

[Fill in sections 4, 5, 7, 9, 16 and 17.]

Technical Report Documentation Page

1. Report No. MN/RC 2017-XX		2.		3. Recipients Accession No.	
4. Title and Subtitle Effective Long Lasting Partial Depth Joint Repairs for Challenging Conditions – Installation, First Year, and Second Year Performance Summary				5. Report Date November 2019	
				6.	
7. Author(s) Heidi Olson, Kenneth Tutu, Justin Lashley, Matthew Oman, Jerry Geib, Dave Van Deusen				8. Performing Organization Report No.	
9. Performing Organization Name and Address Braun Intertec Corporation 11001 Hampshire Avenue S Minneapolis, MN 55438				10. Project/Task/Work Unit No.	
				11. Contract (C) or Grant (G) No.	
12. Sponsoring Organization Name and Address Minnesota Department of Transportation Research Services & Library 395 John Ireland Boulevard, MS 330 St. Paul, Minnesota 55155-1899				13. Type of Report and Period Covered	
				14. Sponsoring Agency Code	
15. Supplementary Notes http:// mndot.gov/research/reports/2017/2017XX.pdf					
16. Abstract (Limit: 250 words) As Portland cement concrete (PCC) pavements age, longitudinal and transverse joints can exhibit signs of distress as a result of traffic loading, climatic variations, materials related issues, and construction defects. Although only small areas are often involved, the joint distress can substantially disrupt traffic flow and increase pavement roughness sacrificing consumer ride comfort. When immediate action is required, temporary repairs are often made using readily available materials, such as cold mix or other asphalt materials. These temporary materials are oftentimes replaced at a later date with more permanent materials to re-establish the integrity and functionality of the concrete pavement. The goal of this project is to provide a guide for MnDOT and other agencies to establish an effective joint repair program. The final report will guide the reader through product selection, installation techniques, equipment needed for completing the repair, typical performance cost, along with the life expectancy of the repair products. This report provides information on the construction of the patches and their condition after the first two years of use.					
17. Document Analysis/Descriptors National Road Research Alliance, NRRRA, MnROAD, concrete repair, joint repair, patch				18. Availability Statement No restrictions. Document available from: National Technical Information Services, Alexandria, Virginia 22312	
19. Security Class (this report) Unclassified		20. Security Class (this page) Unclassified		21. No. of Pages	
				22. Price	

Report for Effective Long-Lasting PCC Partial Depth Joint Repairs for Challenging Conditions

Installation through 2nd Year Performance

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Published by:

Minnesota Department of Transportation

Research Services & Library

395 John Ireland Boulevard, MS 330

St. Paul, Minnesota 55155-1899

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The authors, the Minnesota Department of Transportation, and Braun Intertec Corporation do not endorse products or manufacturers. Trade or manufacturers' names appear herein solely because they are considered essential to this report.

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LIST OF ABBREVIATIONS

Below are the abbreviations for each patch type.

- CL: Centerline
- CLJ: Centerline Joint
- FL: Full Length
- CP: Corner Patch
- WP: Wheel Path
- ML: Mid-Lane
- MLJ: Mid-Lane Joint

Please refer to Figure 3.1 for orientation of each patch type.

EXECUTIVE SUMMARY

As Portland cement concrete (PCC) pavements age, longitudinal and transverse joints can exhibit signs of distress as a result of traffic loading, climatic variations, materials related issues, and construction defects. Although only small areas are often involved, the joint distress can substantially disrupt traffic flow and increase pavement roughness, sacrificing consumer ride comfort. When immediate action is required, temporary repairs are often made using readily available materials, such as cold mix or other asphalt materials. These temporary materials are oftentimes replaced at a later date with more permanent materials to re-establish the integrity and functionality of the concrete pavement.

This research project is being conducted to review alternative patch materials for PCC partial depth repairs and monitor whether these alternative materials last longer than the frequently used cold mix and asphalt patches.

To conduct this research, distresses were made manually within the PCC pavement along the old I-94 westbound at the Minnesota Road Research Facility (MnROAD). This report details the distresses that were patched, what products were used, how they were mixed, and how they were applied. MnDOT Research, District, material suppliers, and Braun Intertec personnel were onsite during the preparation and installation process to document the procedures required or used by each product. Documentation included equipment needed for preparation, manufacturer guidelines or recommendations for the installation of each product and the Personal Protective Equipment (PPE) needed during preparation and application of the repair product.

Additionally, this report provides updates on the condition of the patches after the second year of service. The conditions of the patches were rated on a scale of 0 to 4, with 0 being a failed patch and 4 being a patch with no signs of distress. Discussion of the patch conditions and photos of the patches are included in this report.

CHAPTER 1: OBJECTIVES

Joint distress can range from minor spalling that requires no immediate action to major distresses that can affect large areas of the pavement and significantly disrupt traffic. When immediate action is required, temporary repairs are often made using readily available materials, such as cold mix or other asphalt materials. These temporary materials are oftentimes replaced at a later date with more permanent materials to re-establish the integrity and functionality of the concrete pavement.

When longer-lasting materials are used in the initial joint repairs, the impact to travelers is reduced and additional costs for temporary materials and subsequent removals are eliminated. Different material types are available for longer-term repairs which vary widely in cost, required skill level for satisfactory placement, and time needed before opening to traffic. The performance of each of these materials can also vary widely making selection and installation of permanent repairs challenging.

The objective of this project is to provide a guide for NRRRA members and other agencies to establish an effective partial depth repair program for concrete pavements. The final report will guide the reader through product selection, installation techniques, equipment needed for completing the repair, typical performance cost, along with the life expectancy of the repair products.

CHAPTER 2: PROJECT BACKGROUND

The NRRRA Preventive Maintenance team selected the original westbound lanes of I-94 that are adjacent to the MnROAD Facility to perform this research project. This portion of I-94 was originally constructed in 1973 with a 9-inch thick concrete pavement and skewed 27-foot spaced transverse joints. A total of 15 test sections consisting of three contiguous panels and two transition panels, one at either end, were prepared. Seven different patch types were created as shown in Figure 3.1. Sixteen different proprietary products were supplied by vendors for evaluation. Additionally, asphalt patching mix was used in two of the 15 sections.

MnDOT Research, MnDOT District, material suppliers, and Braun Intertec Corporation (Braun) personnel were onsite during the preparation and installation process to document the procedures required and/or used for each product. Documentation included equipment needed for preparation, manufacturer guidelines or recommendations for the installation of each product and the Personal Protective Equipment (PPE) needed during preparation and application of the repair product.

The patches were installed during October 2017. Westbound I-94 traffic was placed on the partial depth patch sections beginning November 2, 2017 and remained there intermittently through September 16, 2019. Traffic is not usually placed on the old I-94 Westbound section during winter months or while research and other MnROAD events are occurring.

In total, the partial depth patch section carried traffic for 190 days between the installation date and September 16, 2019. In that time, over 4.7 million passenger cars and 1.0 million heavy commercial trucks drove over the partial depth patches. The traffic data is broken down into further detail in Table 2.1.

Table 2.1 Traffic Data between Patch Installation and Second-Year Review

Lane	Dates	Total Number of Cars	Total Number of Heavy Commercial Trucks	WIM Measured CESALs
Driving	Installation (11/2/17) to Year 1 Review (8/27/18)	644,331	176,971	242,115
	Year 1 Review (10/1/18) to Year 2 Review (9/16/19)	1,417,522	426,697	405,948
	<i>Total (11/2/17 to 9/16/19)</i>	<i>2,061,853</i>	<i>603,668</i>	<i>648,063</i>
Passing	Installation (11/2/17) to Year 1 Review (8/27/18)	876,116	60,721	52,087
	Year 1 Review (10/1/18) to Year 2 Review (9/16/19)	1,840,328	341,351	157,753
	<i>Total (11/2/17 to 9/16/19)</i>	<i>2,716,444</i>	<i>402,072</i>	<i>209,840</i>

The second-year review of the patch conditions was performed on September 27, 2019. The conditions of the patches are discussed in Chapter 5. Photographs of the patches are included in Appendix B.

CHAPTER 3: DISTRESS DESIGN

A rotary head milling machine was used to create the distress areas (distress). The process of milling was more aggressive than anticipated and created much larger areas – both in width and depth – than would typically receive partial depth patching. As such, some of the material providers did not have enough material on-hand to patch all the distresses in a test cell. Some of the test cells contain two different patch materials to accommodate for the lack of product. The layout of patch materials used for each distress within each test cell are described in detail in Chapter 5.

Each distress was air blasted to remove the loose rubble left after the milling process. Several distresses were then sand blasted. However, due to a restricted time window and for the sake of streamlining the installation of the patches, not all of the distresss were sand blasted. Chapter 5 details which distresss were sand blasted in the observations of each individual cell. A final cleaning with a traditional leaf blower was performed in each distress before patch material was placed.

The figure below provides the typical patching types and locations within a test cell. Note that the order of the patching types varies within each cell, but each cell contains all types. The actual order of the patching types for each test cell are shown in Chapter 5.

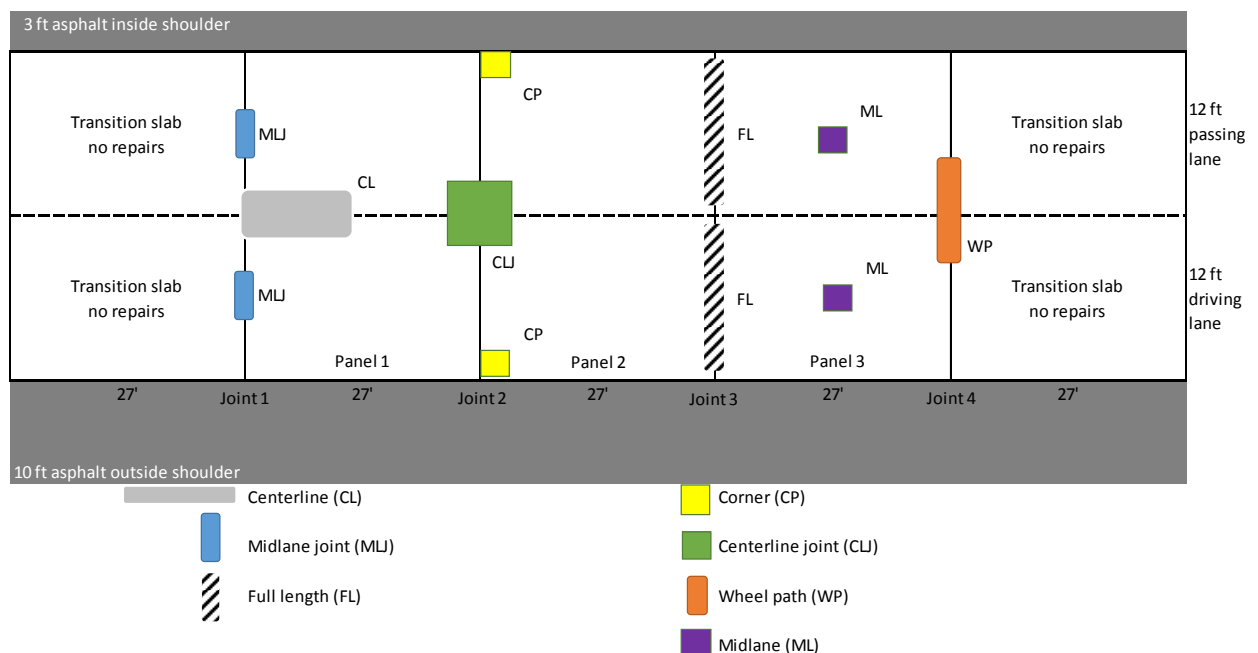


Figure 3.1 Typical Layout of Patching Types for PCC Partial-Depth Repair Study

CHAPTER 4: CONDITION RATING SCALE

MnDOT and Braun personnel developed a rating scale to use when reviewing the patch conditions. This scale is based on whether the original patch still exists and if so, what condition it is in. The scale ranges from 0 to 4, with 0 meaning the patch has failed and has been replaced, and 4 meaning the patch is intact and shows no signs of distress. Although the rating scale is only being used to review the cementitious and polymeric proprietary products, all of the patches were reviewed. The intention is to compare the “patch life” for typical HMA patches versus the proprietary product patches.

Note that shrinkage cracks are not considered a distress in this review. Shrinkage cracks are not identified in MnDOT’s Pavement Distress Identification Manual; however, they are common in concrete pavements. Shrinkage cracks are hairline cracks at the surface that develop during the setting and curing of concrete and typically do not extend through the entire depth of the patch or slab. As such, these cracks were not considered to decrease the integrity of the patches.

Table 4.1 depicts the details of the rating scale. The ratings of the patches within each test cell are discussed in Chapter 5 and included in Appendix B with the corresponding patch photos. A comparison table of the patch condition ratings from the first-year review to the second-year review is also included in Appendix B.

Table 4.1 Patch Condition Rating Scale

Rating	Patch Condition Description
4	Excellent; 100% of patch is intact, only shrinkage cracks present
3	Good; distresses (cracking and debonding) exist, but 100% of original patch is in place
2	Fair; less than 50% of the original patch is gone/been replaced
1	Poor; over 50% of the original patch is gone/been replaced
0	Failed; original patch no longer exists

CHAPTER 5: CONSTRUCTION AND PATCH CONDITIONS

During the installation process, it was decided to document how the material was installed, not necessarily what the best practices are. The Material Technical Data Sheets (MTDS) were reviewed to determine any best practices for each product and to determine more detailed information on the installation techniques and preparation needed of the patch.

It was observed that the patch materials came in a variety of packaging. There may be options for bulk quantities for larger repair projects. Some were contained in bags that are not waterproof while some were contained in buckets or waterproof materials. However, it should be noted that many of the materials are available in different sizes or quantities. The MTDS were reviewed for “shelf life” and storage requirements of each material. These items may play a role in deciding the appropriateness of each material for storage at maintenance facilities.

It was also noted that some materials required a mixer other than the standard revolving drum mixer that most maintenance crews currently utilize. Several products preferred and some required a mortar or shearing mixer. A few of the products could be mixed with a simple drill mixer with a paddle attachment. The mixing procedures are detailed in Chapter 5. The MTDS were also reviewed for any Standard Operating Procedures (SOP) for mixing each product as some suppliers were involved in mixing the product.

