15

Prepared By:
Benjamin L. Cota, Production Engineer
Michael Weigand, P.E.

Enclosures: Concrete Batch Tickets
Photo of raked concrete surface at curb
Sikadur 31 data sheet
Protectosil Degadeck CSS
JPC Beam Stress Analysis
PCINE - BMRG SRP#14
JPC CT-NB2 Crack Map

DELIVERY SLIP # M 12020

124420

# JP CARRARA & SONS, INC.

2464 Case Street ♦ Middlebury, VT 05753
(P) 802-388-6363 ♦ (F) 802-388-9010
www.jpcarrara.com

PRECAST CONCRETE ♦ READY-MIX CONCRETE ♦ CONCRETE PUMPING ♦ SAND, STONE & GRAVEL

| PLANT | TIME | DATE | ACCOUNT | JOB NUMBER | TRUCK | DRIVER |
|---|---|---|---|---|---|---|
| 02 | 10:46 AM | 6/15/15 | 11247 | 000144 | M42 | LAPELL, ROY |

CUSTOMER
11247 MIDDLEBURY PRECAST-NEED JOB #

DELIVERY ADDRESS / DIRECTIONS
23456-015

| PURCHASE ORDER | DELIVERY LOCATION | DELIVERY LOCATION CODE | TAX | SLUMP |
|---|---|---|---|---|
| | | 02 | 01 | 5.00 in |

| LOAD QTY | PRODUCT | DESCRIPTION | AMT ORDERED | AMT DELIVERED | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|
| 8.05 yd | 430M | 20% ~~NO~~ FLYASH 10000PSI N | 48.30 | 48.30 | | |

5TH LOAD PLACED

5.7% AIR

MADE TEST CYLINDERS.

NOTES / CONCRETE USE: <UNKNOWN>

WATER ADDED AT CUSTOMER REQUEST (GALLONS):

| LEAVE PLANT | ARRIVE JOB SITE | LEAVE JOB SITE | RETURN PLANT |
|---|---|---|---|
| | | | |

Time allowed for unloading is five minutes per yard or thirty minutes, whichever is longer. Additional time for unloading is subject to a Demurrage charge.

CAUTION: Freshly mixed concrete may cause skin irritation or chemical burns. Avoid direct contact where possible and wash exposed skin areas promptly with water.

When delivery is made inside the curb line, Customer agrees to accept full responsibility and assumes all risk for any and all damage caused to driveways, sidewalks, buildings, vehicles, lawns, trees, shrubs, utility wires, or any other items or property, real or personal located at the delivery site. Customer agrees to indemnify, defend and hold JP Carrara & Sons, Inc. harmless from and against any and all damage, loss, cost or expense relating to or arising from all such deliveries.

Additional water added to this concrete will reduce its strength. Any water added at the request of customer is done so at customer's own risk.

JP Carrara & Sons, Inc., having no control over the use of materials sold, shall not be held responsible for the quality of any finished products, unless otherwise contracted in writing.

All amounts due on account are payable net 30 days from the date of invoice. Interest in the amount of 1½% per month (18% per annum) shall be applied to any amounts unpaid within this period.

SUBTOTAL

DISCOUNT

TAX

TOTAL

Please SIGN HERE acknowledging receipt of materials and acceptance of the terms and conditions contained herein.

| Truck | Driver | User | Disp Ticket Num | Ticket ID | Time | Date |
|---|---|---|---|---|---|---|
| M42 | 1014 | user | 12020 | 124420 | 10:45 | 6/15 |

| Load Size | Mix Code | Returned | Qty | Mix Age | Seq | Load ID |
|---|---|---|---|---|---|---|
| 8.05 CY | 430M | | | | W1 | 30944 |

| Material | Design Qty | Required | Batched | % Var | % Moisture | Actual | Wat |
|---|---|---|---|---|---|---|---|
| 3/4 STONE | 1440 lb | 11636 lb | 11540 lb | -0.83% | 0.38% M | | 5 gl |
| SAND | 1220 lb | 21724 lb | 21660 lb | -0.30% | 3.70% M | | 43 gl |
| TYPE III | 720.0 lb | 5786.0 lb | 5795.0 lb | 0.16% | | | |
| FLYASH | 180.0 lb | 7244.0 lb | 7230.0 lb | -0.19% | | | |
| AEA | 9.00 oz | 72.45 oz | 73.00 oz | 0.76% | | | |
| PLAST | 3.00 /C | 217.35 oz | 217.00 oz | -0.16% | | | |
| 6100 | 9.00 /C | 652.05 oz | 651.00 oz | -0.16% | | | |
| DCI | 5.0 gl | 40.3 gl | 40.4 gl | 0.31% | | | |
| WATER | 28.00 gl | 176.58 gl | 176.00 gl | -0.33% | | 176.00 gl | |

Actual Num Batches: 2 Manual 10:45:
Load 30764 lb Design 0.260 Water/Cemen 0.260 T Design 225.4 gl Actual 224.5 gl To Add:
Slump: 5.00 in Water in 0.0 gl Adjust Water: 0.0 gl / Trim Water: 0.0 gl / CY

Load Completed Load Time: 6 :55 ---Tares----------

DELIVERY SLIP # M 12022

124422

# JP CARRARA & SONS, INC.

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(P) 802-388-6363 ♦ (F) 802-388-9010
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PRECAST CONCRETE ♦ READY-MIX CONCRETE ♦ CONCRETE PUMPING ♦ SAND, STONE & GRAVEL

| PLANT | TIME | DATE | ACCOUNT | JOB NUMBER | TRUCK | DRIVER |
|---|---|---|---|---|---|---|
| 02 | 11:20 AM | 6/15/15 | 11247 | 000144 | M60 | MARTELL, JAMES |

CUSTOMER
11247 MIDDLEBURY PRECAST-NEED JOB #

DELIVERY ADDRESS / DIRECTIONS
23456-015

| PURCHASE ORDER | DELIVERY LOCATION | DELIVERY LOCATION CODE | TAX | SLUMP |
|---|---|---|---|---|
| | | 02 | 01 | 5.00 in |

| LOAD QTY | PRODUCT | DESCRIPTION | AMT ORDERED | AMT DELIVERED | UNIT PRICE | AMOUNT |
|---|---|---|---|---|---|---|
| 8.05 yd | 430M | 20% ~~NO~~ FLYASH 10000PSI N | 56.35 | 56.35 | | |

6TH LOAD PLACED.

NOTES / CONCRETE USE: <UNKNOWN>

WATER ADDED AT CUSTOMER REQUEST (GALLONS):

| LEAVE PLANT | ARRIVE JOB SITE | LEAVE JOB SITE | RETURN PLANT |
|---|---|---|---|
| | | | |

Time allowed for unloading is five minutes per yard or thirty minutes, whichever is longer. Additional time for unloading is subject to a Demurrage charge.

CAUTION: Freshly mixed concrete may cause skin irritation or chemical burns. Avoid direct contact where possible and wash exposed skin areas promptly with water.

When delivery is made inside the curb line, Customer agrees to accept full responsibility and assumes all risk for any and all damage caused to driveways, sidewalks, buildings, vehicles, lawns, trees, shrubs, utility wires, or any other items or property, real or personal located at the delivery site. Customer agrees to indemnify, defend and hold JP Carrara & Sons, Inc. harmless from and against any and all damage, loss, cost or expense relating to or arising from all such deliveries.

Additional water added to this concrete will reduce its strength. Any water added at the request of customer is done so at customer's own risk.

JP Carrara & Sons, Inc., having no control over the use of materials sold, shall not be held responsible for the quality of any finished products, unless otherwise contracted in writing.

All amounts due on account are payable net 30 days from the date of invoice. Interest in the amount of 1½% per month (18% per annum) shall be applied to any amounts unpaid within this period.

SUBTOTAL

DISCOUNT

TAX

TOTAL

Please SIGN HERE acknowledging receipt of materials and acceptance of the terms and conditions contained herein.

| Truck | Driver | User | Disp Ticket Num | Ticket ID | Time | Date |
|---|---|---|---|---|---|---|
| M60 | 1013 | user | 12022 | 124422 | 11:20 | 6/15 |

| Load Size | Mix Code | Returned | Qty | Mix Age | Seq | Load ID |
|---|---|---|---|---|---|---|
| 8.05 CY | 430M | | | | W1 | 30946 |

| Material | Design Qty | Required | Batched | | % Var | % Moisture | Actual | Wat |
|---|---|---|---|---|---|---|---|---|
| 3/4 STONE | 1440 lb | 11636 lb | 11600 lb | | -0.31% | 0.38% M | | 5 gl |
| SAND | 1220 lb | 21784 lb | 21740 lb | | -0.20% | 3.70% M | | 43 gl |
| TYPE III | 720.0 lb | 5796.0 lb | 5815.0 lb | | 0.33% | | | |
| FLYASH | 180.0 lb | 7264.0 lb | 7285.0 lb | > | 0.29% | | | |
| AEA | 9.00 oz | 72.45 oz | 72.00 oz | | -0.62% | | | |
| PLAST | 3.00 /C | 217.35 oz | 217.00 oz | | -0.16% | | | |
| → 6100 | 10.50 /C # | 760.73 oz | 759.00 oz | | -0.23% | | | |
| DCI | 5.0 gl | 40.3 gl | 40.0 gl | | -0.62% | | | |
| WATER | 28.00 gl | 176.58 gl | 176.00 gl | | -0.33% | | 176.00 gl | |