The curing time also varied amongst products. The MTDS provide generalized timeframe at varying temperatures along with the curing procedures for each material. The re-establishment of the joint was a large topic of discussion during the installation. Some suppliers utilized foam board or cardboard or a combination thereof. Some suppliers requested that their patches be sawed. It was observed during the installation that the foam board or cardboard was difficult to use, as it would routinely float in the material and needed to be weighted down. The sawing time to establish joints in the patches for some of the materials may have been too long to minimize the potential for cracking.

Figures 5.1 through 5.41 detail the patches and products placed in each cell. Below each layout figure is a discussion about the installation process of that product and about the condition of the patch material during the second-year review.

Cell 94001 – CTS, Rapid Set DOT Repair Mix

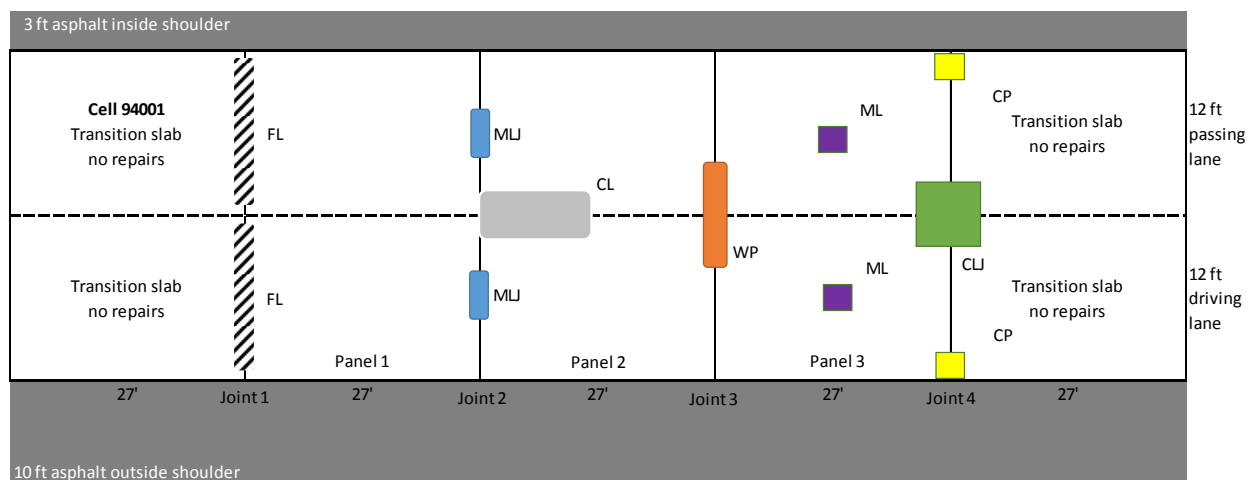


Figure 5.1 Patch Layout for Cell 94001 – CTS, Rapid Set DOT Repair Mix

The driving and passing lane were both sandblasted for this cell. Rapid Set DOT repair mix is a bagged product, 55 pounds. Approximately one 5-gallon bucket of 3/8-inch granite chips was added for each bag of mix added to the mixer, along with approximately 5 quarts of water per bag. The mixture was mixed for 3 minutes in a revolving drum mixer to provide the consistency desired. The mixture was then placed into a wheelbarrow and transported to the patches. The material was finished with traditional concrete tools. The patches were pre-wetted before placing material. Foam board was used to re-establish joints and patches were cured with plastic sheeting. The passing lane FL joint was mixed in a wheelbarrow and had a higher water-to-cementitious ratio than the other patches.

During the second-year review, the patches were exhibiting minor shrinkage cracks but no signs of further distress. The image below shows the general condition of the patches in Cell 94001. Each of the patches within Cell 94001 received a rating of 4, except for the WP and CLJ patches, which showed signs of debonding and received a rating of 3.



Figure 5.2 Cell 94001 – General condition, minor shrinkage cracks (Rating – 4)

Cell 94002 – SpecChem, RepCon 928 and Hot Mix Asphalt

94002 (A) – SpecChem, RepCon 928

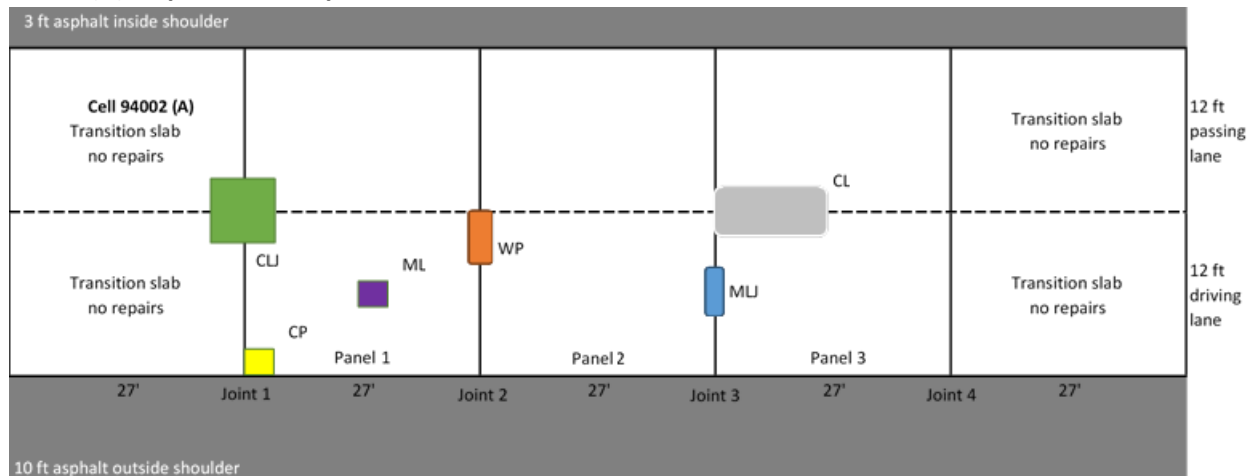


Figure 5.3 Patch Layout for Cell 94002 (A) – SpecChem, RepCon 928

The driving and passing lane were both sandblasted for this cell. RepCon 928 is a bagged product, 50 pounds. Approximately 2.5 quarts of water per bag were added in the mixer and mixed for 3 minutes in a revolving drum mixer. The mixture was then placed into a wheelbarrow and transported to the patches. The material was finished with traditional concrete tools. The patches were pre-wetted before placing material. Foam board was used to re-establish some joints while others were sawed, and patches were cured with plastic sheeting. Some cracking was noted in some patches the next day.

It was noted during the second-year review that the patches had developed some fine linear cracks but were still fully intact. These patches were given a rating of 3. Figure 5.4 shows the general condition of the patches in Cell 94002 (A). The WP and CL have experienced some material loss and have ratings lower than 3.



Figure 5.4 Cell 94002 (A) – General condition, linear cracks (Rating – 3)

94002 (B) – Hot Mix Asphalt

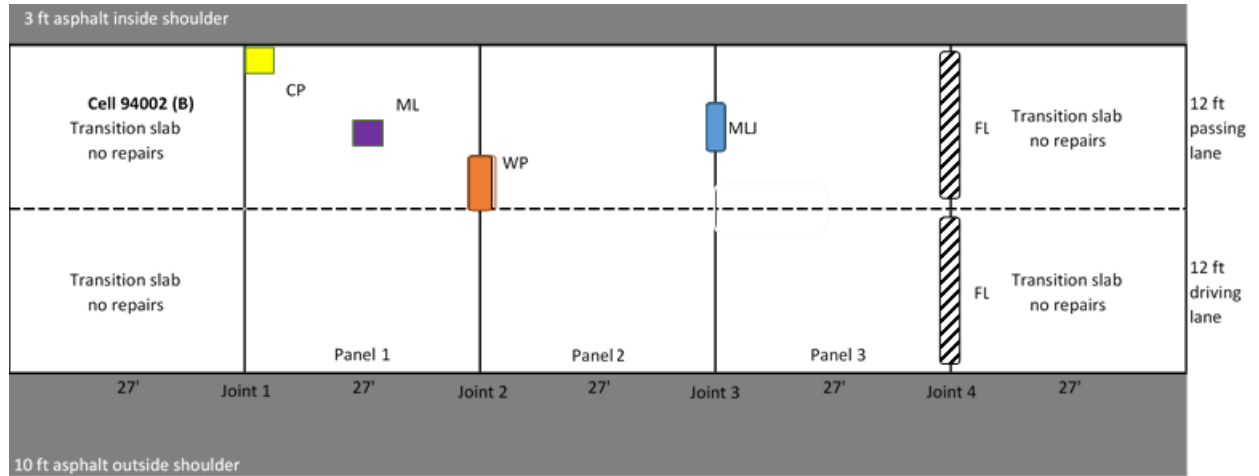


Figure 5.5 Patch Layout for Cell 94002 (B) – Hot Mix Asphalt

The passing lane CP, ML, WP, and MLJ and both FL patches were completed with HMA due to the amount of product required for the patches. The HMA material was installed similarly to the procedure described for Cells 94014 and 94015, which were all HMA material.

The HMA patches in Cell 94002 (B) have developed cracking and some material loss. Some of the patches have required repairs.



Figure 5.6 Cell 94002 (B) – General condition, linear cracks and repairs (Rating – NA)

Cell 94003 – Western Material and Design (2 products)

94003 (A) FasTrac 246

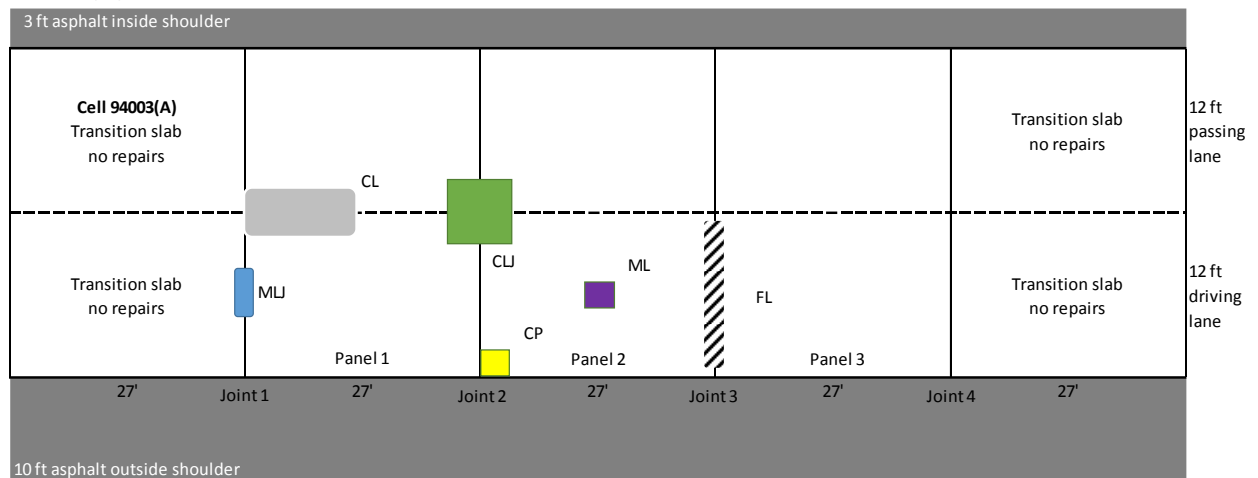


Figure 5.7 Patch Layout for Cell 94003 (A) – Western Material and Design, FasTrac 246

The driving lane and passing lane were both sandblasted. FasTrac 246 is a bagged product, 60 pounds. Approximately 2 quarts of water per bag were added in the mixer. The supplier utilized their own mixer which was a “screw” type mixer. The mixer attached to the front of a skid steer and was used to mix as well as place the concrete in the patches. The material was finished with traditional concrete tools. The patches were pre-wetted before placing material. Foam board was used to re-establish some joints while others were sawed. The patches were cured with plastic sheeting.

The patches in Cell 94003 (A) have developed some linear cracks and some areas of debonding. Most of the patches were rated 3, however, some have no distress and were rated 4.



Figure 5.8 Cell 94003 (A) – General condition, linear cracks and debonding (Rating – 3)

94003 (B) CE 700 HPC

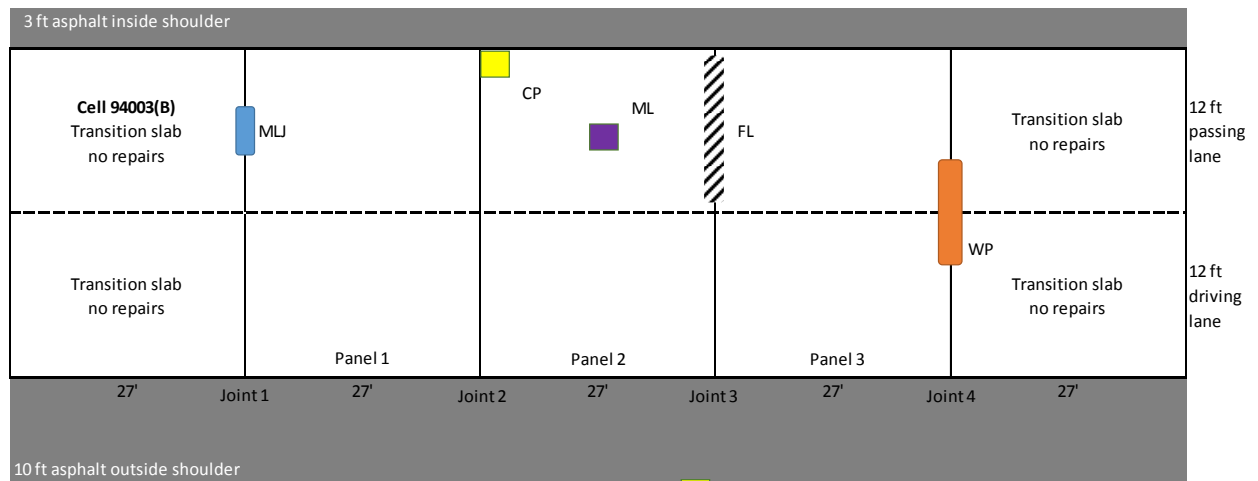


Figure 5.9 Patch Layout for Cell 94003 (B) – Western Material and Design, CE 700 HPC

The passing lane was sand blasted with the exception of the FL and WP repairs. The driving lane for the WP repair was sand blasted. CE 700 HPC is a 3-part system. Before mixing, the material was heated to approximately 70 to 80 degrees Fahrenheit. Part A (liquid polymer, 4 gallons) and Part B (liquid polymer, 4 gallons) are poured into the mixer and mixed for approximately 3 minutes. Then Part C (aggregate, 12 50-pound bags) was added. The supplier utilized their own mixer which was a “screw” type mixer. The mixer attached to the front of a skid steer and was used to mix as well as place the concrete in the patches. The material is finished with traditional concrete tools. Aggregate was broadcast onto the surface for added slip resistance. Cardboard was used to re-establish joints. The patches were not pre-wetted and were not cured.