HRWR increased 13.4 oz/yd³

Actual Num Batches: 2 Manual 11:20:

Load 30893 lb Design 0.260 Water/Cemen 0.258 T Design 225.4 gl Actual 224.6 gl To Add:

Slump: 5.00 in Water in 0.0 gl Adjust Water: 0.0 gl / Trim Water: 0.0 gl / CY Note: Manua

Load Completed Load Time: 7 :59 ---Tares----------

Construction

# 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**

- 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**

- 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** $2.1 \times 10^5$ 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 | $5.4 \times 10^5$ 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 | $6.9 \times 10^5$ 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) |

*Material cured and tested at the temperatures indicated.

Construction

| | |
|---|---|
| **Packaging** | 1, 2 and 4 gal. units. |
| **How to Use** | Surface must be clean and sound. It may be dry or damp, but free of standing water. Remove dust, |
| **Surface Preparation** | laitance, grease, curing compounds, impregnations, waxes and any other contaminants.<br>**Preparation Work: Concrete** - Should be cleaned and prepared to achieve a laitance and contaminant free, open textured surface by blastcleaning or other equivalent mechanical means.<br>**Steel** - Should be cleaned and prepared thoroughly by blastcleaning. |
| **Mixing** | **Pre-mix each component.** Proportion equal parts by volume of Component 'A' and Component 'B' into clean pail. Mix thoroughly for 3 minutes with Sika paddle on low-speed (400-600 rpm) drill until blend is a uniform color. Mix only that quantity that can be applied within its pot life. |
| **Application** | **To bond fresh concrete to hardened concrete -** Apply by brush, roller, broom or spray. Place fresh concrete while Sikadur 32, Hi-Mod, is still tacky. If coating becomes glossy and loses tackiness, remove any surface contaminants then recoat with additional Sikadur 32 Hi-Mod, and proceed.<br>**To grout baseplates -** Add up to 1 1/2 parts of oven-dried aggregate to 1 part of mixed Sikadur 32, Hi-Mod, by volume. Place grout under baseplate. Avoid contact with the underside of the plate. A 1/4 to 3/8 in. (6 to 10 mm) space should remain between the top of the grout and the bottom of the plate.<br>Maximum thickness of grout per lift is 1.5 in. (38 mm) If multiple lifts are needed, allow preceding layer to cool to touch before applying additional layer. The remaining 1/4 to 3/8 in. (6 to 10 mm) space should be filled with neat Sikadur 32 Hi-Mod. Pour a sufficient quantity of neat epoxy to allow the level to rise slightly higher than the underside of the bearing plate.<br>**To gravity feed cracks -** Pour neat material into vee-notched crack. Continue placement until completely filled. Seal underside of slab prior to filling if cracks reflect through. |
| **Limitations** | ▪ Minimum substrate and ambient temperature 40°F (4°C).<br>▪ For spray applications, consult Technical Service at 800-933-7452.<br>▪ Use only oven-dry aggregate.<br>▪ Material is a vapor barrier after cure.<br>▪ For applications on exterior, on-grade substrates, consult Technical Services at 800-933-7452.<br>▪ Do not apply over wet, glistening surface.<br>▪ Not an aesthetic product. Color may alter due to variations in lighting and/or UV exposure. |
| **Warning** | **Component 'A' - IRRITANT; SENSITIZER -** Contains epoxy resin, nonyl phenol. Can cause skin sensitization after prolonged or repeated contact. Eye irritant. May cause respiratory irritation. Harmful if swallowed.<br>**Component 'B' - CORROSIVE; IRRITANT; SENSITIZER -** Contains amines, silica (quartz), and benzylalcohol nonyl phenol. Contact with eyes or skin causes severe burns. Can cause skin sensitization after prolonged or repeated contact. Skin/respiratory/eye irritant. Harmful if swallowed. Deliberate concentration of vapors of Component A or B for purposes of inhalation is harmful and can be fatal. Cured material, if sanded, may result in exposure to a chemical known to the state of California to cause cancer. |
| **First Aid** | **Eyes:** Hold eyelids apart and flush thoroughly with water for 15 minutes. **Skin:** Remove contaminated clothing. Wash skin thoroughly for 15 minutes with soap and water. **Inhalation:** Remove person to fresh air. **Ingestion:** Do not induce vomiting. **In all cases, contact a physician immediately if symptoms persist.** |
| **Clean Up** | Wear chemical resistant gloves/goggles/clothing. Ventilate area. In absence of adequate general and local exhaust ventilation, use a properly filled NIOSH respirator. Confine spill. Collect with absorbent material. Dispose of in accordance with current, applicable local, state and federal regulations. Uncured material can be removed with solvent. Strictly follow manufacturer's warnings and instructions for use. Cured material can only be removed mechanically. |
| **Handling & Storage** | Avoid direct contact with skin and eyes. Wear chemical resistant gloves/goggles/clothing. Use only with adequate ventilation. In absence of adequate general and local exhaust ventilation, use a properly filled NIOSH respirator. Wash thoroughly after handling product. Launder clothing before reuse. Store in a cool dry well ventilated area. |

KEEP CONTAINER TIGHTLY CLOSED • KEEP OUT OF REACH OF CHILDREN • NOT FOR INTERNAL CONSUMPTION • FOR INDUSTRIAL USE ONLY

All information provided by Sika Corporation ("Sika") concerning Sika products, including but not limited to, any recommendations and advice relating to the application and use of Sika products, is given in good faith based on Sika's current experience and knowledge of its products when properly stored, handled and applied under normal conditions in accordance with Sika's instructions. In practice, the differences in materials, substrates, storage and handling conditions, actual site conditions and other factors outside of Sika's control are such that Sika assumes no liability for the provision of such information, advice, recommendations or instructions related to its products, nor shall any legal relationship be created by or arise from the provision of such information, advice, recommendations or instructions related to its products. The user of the Sika product(s) must test the product(s) for suitability for the intended application and purpose before proceeding with the full application of the product(s). Sika reserves the right to change the properties of its products without notice. All sales of Sika product(s) are subject to its current terms and conditions of sale which are available at **www.sikausa.com** or by calling 800-933-7452.

**Prior to each use of any Sika product, the user must always read and follow the warnings and instructions on the product's most current Technical Data Sheet, product label and Material Safety Data Sheet which are available online at www.sikausa.com or by calling Sika's Technical Service Department at 800-933-7452. Nothing contained in any Sika materials relieves the user of the obligation to read and follow the warnings and instruction for each Sika product as set forth in the current Technical Data Sheet, product label and Material Safety Data Sheet prior to product use.**

**LIMITED WARRANTY:** Sika warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Technical Data Sheet if used as directed within shelf life. User determines suitability of product for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of product exclusive of labor or cost of labor. **NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKA SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. SIKA SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.**

**Visit our website at www.sikausa.com** **1-800-933-SIKA NATIONWIDE**

**Regional Information and Sales Centers.** For the location of your nearest Sika sales office, contact your regional center.

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Carretera Libre Celaya Km. 8.5
Fracc. Industrial Balvanera
Corregidora, Queretaro
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# Protectosil® Degadeck® CSS

## MMA CONCRETE SYSTEM SEALER

### Product Data and Test Information

LOW VOC's

### PRODUCT DESCRIPTION

**Protectosil Degadeck CSS** is a low viscosity reactive methylmethacrylate (MMA) for use in sealing cracks in concrete structures. **Protectosil Degadeck CSS** is a two component liquid material which is catalyzed to cure into a hard methylmethacrylate (MMA) resin. The low viscosity of the **Protectosil Degadeck CSS** allows it to readily penetrate into cracks. Cracks as wide as 1/8 of an inch(3 mm) to hairline can be sealed. **Protectosil Degadeck CSS** cures within one hour and is ready for traffic at that time. The cured MMA is resistant to water, chloride ion ingress, and also alkali attack.

**Protectosil Degadeck CSS** penetrates into cracks, then reacts to seal against water and chloride ion intrusion. The unique MMA resin also seals sound concrete against water and chloride ion ingress. The cured MMA creates a barrier which prevents the ingress of water and water borne contaminants from entering the substrate and causing premature deterioration.