The patches in Cell 94003 (B) did not show any signs of distress during the second-year review. The patches were all rated 4.



Figure 5.10 Cell 94003 (B) – General condition, no distress (Rating – 4)

Cell 94004 – D.S. Brown, PaveSaver Polymeric Concrete Patch and Crafcro, HP Concrete Cold Patch

94004 (A) – PaveSaver Polymeric Concrete Patch

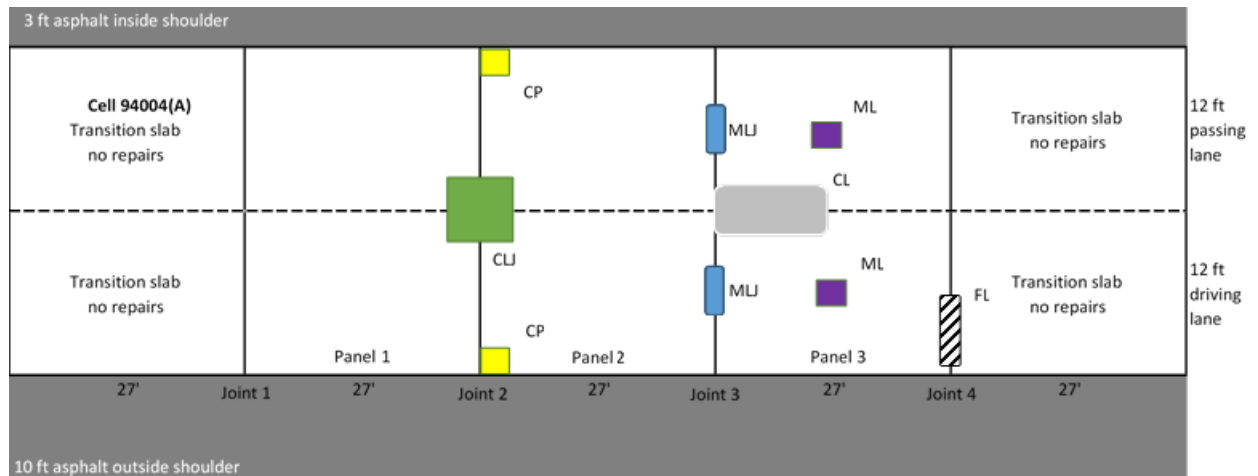


Figure 5.11 Patch Layout for Cell 94004 (A) – D.S. Brown, PaveSaver Polymeric Concrete Patch

The driving lane was sand blasted for all repairs while the passing lane was sand blasted only for the CL and ML repairs. PaveSaver Polymeric Concrete Patch is a 3-part system. Part A (1-gallon gray liquid) and Part B (1-gallon clear liquid) were poured into a 5-gallon bucket and mixed with a drill mixer with a paddle attachment for 3 minutes. The paddle mixer was placed towards the bottom of the bucket to minimize the introduction of air into the mixture. Part C (aggregate, 2 50-pound bags) was then placed into the bucket while mixing continued until the desired consistency was achieved. The material was poured from the bucket into the patch. The material was finished with traditional concrete tools. Cardboard was used to re-establish joints. The patches were not pre-wetted and were not cured.

Most of the patches in Cell 94004 (A) did not show any signs of distress during the second-year review, and were rated 4. However, two of the patches had some debonding and were rated 3.



Figure 5.12 Cell 94004 (A) – General condition, debonding (Rating – 3)

94004 (B) – Crafc0, HP Concrete Cold Patch

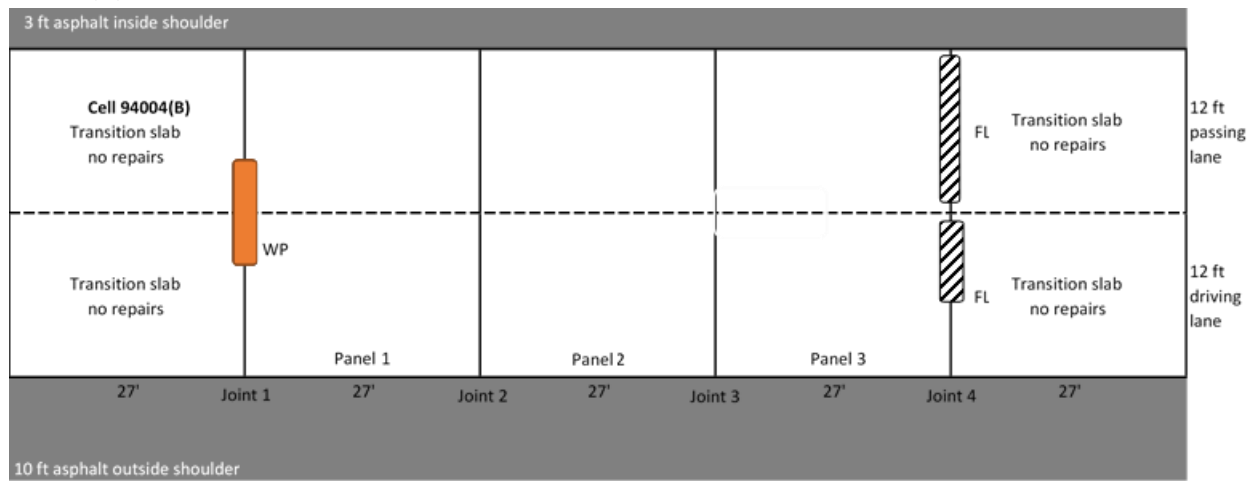


Figure 5.13 Patch Layout for Cell 94004 (B) – Crafc0, HP Concrete Cold Patch

The WP, passing lane FL, and about half of the driving lane FL repairs were patched with the Crafc0, HP Concrete Cold Patch, due to a lack of PaveSaver materials. The HP Concrete Cold Patch material was placed similarly to the procedure described for Cell 94009.

The patches in Cell 94004 (B) have some linear cracks, and were rated 3.



Figure 5.14 Cell 94004 (B) – General condition, linear cracks (Rating – 3)

Cell 94005 – Willamette Valley Company, FastPatch DPR

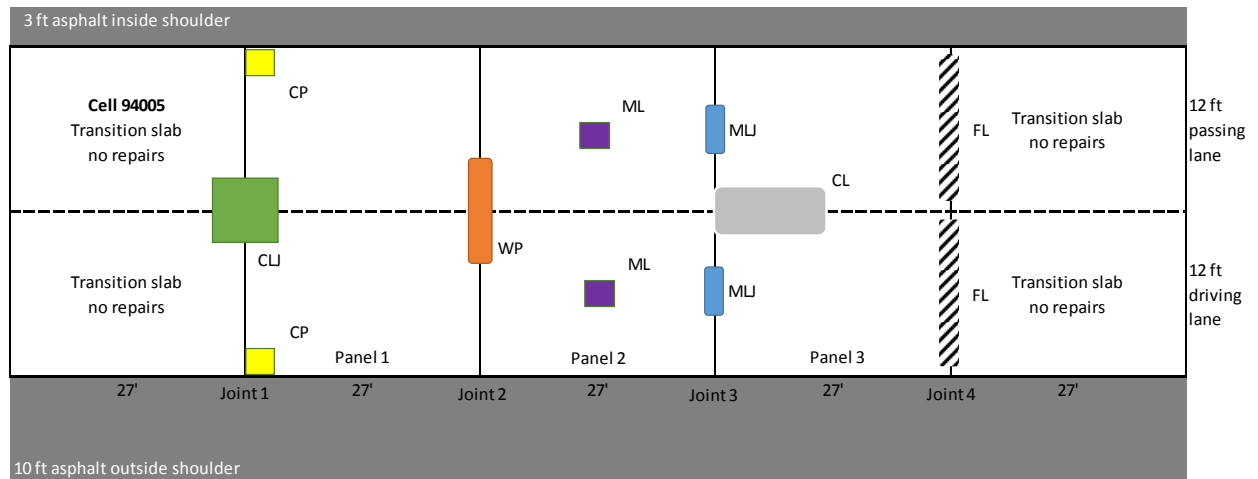


Figure 5.15 Patch layout for Cell 94005 – Willamette Valley Company, FastPatch DPR

The driving lane was sandblasted for all repairs and the passing lane was sand blasted for the CLJ and CL repairs. FastPatch is a 3-part system wholly contained in a 5-gallon bucket. Part A (11 liters) and Part B (6 liters) are packaged in separate packets inside the bucket while Part C (2.5 liters) is “loose” aggregate in the bucket. The mixing required a drill with a paddle attachment. Part A was added to Part C while mixing for 2 minutes then Part B was added while mixing for an additional 2 minutes. The material was poured from the bucket into the patch. The material is finished with traditional concrete tools. Foam board was used to re-establish the joints. Aggregate was broadcast onto the surface for added slip resistance. The patches were not pre-wetted and were not cured.

The patches in Cell 94005 had some areas of debonding during the second-year review. The patches were rated 4.



Figure 5.16 Cell 94005 – General condition, debonding (Rating – 3)

Cell 94006 – Five Star Products (2 Products)

94006 (A) Rapid Surface Repair Easy Mix

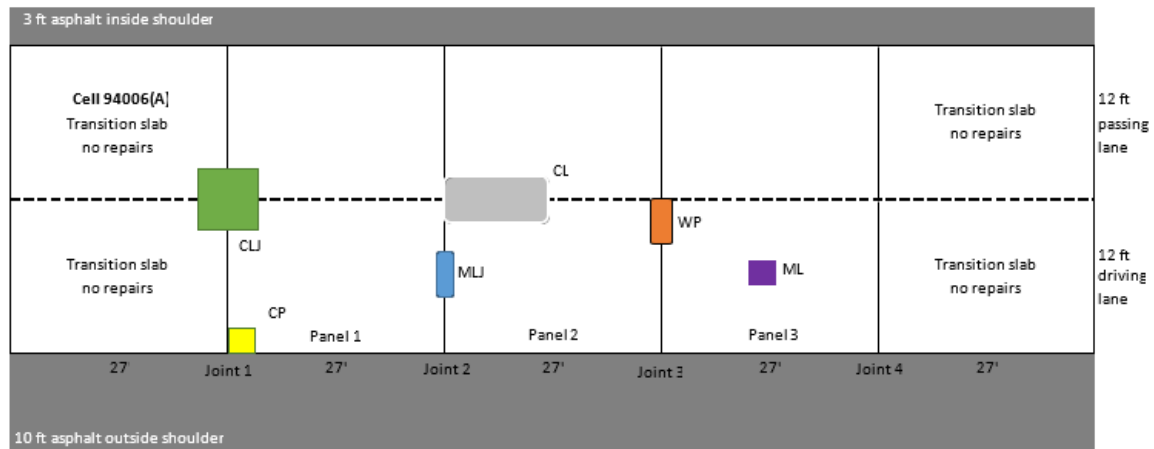


Figure 5.17 Patch Layout for Cell 94006 (A) – Five Star Products, Rapid Surface Repair Easy Mix

The driving lane was sand blasted along with the passing lane for the CL repair. Rapid Surface Repair Easy Mix is a 3-part system. Part A (1.21 liters) and Part B (1.21 liters) are poured into a 5-gallon bucket and mixed using a drill with a paddle attachment for approximately 30 seconds. Part C (50-pound aggregate bag) was added and mixed until the desired consistency was achieved. The material was poured from the bucket into the patch. The material is finished with traditional concrete tools. The patches were heated with a propane torch before placing the material. It was observed that the patches were most likely too large for this material, at least in the provided material sizes. It was difficult to place the material in more than one lift as the previous lift typically hardened before the second lift could be mixed.

The patches were generally showing cracks and debonding with some material loss. Figure 5.12 shows the general condition of the patches in Cell 94006 (A), which were given a rating of 2 or 1.



Figure 5.18 Cell 94006 (A) – General condition, cracks, debonding and loss (Rating – 2)

94006 (B) Rapid Surface Repair Epoxy Fix

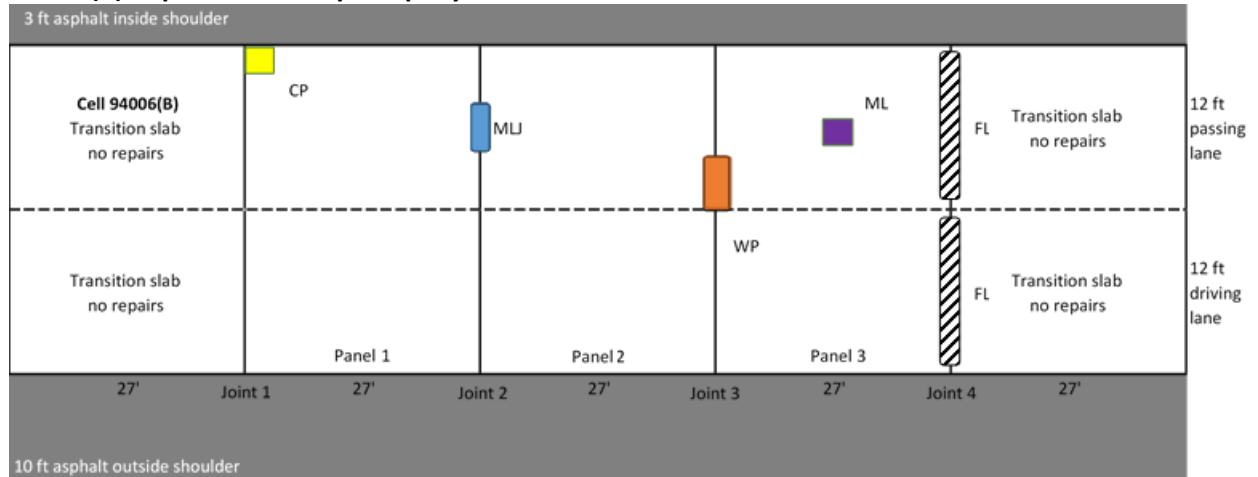


Figure 5.19 Patch Layout for Cell 94006 (B) – Five Star Products, Rapid Surface Repair Epoxy Mix

The passing lane was not sand blasted for these repairs. Rapid Surface Repair Epoxy Mix is a 3-part system. The 3/8-inch granite chips were placed into the patch. The supplier provided a dispensing system contained in a cargo van. The system mixed Part A and Part B together and dispensed the mixed product onto the granite chips. The mixture filled in the voids in the aggregate to fill the patch. The patches were heated with a propane torch before placing the material. Foam board was used to re-establish joints. Aggregate was broadcast onto the surface for added slip resistance. The patches were not cured.

Most of the patches had over 50 percent of the patches repaired with HMA or the Crafcold HP Concrete Cold Patch material. These patches have a rating of 1 or 0.



Figure 5.20 Cell 94006 (B) – General condition, over 50% repaired (Rating – 1)

Cell 94007 – TCC Materials, ProSpec Concrete Patching Mix

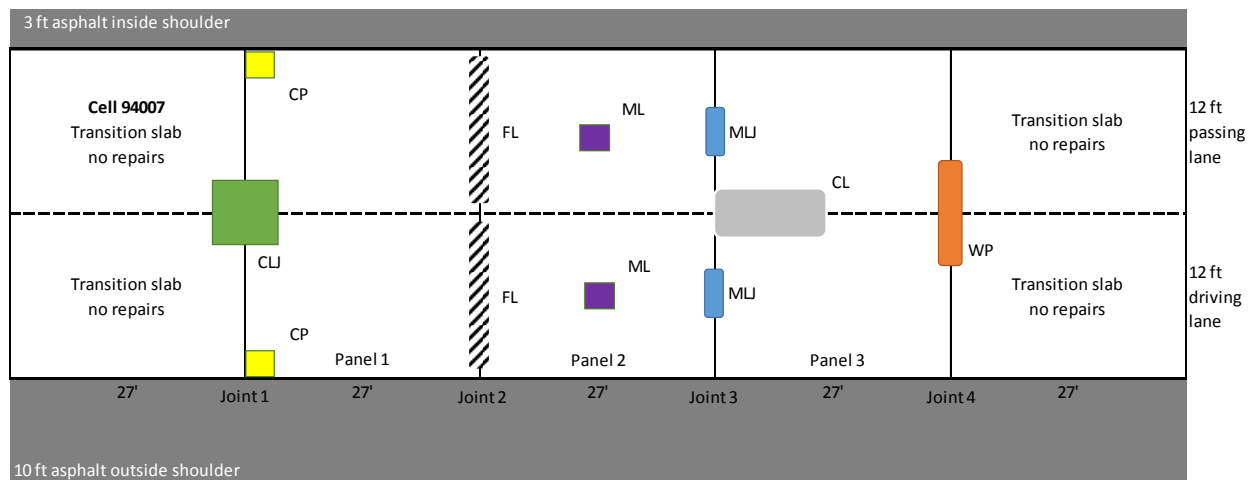


Figure 5.21 Patch Layout for Cell 94007 – TCC Materials, ProSpec Concrete Patching Mix

The driving lane was sand blasted along with the passing lane for the CLJ and CL repairs. ProSpec Concrete Patching Mix is a bagged product, 50 pounds. Approximately 3 quarts of water was added to the mixture per bag. The mixer required for this product was a paddle or mortar mixer. A revolving drum mixer was not suitable. Mixing continued for 2 to 3 minutes until the desired consistency was obtained. The mixture was then placed into a wheelbarrow and transported to the patches. The material was finished with traditional concrete tools. Foam board was used to re-establish joints. The patches were pre-wetted before placing material and curing was completed using plastic sheets.

During the second-year review, the patches in cell 94007 generally showed some debonding and missing material along the edges of the patches. The patches with missing material were given a rating of 2. The other patches each got a rating of 3.



Figure 5.22 Cell 94007 – General condition, cracks, debonding, and loss (Rating – 2)

Cell 94008 –Aqua Patch Road Materials, Aqua Patch and TCC Materials, ProSpec Concrete Patching Mix

94008 (A) – Aqua Patch Road Materials, Aqua Patch

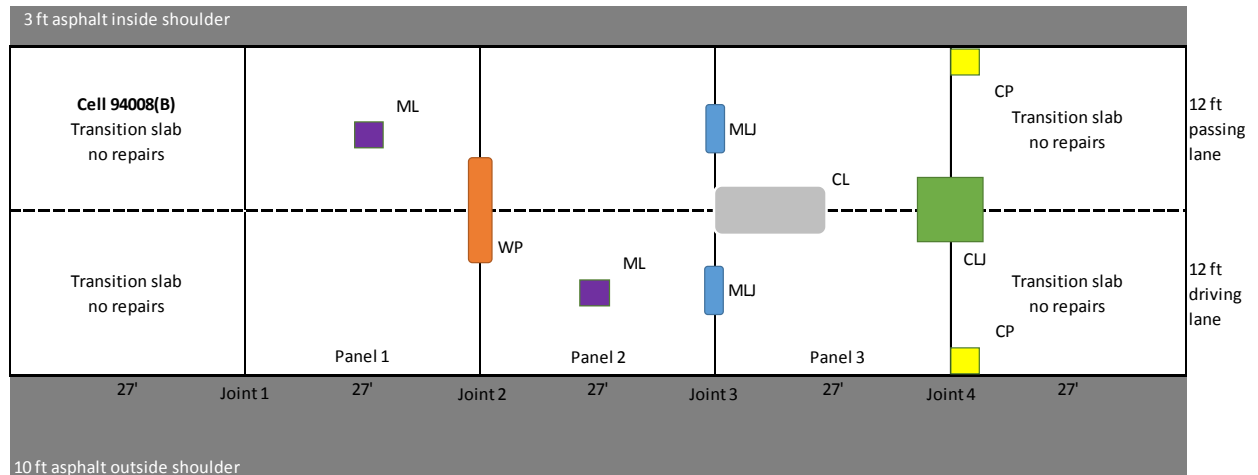


Figure 5.23 Patch Layout for Cell 94008 (A) – Aqua Patch Road Materials, Aqua Patch

The driving lane was sand blasted along with the passing lane for the CL and CLJ repairs. Aqua Patch is a bagged product, 50 pounds. There is no mixing or finishing required. The material is placed into the patch, water added, and tamped down.

The driving and passing lane ML patches are still intact, with ratings of 4. The majority of the patches are exhibiting significant material loss and were rated as 0. Aqua Patch is a material designed for patching HMA pavements. It is not recommended for patching jointed areas or where pavement is designed to move.



Figure 5.24 Cell 94008 (A) – General condition, missing/replaced material (Rating – 0)

94008 (B) – TCC Materials, ProSpec Concrete Patching Mix

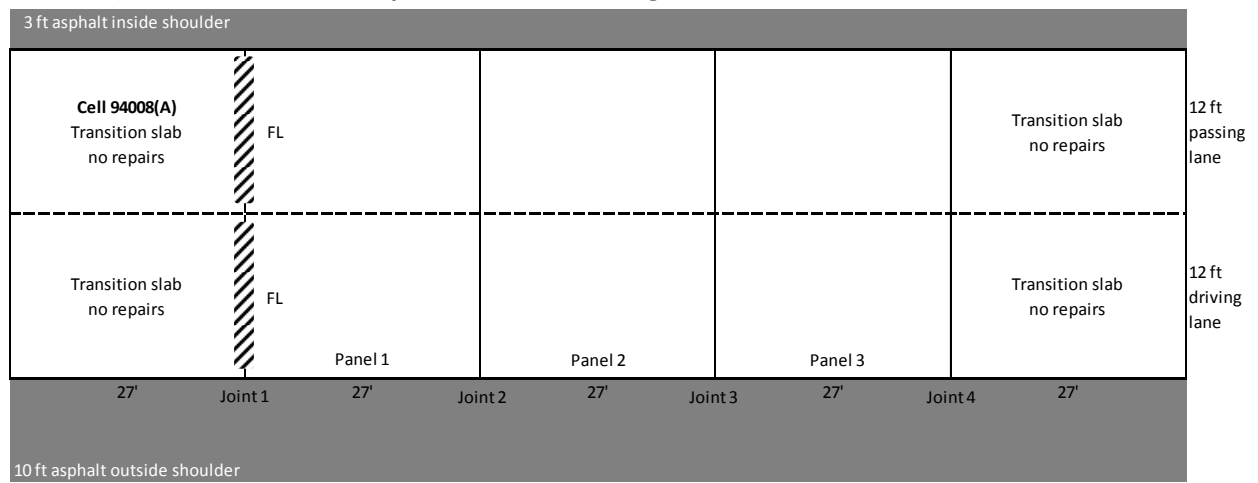


Figure 5.25 Patch Layout for Cell 94008 (B) – TCC Materials, ProSpec Concrete Patching Mix

The driving lane was sand blasted for the FL repair. The procedures for mixing and placing are the same as described for the material as used in Cell 94007.

The passing lane FL patch lost material and was rated 1. The driving lane FL was in generally good condition, with some linear cracks and given a rating of 3.



Figure 5.26 Cell 94008 (B) – General condition, cracks and missing material (Rating – 1)

Cell 94009 – Crafcro, HP Concrete Cold Patch

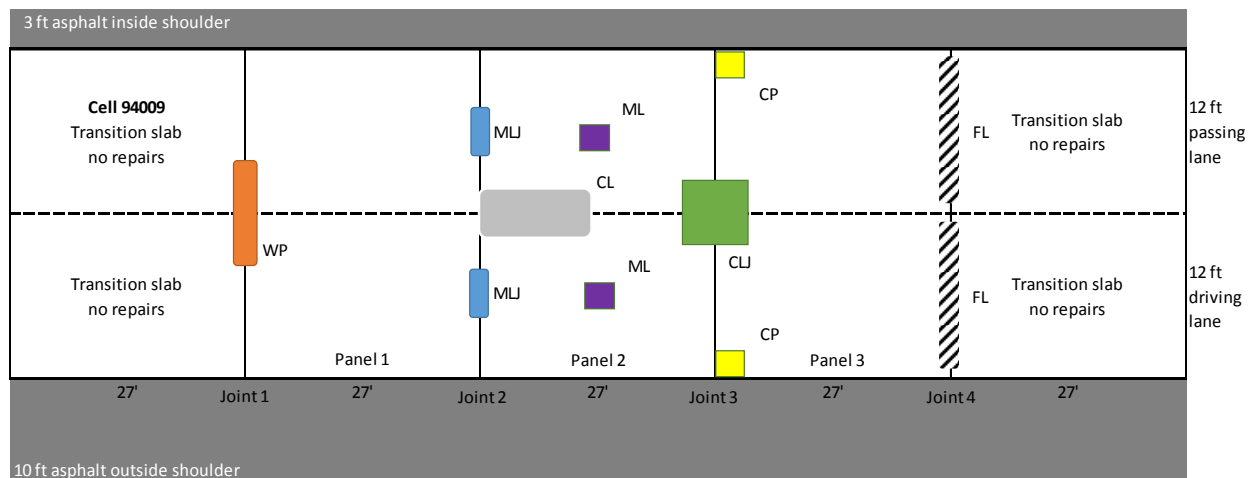


Figure 5.27 Patch Layout for Cell 94009 – Crafcro, HP Concrete Cold Patch

The driving lane was sand blasted along with the passing lane for the CL and CLJ repairs. HP Concrete Cold Patch is a bagged product, 50 pounds. The material was placed in 2-inch lifts in patches where required. Each lift was compacted via a hand tamper. The final layer was placed approximately 1/2 inch above the top of the patch and hand tamped. There is no finishing of the material required. A bond breaker or Portland cement was used on the surface. The supplier then proceeded to drive back and forth over the product for final compaction.

During the second-year review, the patches were overlaid with an HMA patch due to the patches settling. Patches that were not overlaid with HMA had some linear cracks, and are rated 3. All of the patches in Cell 94009 with HMA are rated 1.



Figure 5.28 Cell 94009 – General condition, cracking (Rating – 3)

Cell 94010 – Crafc0, Techrete-TBR

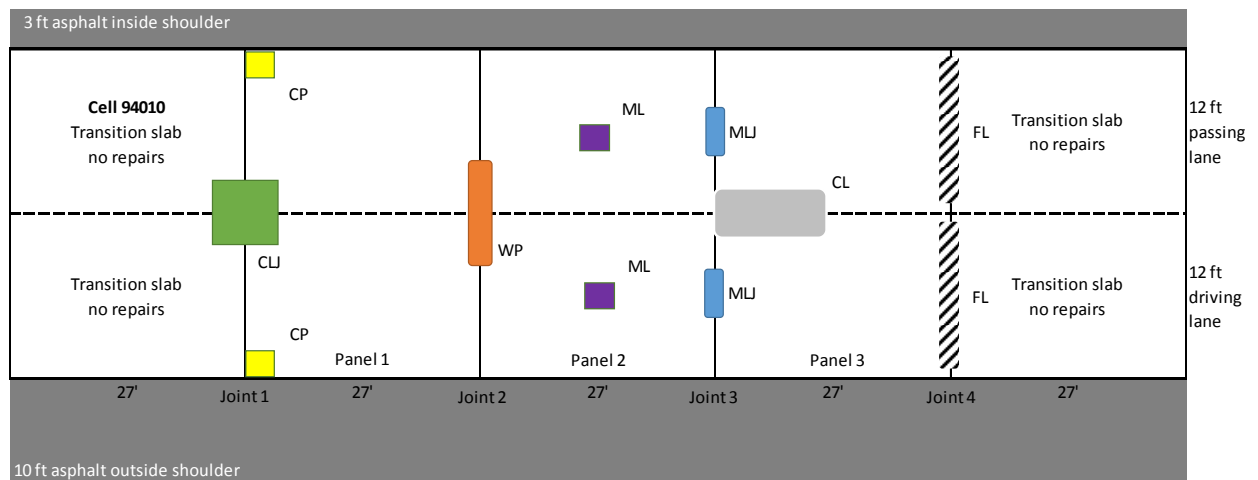


Figure 5.29 Patch Layout for Cell 94010 – Crafc0, Techrete-TBR

Sand blasting was performed for all patches in the driving lane, and the passing lane CLJ. Techrete-TBR is a hot applied flexible mastic sealant. The material is in melt-able bags weighing 35 pounds, and heated and mixed in a melter to approximately 400 degrees Fahrenheit. The melter used in this application was a Crafc0 Patcher II. It was reported that most MnDOT districts have an approved melter that can be used for the Techrete-TBR patches. The melter is placed directly over the patch and the material moves down the shoot into the patch. Although sandblasting is not required, it is preferred. A primer is applied to each distress and dried before material is placed. There is no need to re-establish joints as the material should move with the slab. For deeper patches, material can be placed in two lifts. The first layer should “set” before the second lift is placed. The edges are finished with a heated tool, similar to a float used for traditional concrete finishing. An aggregate can be broadcast onto the surface for slip resistance although none was broadcast during the placement. Once the material has cooled it can be opened to traffic.