By combining the two low viscosity componants of the MMA resin, **Protectosil Degadeck CSS** penetrates by gravity into even the smallest crack. The excellent adhesion and strength of the cured resin ensures a long service life

### APPROPRIATE APPLICATIONS/SUBSTRATES

For use to seal cracks on cast-in-place, pre-cast, and high strength concrete as well as concrete surfaces from ingress of water and water-borne contaminates, such as chloride ions. For use on concrete bridge decks, parking garages, pedestrian walkways and other elevated concrete structures.

### ADVANTAGES

**Protectosil Degadeck CSS** is a 100% solid reactive MMA resin with low intrinsic viscosity and excellent adhesion to concrete surfaces.

The main benefits of this product are:

- Fast Curing System
- Deep penetration into cracks
- Excellent adhesion and bond strength
- Excellent water and chloride ion screening
- Compatible with other Protectosil® Building Protection products
- UV Resistance
- Highly resistant to alkali attack

### LIMITATIONS

Not intended for below-grade waterproofing of cracks under hydrostatic pressure. Should not be applied if the surface temperature is below 40°F(4°C) or above 90°F (32°C), if rain is expected within two hours following application, or if high winds or other conditions prevent proper application. If rain has preceded the application, the surface should be allowed to dry at least 24 hours.

### TECHNICAL DATA

**Protectosil Degadeck CSS** is a liquid system catalyzed by the addition of an activator.

| | |
|---|---|
| Color | bluish, slightly turbid liquid |
| Active Substance | methylmethacrylate |
| Active Content | 100% |
| Solvent | none |
| Viscosity @ 74°F | 5 - 15 cp |
| $T_{max}$ @74°F | 20 - 40 min/212°F -392°F |
| Flash point | 50°F |
| VOC | less then 70 g/l |

Tensile Strength DIN EN ISO 527
54 Mpa (7755 psi)
Elongation at Break DIN EN ISO 527
4 %
Flexural Strength DIN EN ISO 1788
2 MPa (11,900 psi)

### INSTALLATION

Concrete should be allowed to cure a minimum of 28 days. Concrete repair and replacement must be completed prior to application of **Protectosil Degadeck CSS**. Patching materials, caulking, sealing material, and traffic paint must be fully cured before application.

All surfaces must be cleaned to remove all traces of dirt, dust, efflorescence, mold, salt, grease, oil asphalt, laitance, curing compounds, paint, coatings, and other foreign materials. Acceptable surface cleaning methods include shotblasting, sandblasting, waterblasting, and chemical cleaners. Do not apply to a wet substrate and allow a minimum of 24 hours drying after precipitation. Check with your Evonik Degussa Corporation representative to verify that surface preparation is adequate.

(Continued)

DO NOT ADD SOLVENTS, WATER OR OTHER MATERIAL TO THE **Protectosil Degadeck CSS** FORMULATION.

Mix the **Protectosil Degadeck CSS** containers by rolling, shaking or stirring containers prior to use. The **Protectosil Degadeck CSS** formulation should be mixed in clean containers, preferably plastic. Mix the **Protectosil Degadeck CSS** until thoroughly mixed.

After mixing, **Protectosil Degadeck CSS** is ready for the addition of the initiator. Slowly stir the **Protectosil Degadeck CSS** and add the BPO catalyst per the following temperature chart:

| Application Temp | BPO catalyst (% by wt.) | Pot Life (min) | Hardening Time (min) |
|---|---|---|---|
| 40°F (9°C) | 7.0 | 15 | 60 |
| 50°F (9°C) | 5.0 | 12 - 16 | 45 - 50 |
| 60°F (16°C) | 3.0 | 15 -20 | 45 - 50 |
| 70°F (21°C) | 2.0 | 15 - 20 | 45 - 50 |
| 80°F (27°C) | 1.0 | 20 - 25 | 45 - 50 |
| 90°F 32°C) | 1.0 | 5-10 | 30 - 35 |

Stir the mixture until the BPO powder is dissolved and immediately pour the **Protectosil Degadeck CSS** on the concrete surface. Using squeegees, rollers or brooms quickly distribute the material over the concrete surface. Push material onto and into cracks to allow more material to penetrate. After approximately 10 minutes at 70°F (20°C) broadcast clean dry quartz (20 to 30 mesh), aluminum oxide or other approved medium onto the sealed surface. Distribute medium evenly over the surface at a rate of 10 to 15 pounds per 100 square feet for pedestrian traffic areas and 15 to 20 pounds for vehicular traffic areas. After approximately one hour remove any loose sand and open sealed area to traffic.