The patches were exhibiting no signs of distress and were rated 4.



Figure 5.30 Cell 94010 – General condition, no distress (Rating – 4)

Cell 94011 – TCC Materials, 3U18 Modified

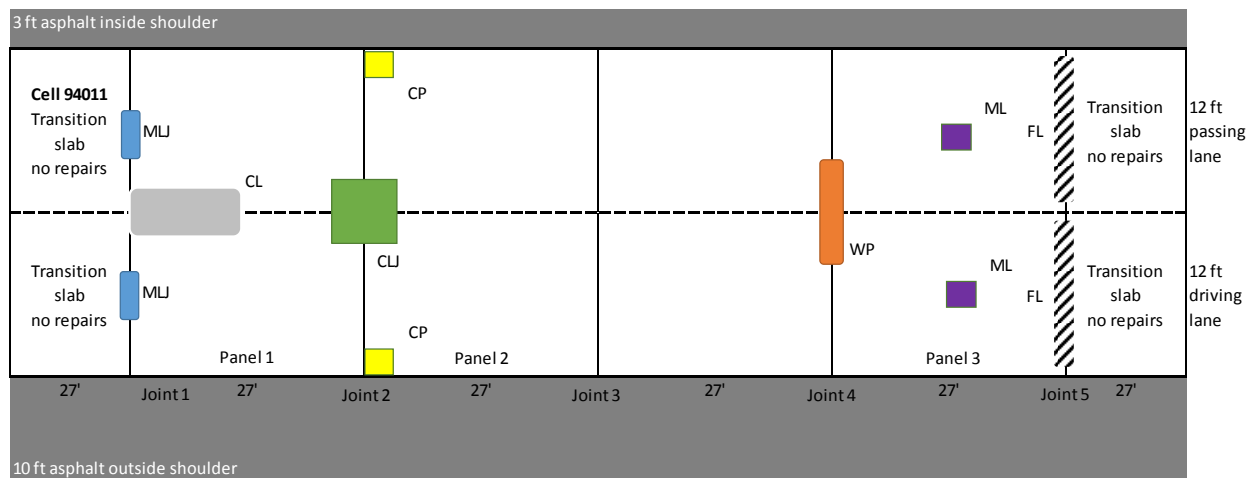


Figure 5.31 Patch Layout for Cell 94011 – TCC Materials, 3U18 Modified

The driving and passing lane were sand blasted. 3U18 Modified is a bagged product, 50-pound bags. Water was added to the product until an approximate 10-inch slump was achieved continuing the mixing for approximately 6 minutes. MnDOT also added two admixtures; one was reported to be an accelerating admixture, and the second was a water reducer. A revolving drum mixer was utilized to mix the product. The mixture was then placed into a wheelbarrow and transported to the patches. The material was finished with traditional concrete tools. The patches were saw cut to re-establish joints. The patches were pre-wetted before placing material and curing was completed using plastic sheets.

The patches were generally some shrinkage and linear cracks. Most of the patches in Cell 94011 were rated as 3 or 4.



Figure 5.32 Cell 94011 – General condition, no distress (Rating – 4)

Cell 94012 – USG Ecofix

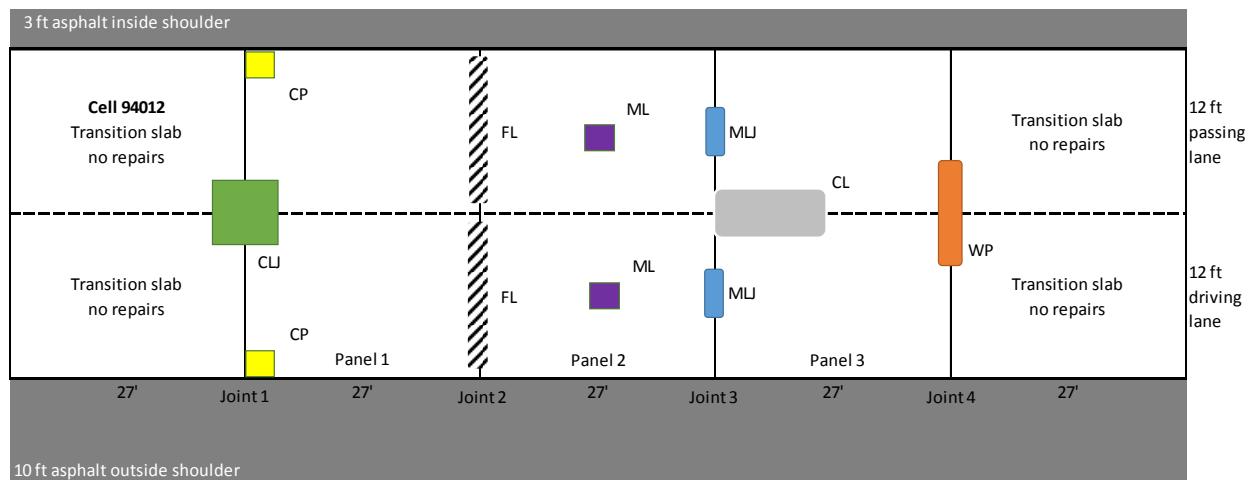


Figure 5.33 Patch Layout for Cell 94012 – USG Ecofix

The driving and passing lane were sand blasted. USG Ecofix is a bagged product, 50 pounds. Approximately 32.5 pounds of 3/8-inch granite chips and approximately 2.25 quarts of water were added per bag. The mixture was mixed in a revolving drum mixer for 2 to 3 minutes until the desired consistency was obtained. The mixture was then placed into a wheelbarrow and transported to the patches. The material was finished with traditional concrete tools. The patches were pre-wetted and saw cutting was utilized to re-establish the joints. The patches were cured with plastic sheets.

Most of the patches were showing no signs of distress or have developed minor cracks and debonding, and were rated as 3 or 4.



Figure 5.34 Cell 94012 – General condition, cracking and debonding (Rating – 3)

Cell 94013 – CTS, Rapid Set DOT Repair Mix and Helix Steel Fibers (2 fiber products)

94013 (A) – CTS, Rapid Set DOT Repair Mix and Helix 5-25-Standard BA (Zinc Coated) Fibers

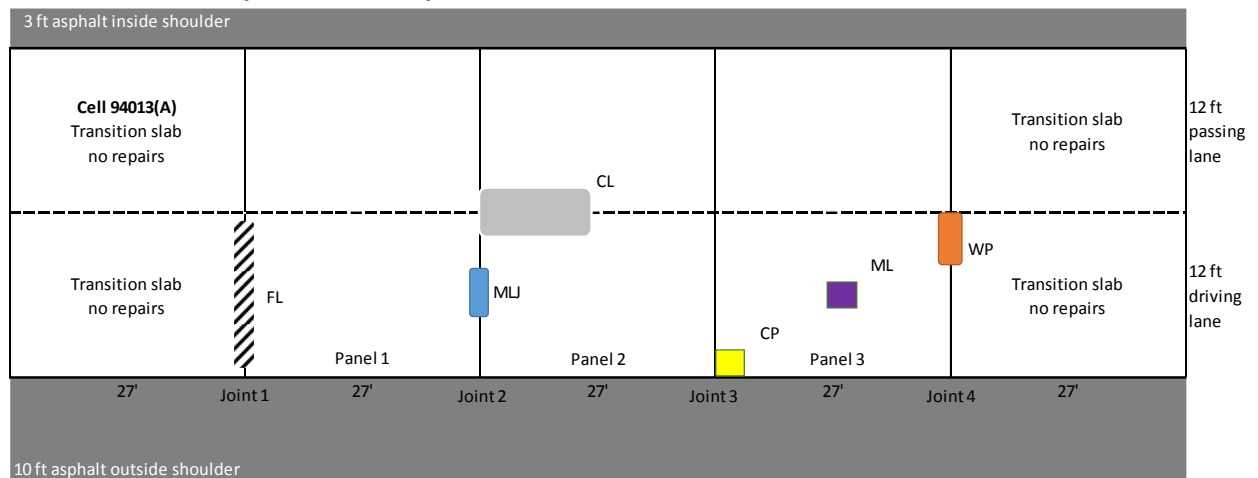


Figure 5.35 Patch Layout for Cell 94013 (A) – CTS, Rapid Set DOT Repair Mix and Helix 5-25-Standard BA (Zinc Coated) Fibers

The driving and passing lane were sand blasted. The material is a bagged product, 55 pounds, that was used in cell 94001. Approximately one 5-gallon bucket of 3/8-inch granite chips were added for each bag of material in the mixer along with approximately 5 quarts of water per bag. Helix zinc coated fibers were added to the mixture at the rate of 2 pounds per bag. The fiber was added to the granite chips and mixed before addition of the bagged product. Everything was mixed for approximately 3 minutes in a revolving drum mixer to provide the consistency desired, and then placed into a wheelbarrow and transported to the patches. The material was finished with traditional concrete tools. The distresses were pre-wetted before placing material. Foam board was used to re-establish joints and patches were cured with plastic sheeting.

Some of the patches had developed shrinkage cracks, cracks along the edge of the patch, and debonding and were rated 3. Most of the patches are in good condition and were rated 4.



Figure 5.36 Cell 94013 (A) – General condition, cracking and debonding (Rating – 3)

94013(B) - CTS, Rapid Set DOT Repair Mix and Helix 5-25-SS BA (Stainless Steel) Fibers

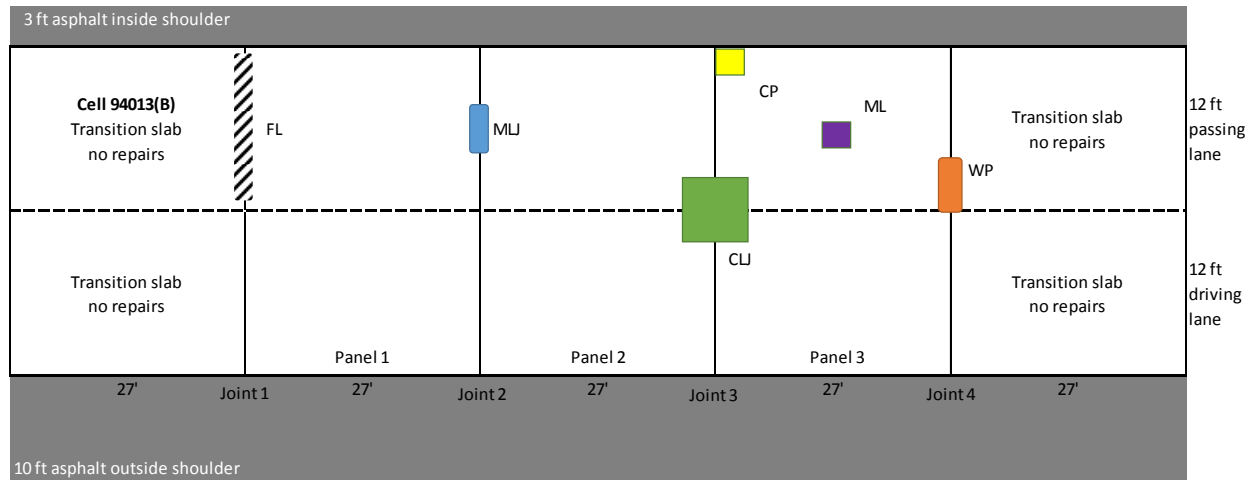


Figure 5.37 Patch Layout for Cell 94013 (B) – CTS, Rapid Set DOT Repair Mix and Helix 5-25-SS BA (Stainless Steel) Fibers

The driving and passing lane were sand blasted. The mixing procedures were the same as for Cell 94013 (A) with the difference being the utilization of stainless-steel fibers instead of zinc coated.

The patch conditions were generally similar to Cell 94013 (A) as well, with some patches having cracks and debonding, which were rated 3. Most of the patches were rated 4.



Figure 5.38 Cell 94013 (B) – General condition, cracking and debonding (Rating – 3)

Cell 94014 and 94015 – Hot Mix Asphalt

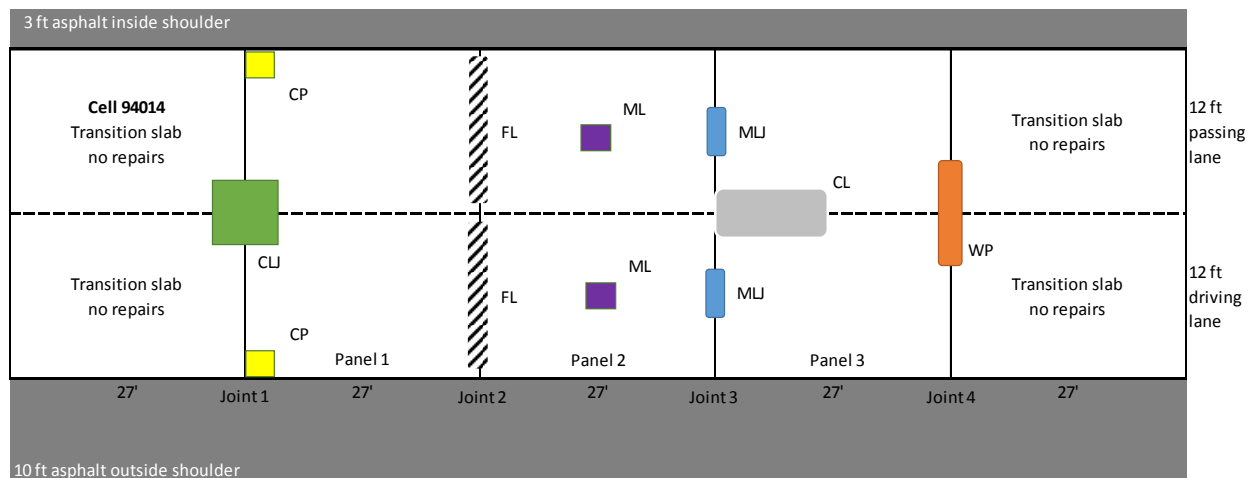


Figure 5.39 Patch Layout for Cell 94014 – Hot Mix Asphalt

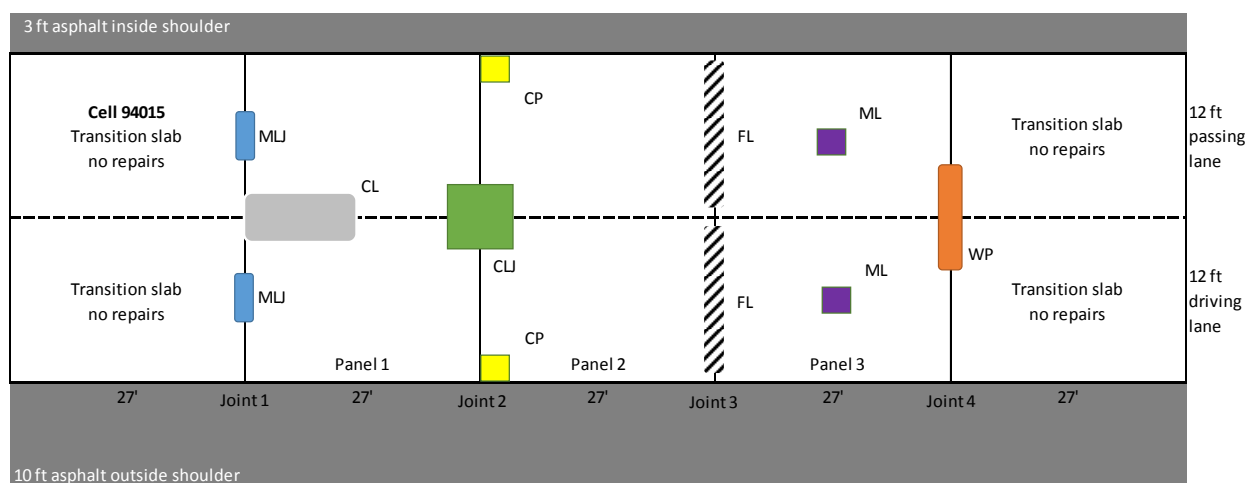


Figure 5.40 Patch Layout for Cell 94015 – Hot Mix Asphalt

The Hot Mix Asphalt was provided by District 3 and installed by MnROAD personnel. All patches were tack coated prior to mix placement. Compaction was achieved utilizing a small drum roller.

The HMA patches had cracks present and some patches had been replaced. Figure 5.35 shows the general condition of the HMA patches in cells 94014 and 94015.



Figure 5.41 Cell 94015 – General Condition for Cells 94014 and 94015 (Rating – NA)

APPENDIX A - INSTALLATION PHOTOS



Photograph: Milled Patch

Subject: General patch condition after milling



Photograph: Air Blasting

Subject: Process of air blasting removing rubble



Photograph: Air Blasted Patch

Subject: General patch condition after air blasting



Photograph #: Sand Blasting

Subject: Process of sand blasting (performed after air blasting)



Photograph: Sand Blasted Patch

Subject: General patch condition after sand blasting



Photograph: 94001 CTS, Rapid Set

Subject: Mix Consistency



Photograph: 94001 CTS, Rapid Set

Subject: Placing mixture



Photograph: 94001 CTS, Rapid Set

Subject: Weighing down foam board



Photograph: 94002 SpecChem, Repcon 928

Subject: Finished Product



Photograph: 94003 (A) Western Material and Design, FasTrac246

Subject: Mixer



Photograph: 94003 (A) Western Material and Design, FasTrac246

Subject: Inside of mixer



Photograph: 94003 (A) Western Material and Design, FasTrac246

Subject: Concrete placement



Photograph: 94003 (B) Western Material and Design, CE700 HPC

Subject: Heating materials prior to placement



Photograph: 94003 (B) Western Material and Design, CE700 HPC

Subject: Part A and Part B mixing



Photograph: 94003 (B) Western Material and Design, CE700 HPC

Subject: Material Placement



Photograph: 94004 D.S. Brown, PaveSaver Polymeric Concrete

Subject: Part A and Part B mixing



Photograph: 94004 D.S. Brown, PaveSaver Polymeric Concrete

Subject: Finishing material



Photograph: 94005 Willamette Valley Company, FastPatch

Subject: Finishing Product



Photograph: 94005 Willamette Valley Company, FastPatch

Subject: Final product (right side has aggregate broad cast)



Photograph: 94006 (A) Five Star, Rapid Surface Repair Easy Mix

Subject: First lift had set up



Photograph: 94006 (B) Five Star, Rapid Surface Repair Epoxy Fix

Subject: Dispensing material



Photograph: 94006 (B) Five Star, Rapid Surface Repair Epoxy Fix

Subject: Broad casting aggregate onto surface



Photograph: 94006 (B) Five Star, Rapid Surface Repair Epoxy Fix

Subject: Small application of previous patch



Photograph: 94007 TCC Materials, ProSpec Concrete Patch

Subject: Paddle Mixer



Photograph 94007 TCC Materials, ProSpec Concrete Patch

Subject Material being placed



Photograph: 94008 (B) Aqua Patch Road Materials, Aqua Patch

Subject: Patch Material the day after placement



Photograph: 94009 Crafco HP Concrete Cold Patch

Subject: Spreading Material



Photograph: 94009 Crafco HP Concrete Cold Patch

Subject: Patch material the day after placement (no traffic)



Photograph: 94010 Crafcro Techcrete-TBR

Subject: Crafcro Patcher (melter and mixer)



Photograph: 94010 Crafcro Techcrete-TBR

Subject: Finishing tool heater



Photograph: 94010 Crafcro Techcrete-TBR

Subject: Primed Patch



Photograph: 94010 Crafcro Techcrete-TBR

Subject: Placed patch material



Photograph: 94010 Crafcro Techcrete-TBR

Subject: Finishing patch material



Photograph: 94011 3U18M

Subject: Placing and finishing material



Photograph: 94012 USG Ecofix

Subject: Material mixing in revolving drum



Photograph: 94013 CTS, Rapid Set and Helix Fiber

Subject: Fibers and aggregate mixing



Photograph: 94013 CTS, Rapid Set and Helix Fiber

Subject: Mixing of bagged product, aggregate, and fibers



Photograph: 94013 CTS, Rapid Set and Helix Fiber

Subject: Finishing of product with steel fibers

APPENDIX B

Appendix B.1 First-Year Review Patch Conditions



Cell/Patch: 94001/CLJ
 Date: 6/20/2018
 Condition: Linear Cracks
 Rating: 3

Material: CTS, Rapid Set DOT Repair Mix



Cell/Patch: 94001/FL
 Date: 6/20/2018
 Condition: Shrinkage Cracks
 Rating: 4

Material: CTS, Rapid Set DOT Repair Mix



Cell/Patch: 94002 (A)/CLJ
 Date: 6/20/2018
 Condition: Linear Cracks
 Rating: 3

Material: SpecChem, RepCon 928



Cell/Patch: 94002 (A)/WP – driving lane
 Date: 6/20/2018
 Condition: Linear Cracks
 Rating: 3

Material: SpecChem, RepCon 928



Cell/Patch:	94006 (A)/MLJ – driving lane	Material: Rapid Surface Repair Easy Mix
Date:	6/20/2018	
Condition:	No distress	
Rating:	4	



Cell/Patch:	94006 (A)/WP – driving lane	Material: Rapid Surface Repair Easy Mix
Date:	6/20/2018	
Condition:	Missing material along edge, less than 50%	
Rating:	2	



Cell/Patch:	94006 (A)/ WP – driving lane	Material: Rapid Surface Repair Easy Mix
Date:	9/15/2018	
Condition:	About 50% of patch was repaired.	
Rating:	1	



Cell/Patch:	94006 (B)/FL – driving lane	Material: Rapid Surface Repair Epoxy Fix
Date:	9/15/2018	
Condition:	Most of patch has been repaired.	
Rating:	1	



Cell/Patch:	94006 (B)/FL – passing lane	Material: Rapid Surface Repair Epoxy Fix
Date:	9/15/2018	
Condition:	No distress	
Rating:	4	



Cell/Patch:	94006 (B)/MLJ – passing lane	Material: Rapid Surface Repair Epoxy Fix
Date:	9/15/2018	
Condition:	50% of the patch is gone, needs repair	
Rating:	1	



Cell/Patch:	94006 (B)/WP	Material: Rapid Surface Repair Epoxy Fix
Date:	9/15/2018	
Condition:	No distress	
Rating:	4	



Cell/Patch:	94007/CLJ	Material: TCC Materials, ProSpec
Date:	6/20/2018	Concrete Patching Mix
Condition:	No distress	
Rating:	4	



Cell/Patch:	94007/FL – passing lane	Material: TCC Materials, ProSpec
Date:	6/20/2018	Concrete Patching Mix
Condition:	Less than 50% of material missing, needs repair	
Rating:	2	



Cell/Patch:	94007/FL – passing lane	Material: TCC Materials, ProSpec
Date:	9/15/2018	Concrete Patching Mix
Condition:	Less than 50% of patch repaired	
Rating:	2	



Cell/Patch:	94007/ML	Material: TCC Materials, ProSpec
Date:	6/20/2019	Concrete Patching Mix
Condition:	Less than 50% of material missing, needs repair	
Rating:	2	



Cell/Patch:	94007/MLJ	Material: TCC Materials, ProSpec
Date:	9/15/2018	Concrete Patching Mix
Condition:	Less than 50% of material missing, needs repair	
Rating:	2	



Cell/Patch:	94007/WP	Material: TCC Materials, ProSpec
Date:	6/20/2018	Concrete Patching Mix
Condition:	Less than 50% of material missing, needs repair	
Rating:	2	



Cell/Patch:	94007/WP	Material: TCC Materials, ProSpec
Date:	9/15/2018	Concrete Patching Mix
Condition:	Less than 50% of patch repaired	
Rating:	2	



Cell/Patch:	94008 (A)/ML – passing lane	Material: Aqua Patch Road Materials,
Date:	6/20/2018	Aqua Patch
Condition:	No distress	
Rating:	4	



Cell/Patch:	94008 (A)/MLJ – passing lane, CL, and MLJ – driving lane	Material: Aqua Patch Road Materials,
Date:	6/20/2018	Aqua Patch
Condition:	Linear cracks along joints, some edge material missing (less than 50%)	
Rating:	2	



Cell/Patch:	94008 (A)/MLJ – passing lane	Material: Aqua Patch Road Materials,
Date:	9/15/2018	Aqua Patch
Condition:	Over 50% of patch repaired, original material still in place	
Rating:	1	



Cell/Patch:	94008 (A)/MLJ – driving lane	Material: Aqua Patch Road Materials,
Date:	9/15/2018	Aqua Patch
Condition:	Linear cracks and missing material (less than 50%)	
Rating:	2	



Cell/Patch:	94008 (A)/CP – driving lane	Material: Aqua Patch Road Materials,
Date:	9/15/2018	Aqua Patch
Condition:	Over 50% of patch repaired, original material still in place	
Rating:	1	



Cell/Patch:	94008 (A)/WP	Material: Aqua Patch Road Materials,
Date:	6/20/2018	Aqua Patch
Condition:	Linear cracks and missing material along edges (less than 50%)	
Rating:	2	



Cell/Patch:	94008 (A)/WP	Material: Aqua Patch Road Materials,
Date:	9/15/2018	Aqua Patch
Condition:	Linear cracks and missing material along edges (less than 50%)	
Rating:	2	



Cell/Patch:	94008 (B)/FL – passing lane	Material: TCC Materials, ProSpec
Date:	9/15/2018	Concrete Patching Mix
Condition:	Less than 50% of patch repaired	
Rating:	2	



Cell/Patch:	94009/FL – both lanes	Material: Crafcu, HP Concrete Cold Patch
Date:	9/15/2018	
Condition:	No distress, layer of material added to driving lane FL due to depression	
Rating:	4	



Cell/Patch:	94010/CLJ	Material: Crafcu, Techrete-TBR
Date:	6/20/2018	
Condition:	No distress	
Rating:	4	



Cell/Patch: 94010/WP
 Date: 6/20/2018
 Condition: No distress
 Rating: 4

Material: Crafcro, Techrete-TBR



Cell/Patch: 94011/CLJ
 Date: 6/20/2018
 Condition: No distress
 Rating: 4

Material: TCC Materials, 3U18 Modified



Cell/Patch:	94011/WP	Material: TCC Materials, 3U18 Modified
Date:	6/20/2018	
Condition:	No distress, shrinkage cracks developing	
Rating:	4	



Cell/Patch:	94012/CLJ	Material: USG Ecofix
Date:	6/20/2018	
Condition:	Corner break and cracks	
Rating:	3	



Cell/Patch: 94013 (A)/WP
 Date: 6/20/2018
 Condition: Crack along edge of patch
 Rating: 3

Material: CTS, Rapid Set DOT Repair Mix
 and Helix 5-25-Standard BA (Zinc Coated)
 Fibers



Cell/Patch: 94013 (B)/CLJ
 Date: 6/20/2018
 Condition: Crack near edge of patch
 Rating: 3

Material: CTS, Rapid Set DOT Repair Mix
 and Helix 5-25-SS BA (Stainless Steel)
 Fibers



Cell/Patch:	94014/WP	Material: Hot Mix Asphalt
Date:	6/20/2018	
Condition:	Edge cracks and some missing material at edges	
Rating:	NA/Not failed	



Cell/Patch:	94015/CLJ	Material: Hot Mix Asphalt
Date:	6/20/2018	
Condition:	Linear cracks at joints	
Rating:	NA/Not failed	



Cell/Patch: 94015/MLJ
Date: 6/20/2018
Condition: Linear cracks
Rating: NA/Not failed

Material: Hot Mix Asphalt

APPENDIX B

Appendix B.2 Second-Year Review Patch Conditions



Cell/Patch:	94001/FL – driving lane	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks and linear cracks	
Rating:	3	



Cell/Patch:	94001/FL – passing lane	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