For large cracks that reflect through the slab, apply by brush or roller **Protectosil Degadeck CSS** to the underside of the slab and allow to cure before sealing top surface. On larger cracks it may be advisable to partially fill the cracks with clean dry quartz to reduce the amount of **Protectosil Dega**

**deck CSS** needed. Coverage rates depend on the amount and size of cracks, typical coverage is approximately 80 to 140 square feet per gallon. Exact coverage depends on the number and volume of cracks as well as the concrete porosity. It is recommended to seal cracks in the early part of the day if the concrete will be exposed to direct sunlight. As the concrete heats up it will expand and the cracks will close-up. As long as there is no dew or moisture on the decks the **Protectosil Degadeck CSS** can be used even at night.

**Precautions: Protectosil Degadeck CSS** is a flammable liquid and should be kept away from heat, sparks, open flame or other sources of ignition. The **Protectosil Degadeck CSS** containers should be kept closed when not in use and should be stored at temperatures below 75°F (24°C) and away from rain, standing water and direct sunlight. When working in an enclosed area, an air respirator should be used. Please refer to the Material Safety Data Sheet for more detailed information.

## AVAILABILITY

**Protectosil Degadeck CSS** is available in 5 and 55 gallon(180kg) drums to approved applicators, F.O.B. to various warehouses throughout the United States. Contact your local Protectosil representative or your regional manager for specific cost information. You can obtain their contact information on our website, www.protectosil.com,or by calling us at 1 (800) 828-0919.

## TECHNICAL SERVICE

Technical service engineers and scientists are available to answer questions about product performance, application methods and compatibility with other building materials. You can speak to one of our engineers or scientists directly by calling our toll-free number, 1 (800) 828-0919, and selecting option 1.

## MANUFACTURER

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PROTECTOSIL PRODUCTS ARE MANUFACTURED AT THE EVONIK CORPORATION THEODORE, ALABAMA, PLANT UNDER A QUALITY SYSTEM CERTIFIED TO ISO-9001 AND ISO-14001 REQUIREMENTS.

**For more information, MSDS and the most updated product information, and to find your local representative, go to www.protectosil.com**

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J.P. CARRARA & SONS, INC.

ERNEST J. BROD
7-20-15

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CASTLETON BRIDGE
JPC # 23456-015

STATE OF VERMONT
ERNEST J. BROD
No. 5213
REGISTERED
PROFESSIONAL ENGINEER

## CHECK BEAM STRESSES

NEXT 28D $f'_c = 10000$ PSI OR $f'_{ci} = 7500$ PSI
($f'_c = 7000$ PSI)
WIDTH $8'-2\frac{1}{4}''$

SECTION PROPERTIES FOR 8'-0" WIDE BEAM (N APPLICABLE)

$A = 1346 \text{ in}^2$

$Y_b = 18.06''$

$S_t = 8620 \text{ in}^3$

$S_b = 4742 \text{ in}^3$

WT 1402 PLF

| | |
|---|---|
| MEMBER MOMENT | 803 K-FT |
| NON COMPOSITE SDL | 177 K-FT |
| COMPOSITE DLM | 275 K-FT |
| LL+E M | 1297 K-FT |

ASSUME 11% LOSSES @ RELEASE

RELEASE

@ MIDSPAN 44 STRANDS PULLED TO $44^k$ EACH $P_o = 0.9 \times 44 \times 44 = 1742^k$

@ ENDS 30 STRANDS PULLED TO $44^k$ EACH $P_o = 0.9 \times 30 \times 44 = 1188^k$

$\bar{x}_{END} = 7.03''$ UP @ END FROM MKW $e_{END} = 18.06 - 7.03 = \underline{11.03''}$

$$\bar{x}_{MIDSPAN} = \frac{6@2\frac{1}{2} + 10@4\frac{1}{2} + 10@6\frac{1}{2} + 10@8\frac{1}{2} + 8@10\frac{1}{2}}{44}$$