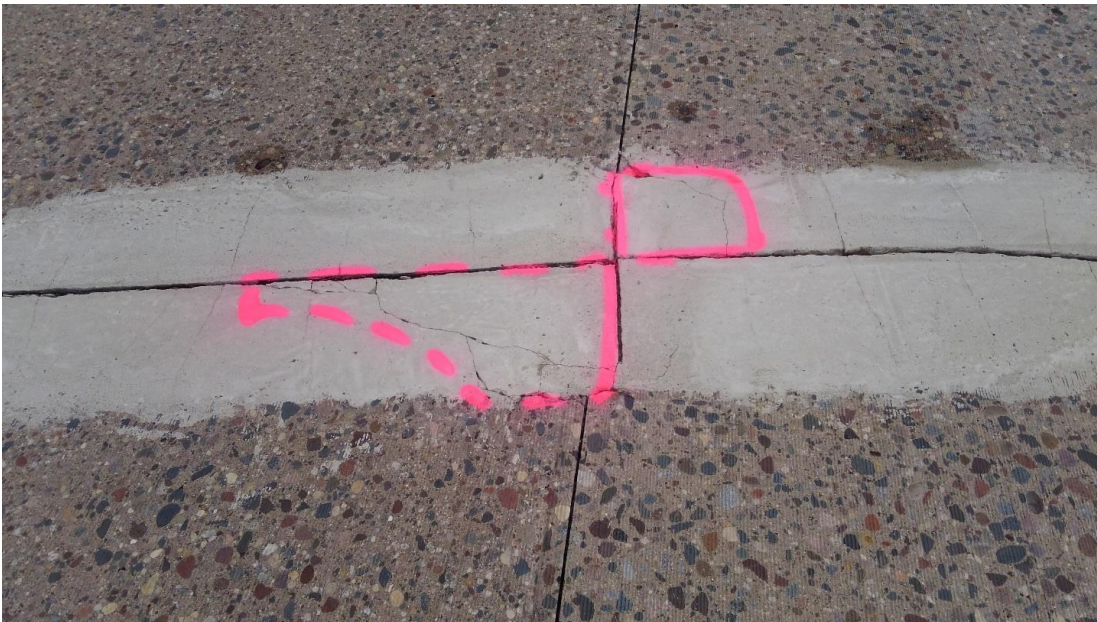
Cell/Patch:	94001/MLJ – driving lane	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94001/MLJ – passing lane	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94001/CL	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



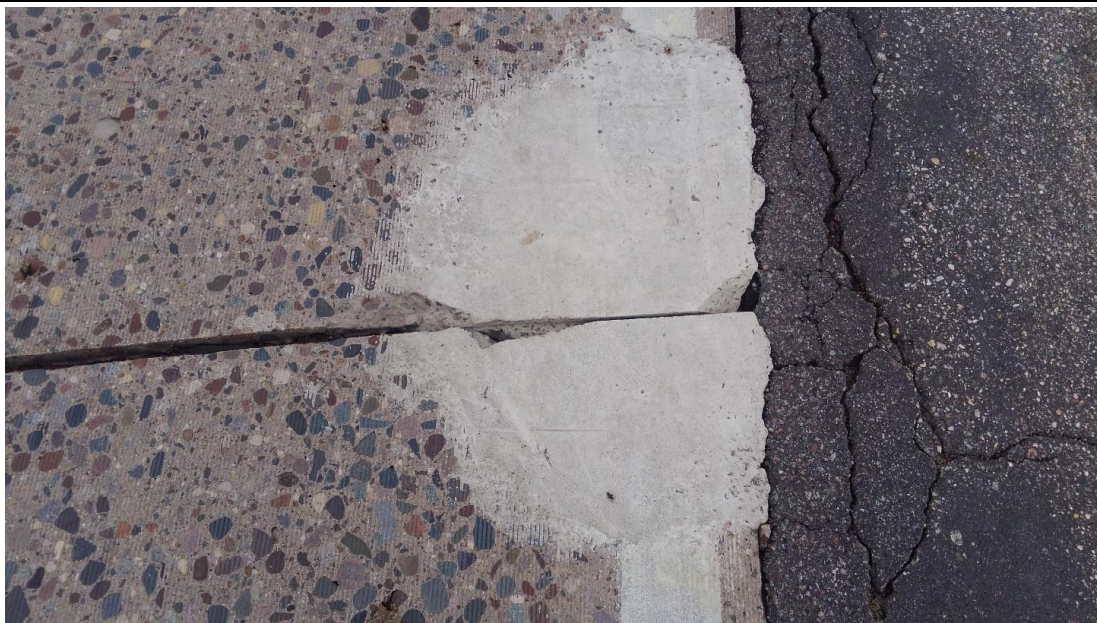
Cell/Patch:	94001/WP	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks and linear cracks, debonding	
Rating:	3	



Cell/Patch:	94001/ML – driving lane	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94001/ML – passing lane	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



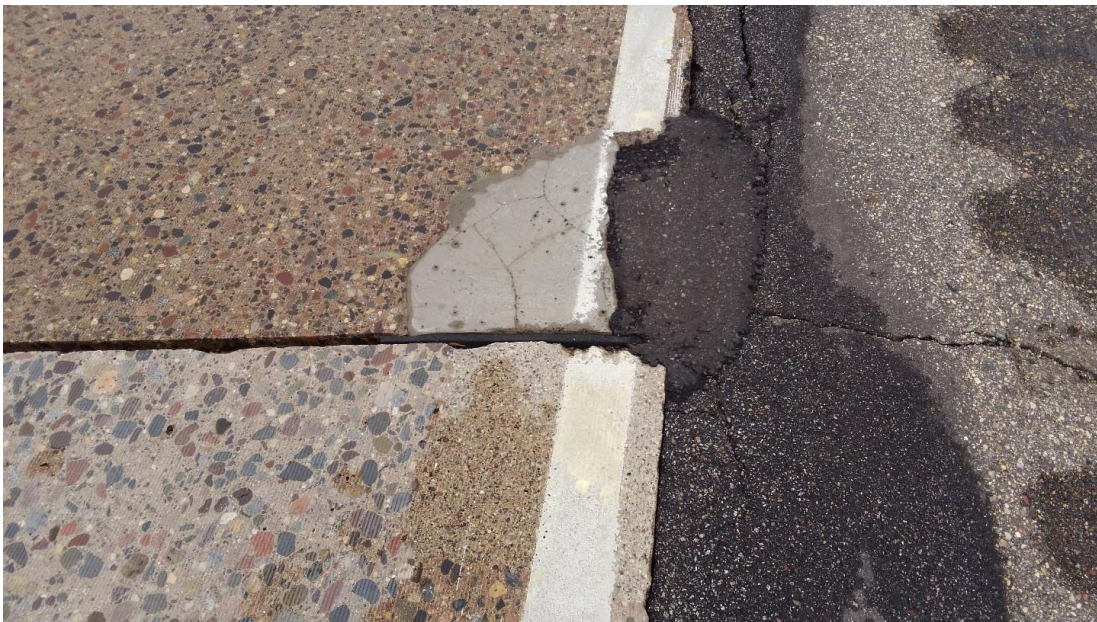
Cell/Patch:	94001/CP – driving lane	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94001/CP – passing lane	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	No distress	
Rating:	4	



Cell/Patch:	94001/CLJ	Material: CTS, Rapid Set DOT Repair Mix
Date:	09/27/2019	
Condition:	Linear cracks, debonding	
Rating:	3	

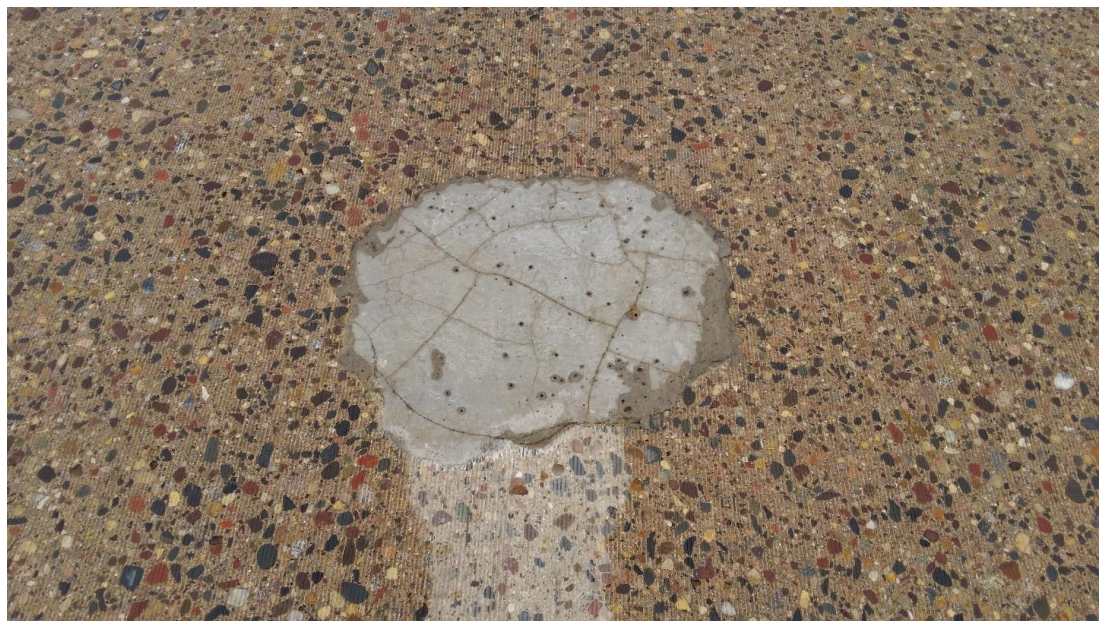


Cell/Patch:	94002(A)/CP – driving lane	Material: SpecChem RepCon 928
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	3	



Cell/Patch: 94002(A)/CLJ
 Date: 09/27/2019
 Condition: Linear cracks
 Rating: 3

Material: SpecChem RepCon 928



Cell/Patch: 94002(A)/ML – driving lane
 Date: 09/27/2019
 Condition: Linear cracks
 Rating: 3

Material: SpecChem RepCon 928



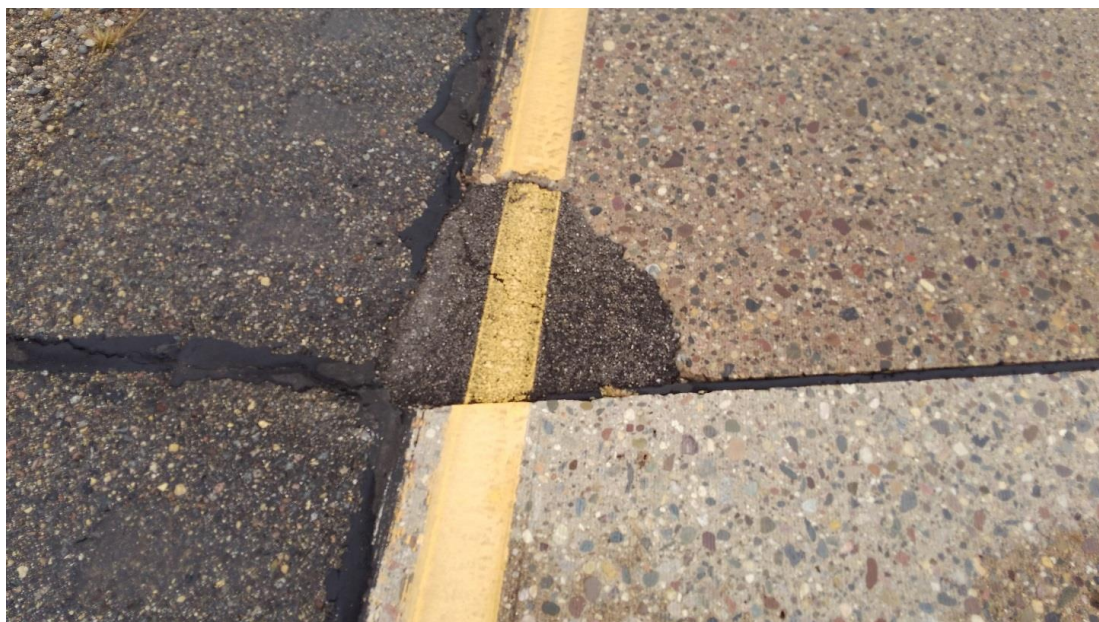
Cell/Patch:	94002(A)/WP – driving lane	Material: SpecChem RepCon 928
Date:	09/27/2019	
Condition:	Over 50% of original patch has been repaired	
Rating:	1	



Cell/Patch:	94002(A)/MLJ – driving lane	Material: SpecChem RepCon 928
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	3	



Cell/Patch:	94002(A)/CL	Material: SpecChem RepCon 928
Date:	09/27/2019	
Condition:	Linear cracks, less than 50% of patch has been repaired, debonding	
Rating:	2	



Cell/Patch:	94002(B)/CP – passing lane	Material: Hot Mix Asphalt
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	NA	



Cell/Patch: 94002(B)/ML – passing lane
 Date: 09/27/2019
 Condition: No distress
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94002(B)/WP – passing lane
 Date: 09/27/2019
 Condition: Linear cracks
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94002(B)/MLJ – passing lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA



Cell/Patch: 94002(B)/FL – driving lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks, less than 50% of patch repaired

Rating: NA



Cell/Patch:	94002(B)/FL – passing lane	Material: Hot Mix Asphalt
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	NA	



Cell/Patch:	94003(A)/MLJ – driving lane	Material: Western Material and Design FasTrac 246
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94003(A)/CL	Material: Western Material and Design
Date:	09/27/2019	FasTrac 246
Condition:	Linear cracks, debonding	
Rating:	3	

No photo

Cell/Patch:	94003(A)/CP – driving lane	Material: Western Material and Design
Date:	09/27/2019	FasTrac 246
Condition:		
Rating:		



Cell/Patch:	94003(A)/CLJ	Material: Western Material and Design
Date:	09/27/2019	FasTrac 246
Condition:	Shrinkage cracks, debonding	
Rating:	3	



Cell/Patch:	94003(A)/ML – driving lane	Material: Western Material and Design
Date:	09/27/2019	FasTrac 246
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94003(A)/FL – driving lane	Material: Western Material and Design
Date:	09/27/2019	FasTrac 246
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch:	94003(B)/MLJ – passing lane	Material: Western Material and Design
Date:	09/27/2019	CE700 HPC
Condition:	No distress	
Rating:	4	

No photo

Cell/Patch:	94003(B)/CP – passing lane	Material: Western Material and Design
Date:	09/27/2019	CE700 HPC
Condition:		
Rating:		