$= (15.0 + 45.0 + 65.0 + 85.0 + 84)\,44$

$= 294/44 = 6.68''$ $e_{MIDSPAN} = 18.06 - 6.68 = \underline{11.38''}$

SERVICE

STRAND FORCE @ SERVICE

@ MIDSPAN $P = 44 \times 44 \times 0.8 = 1549^k$, ASSUME 20% LOSSES

@ ENDS $P = 30 \times 44 \times 0.8 = 1056^k$, ASSUME 20% LOSSES

TOPS

STRESSES, PSI (+ COMP, − TEN)

| LOAD | TRANSFER PT @ RELEASE P=P₀ | | MIDSPAN @ RELEASE P=P₀ | | MIDSPAN TOP STRESS @ SERVICE P=P | |
|---|---|---|---|---|---|---|
| | $f_b$ | $f_t$ | $f_b$ | $f_t$ | $f_t$ | |
| P/A | +.883 | +.883 | +1294 | +1294 | +1151 | EVALUATION AT SERVICE IS CONSERVATIVE AS EFFECTS OF INTEGRAL ABUTMENT IGNORED. |
| Pe/S | +2763 | −1520 | +4181 | −2300 | +2045 | |
| $M_d/S$ | −290 | +160 | −2032 | +1118 | +1118 | |
| $M_{sd}/S$ | | | | | +383** | |
| $M_{LL}/S$ | | | | | +1805** | |
| TOT | +3356 | −477 | +3443 | +112 | +2412 | |
| ALLOW | 0.6×7500 +4500 OK [0.6×7000 = 4200 OK] | 7.5√7500 = −650 OK* [7.5√7000 = 627 OK] | OK | OK | 0.4×10000 = 4000 PSI OK; 0.4×7000 = 2800 PSI OK | |

TRANSFER PT ≈ 50 φ = 50 × 0.6 = 30" = 2.5' FROM END

$$M_{SELF\ WT\ @\ TRANSFER\ PT} = \frac{wx}{2}(l-x) \quad ; \quad l = 68'-0"$$

$$= \frac{1402 \times 2.5(68-2.5)}{2} = 114789\ \text{LB-FT}$$

* REINFORCING @ TOP FLANGE REQD IF $f_t > 7.5\sqrt{f'_{ci}}$

$$c = \frac{477}{3356+477}(28) = 3.48"$$

$$T = \frac{3.48 \times 477 \times 96}{2} = 79678\ \text{LB}$$

FOR REINF @ 24 KSI

$$A = 79678/24000 = 3.32\ \text{in}^2$$

$$A_{s\ SUPPLIED} = 24\#6's = 10.56\ \text{in}^2 >> 3.32\ \text{in}^2,\ \text{OK}$$

** BASED ON NON-COMPOSITE PROPERTIES, CONSERVATIVE

# STANDARD REPAIR PROCEDURE #14
# FOR
# SEALING CRACKS

CRACKS ON HORIZONTAL SURFACES

NOTE: This repair procedure addresses sealing cracks on horizontal surfaces with a low modulus, high molecular weight methacrylate penetrating sealer and crack filler. The methacrylate resin is impervious to water, strong and quick setting (3-12 hours). It bonds to concrete and can be applied in temperatures from 20 °F to 100 °F.

A. The specific methacrylate sealer material shall be approved by the owner/engineer.

B. Substrate shall be clean, sound and free of surface moisture. Remove dust, laitance, and oils, curing compounds and all other foreign material by mechanical means.

C. Cracks extending through the entire member thickness shall be sealed from the underside to prevent leakage.

D. The methacrylate sealer shall be applied to the surface according to manufacturer's recommendations and allowed to pond over the crack. In some cases it may be necessary to build a temporary dam on either side of the crack to facilitate ponding.

E. The treated surface can become smooth after curing. A dry sand can be broadcast on the partially cured surface if a smooth surface is undesirable.

CRACKS ON VERTICAL SURFACES

NOTE: This repair procedure addresses sealing cracks on vertical surfaces with various materials.

I. EPOXY PASTE:

An epoxy paste applied by hand and worked into cracks can provide an effective moisture seal. This type of repair is typically used to seal individual cracks. The material used shall be approved by the owner/engineer and applied according to manufacturer's recommendations.

A. Surface preparation
   1. Surface to be clean and sound
   2. Surface may be damp or dry
   3. Substrate must be 40 degrees F and rising with preferred temperatures ranging from 40 degrees F to no higher than 80 degrees F

B. Application of the epoxy paste
   1. Prepare the epoxy past according to the manufacturer's recommendations
   2. Using a thin, flexible, and square ended, plastic or nylon spatula, force the epoxy gel with uniform pressure by squeegee action into the cracks
   3. Finger application to the cracks is permissible, but uniformity in filling of the cracks is best accomplished with the action of a spatula
   4. Allow to set until tack free. Note Well: this is a temperature dependent process and at 40 F and rising the set time will be longer than at 75 degrees F
   5. Lightly hand sand the area to match texture and appearance of adjacent areas not repaired

STANDARD REPAIR PROCEDURE #14
FOR
SEALING CRACKS (CONTINUED)

II. SILANE AND SILOXANE SYSTEMS:
A silane or siloxane based water repellents can be applied to the surface surrounding a crack. Experience has shown that the sealers will wick into and seal cracks ≤ 0.013" in width. Multiple applications may be required. This type of repair is typically used on large network or series of fine cracks. The material used shall be approved by the owner/engineer and applied according to manufacturer's recommendations.

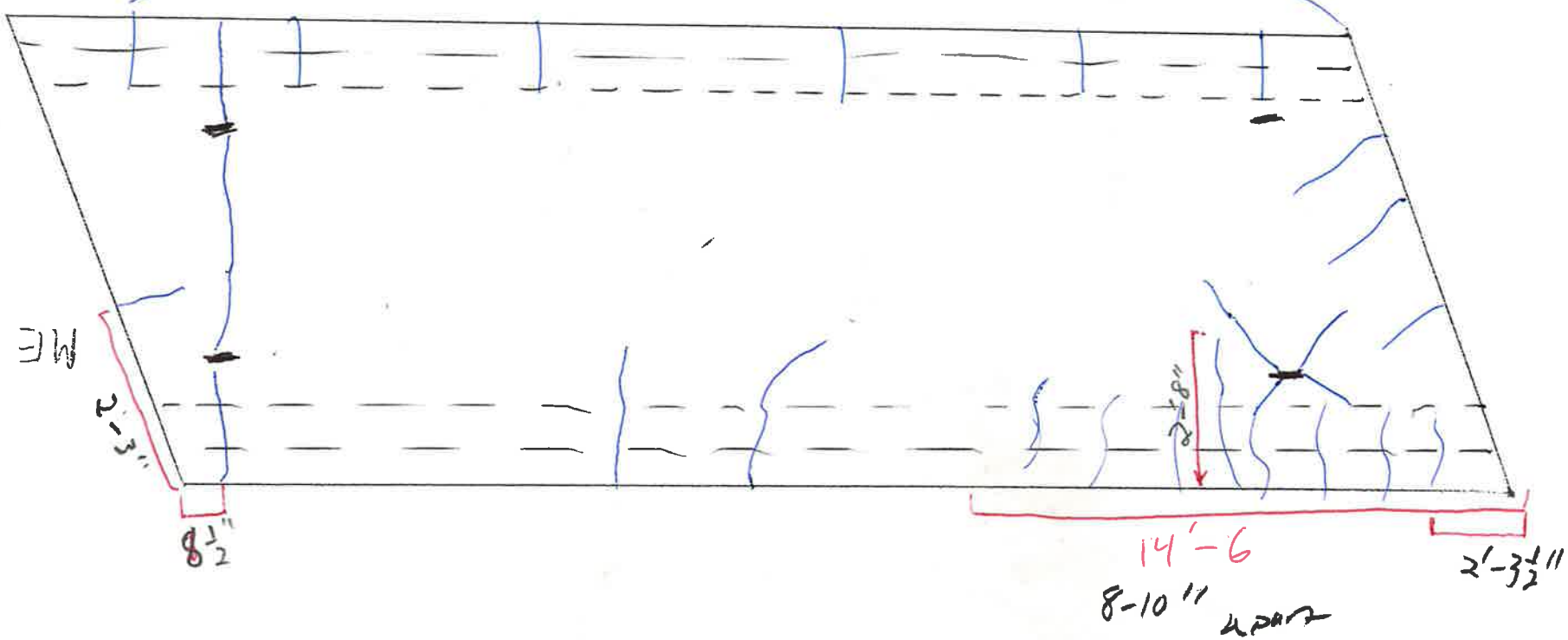
A. Application of breathable water repellent: silane or siloxane sytems
1. Power mix materials per manufactures recommendation for the time specified, and periodically thereafter to ensure uniform product
2. Apply with paint brush, roller or sprayer from the bottom up on vertical surfaces
3. Apply to saturation per manufacturers recommendations

METHACRYLATE:
A low modulus, high molecular weight methacrylate sealer can be introduced into cracks at any orientation using a vacuum-impregnation process. This type of repair can be used on a series of fine cracks and on individual cracks. The cracks are prepared in a similar fashion to those undergoing an epoxy injection repair. The vacuum-impregnation process is patented by BALVAC, Inc.

#23456-015
Castleton VT Bridge
J. P. Carrara & Sons, Inc.

Quality Control
Crack Map, Top of Beam
'CT-NB2'

CT-NB2

All less than .006

@ each guardrail cluster.