Cell/Patch:	94003(B)/ML – passing lane	Material: Western Material and Design
Date:	09/27/2019	CE700 HPC
Condition:	No distress	
Rating:	4	



Cell/Patch:	94003(B)/FL – passing lane	Material: Western Material and Design
Date:	09/27/2019	CE700 HPC
Condition:	No distress	
Rating:	4	



Cell/Patch:	94003(B)/WP	Material: Western Material and Design
Date:	09/27/2019	CE700 HPC
Condition:	No distress	
Rating:	4	



Cell/Patch:	94004(A)/CP – driving lane	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	No distress	
Rating:	4	



Cell/Patch:	94004(A)/CP – passing lane	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	Debonding	
Rating:	3	



Cell/Patch:	94004(A)/CLJ	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	Linear cracks at joint	
Rating:	3	



Cell/Patch:	94004(A)/MLJ – driving lane	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	No distress	
Rating:	4	



Cell/Patch:	94004(A)/MLJ – passing lane	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	Debonding	
Rating:	3	



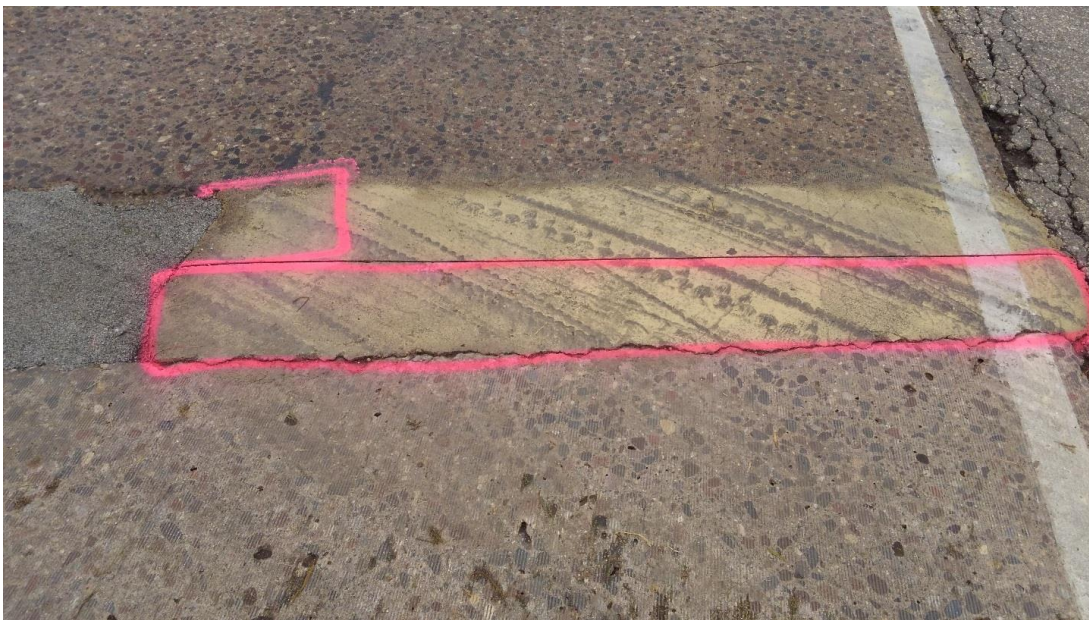
Cell/Patch:	94004(A)/CL	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	No distress	
Rating:	4	



Cell/Patch:	94004(A)/ML – driving lane	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	No distress	
Rating:	4	



Cell/Patch:	94004(A)/ML – passing lane	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	No distress	
Rating:	4	



Cell/Patch:	94004(A)/FL – half of driving lane	Material: D.S. Brown PaveSaver Polymeric
Date:	09/27/2019	Concrete Patch
Condition:	Shrinkage cracks, debonding	
Rating:	3	



Cell/Patch:	94004(B)/WP	Material: Crafc HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Linear cracks, patch depressed	
Rating:	3	

No photo

Cell/Patch:	94004(B)/FL – half of driving lane	Material: Crafc HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Linear cracks, patch depressed	
Rating:	3	



Cell/Patch:	94004(B)/FL – passing lane	Material: Crafc0 HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Linear cracks, depressed	
Rating:	3	



Cell/Patch:	94005/CP – driving lane	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch:	94005/CP – passing lane	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	No distress	
Rating:	4	



Cell/Patch:	94005/CLJ	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	No distress	
Rating:	4	



Cell/Patch:	94005/WP	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch:	94005/ML – driving lane	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	No distress	
Rating:	4	



Cell/Patch:	94005/ML – passing lane	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94005/MLJ – driving lane	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch: 94005/MLJ – passing lane
 Date: 09/27/2019
 Condition: Linear cracks, debonding
 Rating: 3

Material: Willamette Valley Company
 FastPatch DPR

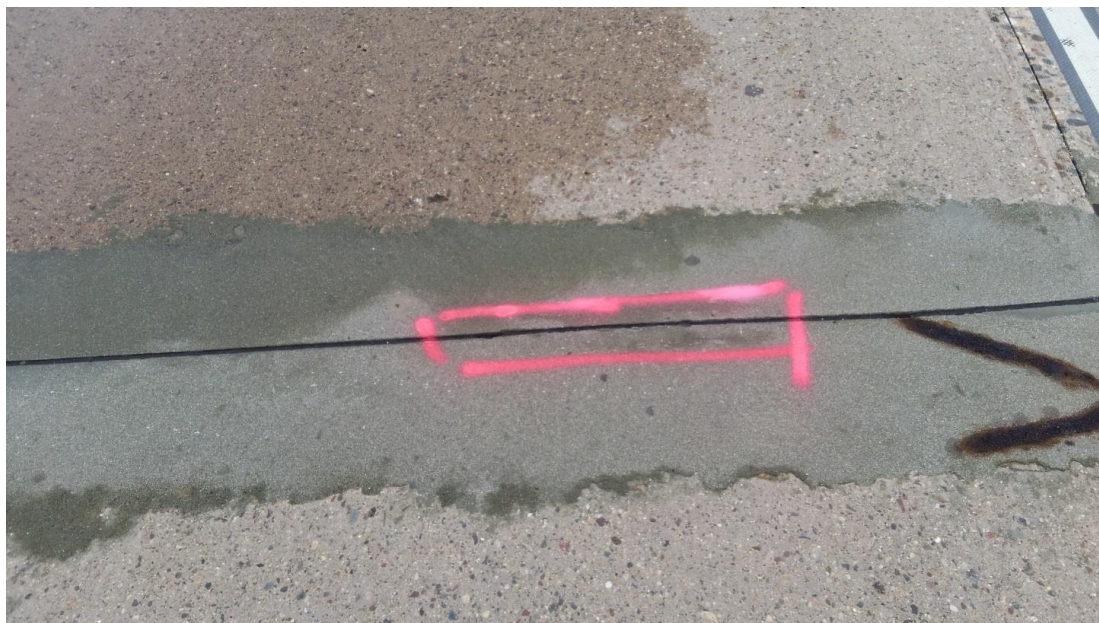


Cell/Patch: 94005/CL
 Date: 09/27/2019
 Condition: Debonding
 Rating: 3

Material: Willamette Valley Company
 FastPatch DPR



Cell/Patch:	94005/FL – driving lane	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch:	94005/FL – passing lane	Material: Willamette Valley Company
Date:	09/27/2019	FastPatch DPR
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch:	94006(A)/CP – driving lane	Material: Five Star Products Rapid Surface
Date:	09/27/2019	Repair Easy Mix
Condition:	Linear crack, debonding	
Rating:	3	



Cell/Patch:	94006(A)/CLJ	Material: Five Star Products Rapid Surface
Date:	09/27/2019	Repair Easy Mix
Condition:	Over 50% of patch repaired, debonding	
Rating:	1	



Cell/Patch:	94006(A)/MLJ – driving lane	Material: Five Star Products Rapid Surface
Date:	09/27/2019	Repair Easy Mix
Condition:	Linear cracks, less than 50% of patch repaired, debonding	
Rating:	2	



Cell/Patch:	94006(A)/CL	Material: Five Star Products Rapid Surface
Date:	09/27/2019	Repair Easy Mix
Condition:	Shrinkage cracks, debonding	
Rating:	3	



Cell/Patch:	94006(A)/WP – driving lane	Material: Five Star Products Rapid Surface
Date:	09/27/2019	Repair Easy Mix
Condition:	Over 50% of patch is repaired, but original material still in place	
Rating:	1	



Cell/Patch:	94006(A)/ML – driving lane	Material: Five Star Products Rapid Surface
Date:	09/27/2019	Repair Easy Mix
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch:	94006(B)/CP – passing lane	Material: Five Star Products Rapid Surface
Date:	09/27/2019	Repair Epoxy Fix
Condition:	Linear cracks	
Rating:	3	



Cell/Patch:	94006(B)/MLJ – passing lane	Material: Five Star Products Rapid Surface
Date:	09/27/2019	Repair Epoxy Fix
Condition:	Patch failed, 100% replaced	
Rating:	0	



Cell/Patch: 94006(B)/WP – passing lane
 Date: 09/27/2019
 Condition: Patch failed, 100% replaced
 Rating: 0

Material: Five Star Products Rapid Surface
 Repair Epoxy Fix



Cell/Patch: 94006(B)/ML – passing lane
 Date: 09/27/2019
 Condition: Patch failed, 100% replaced
 Rating: 0

Material: Five Star Products Rapid Surface
 Repair Epoxy Fix



Cell/Patch: 94006(B)/FL – driving lane
 Date: 09/27/2019
 Condition: Patch failed, 100% replaced
 Rating:

Material: Five Star Products Rapid Surface
 Repair Epoxy Fix

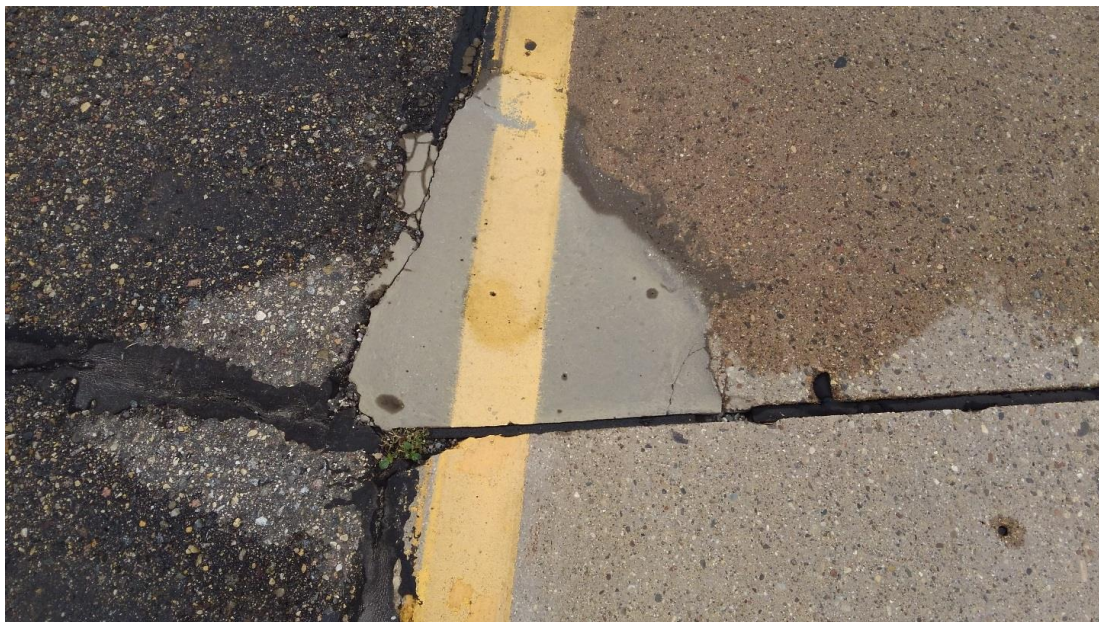


Cell/Patch: 94006(B)/FL – passing lane
 Date: 09/27/2019
 Condition: Patch failed, 100% replaced
 Rating: 0

Material: Five Star Products Rapid Surface
 Repair Epoxy Fix



Cell/Patch:	94007/CP – driving lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	No distress	
Rating:	4	



Cell/Patch:	94007/CP – passing lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Linear cracks	
Rating:	3	



Cell/Patch:	94007/CLJ	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Shrinkage cracks, debonding	
Rating:	3	



Cell/Patch:	94007/FL – driving lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94007/FL – passing lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Linear cracks, over 50% of patch repaired, debonding	
Rating:	1	



Cell/Patch: 94007/ML – driving lane

Material: TCC Materials ProSpec Concrete
Patching Mix

Date: 09/27/2019

Condition: Patch failed, 100% of original patch replaced

Rating: 0



Cell/Patch:	94007/ML – passing lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Debonding	
Rating:	3	



Cell/Patch:	94007/MLJ – driving lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Linear cracks	
Rating:	3	



Cell/Patch:	94007/MLJ – passing lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Linear cracks, less than 50% of patch repaired, debonding	
Rating:	2	



Cell/Patch:	94007/CL	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Shrinkage cracks, debonding	
Rating:	3	



Cell/Patch:	94007/WP	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Linear cracks, less than 50% of patch repaired, debonding	
Rating:	2	



Cell/Patch:	94008(A)/ML – driving lane	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Less than 50% of material loss along edges	
Rating:	2	



Cell/Patch:	94008(A)/ML – passing lane	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Less than 50% of material loss along edges	
Rating:	2	



Cell/Patch:	94008(A)/WP	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Patch failed, 100% of original material replaced	
Rating:	0	



Cell/Patch:	94008(A)/MLJ – driving lane	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Patch failed, 100% of original patch replaced	
Rating:	0	



Cell/Patch:	94008(A)/MLJ – passing lane	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Over 50% of patch has been repaired, some original material is still in place	
Rating:	1	



Cell/Patch:	94008(A)/CL	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Patch failed, 100% of original patch replaced	
Rating:	0	



Cell/Patch:	94008(A)/CP – driving lane	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Over 50% of patch has been repaired, some original material is still in place	
Rating:	1	



Cell/Patch:	94008(A)/CP – passing lane	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Linear cracks, less than 50% missing material	
Rating:	2	



Cell/Patch:	94008(A)/CLJ	Material: Aqua Patch Road Materials
Date:	09/27/2019	Aqua Patch
Condition:	Patch failed, 100% of original patch replaced	
Rating:	0	



Cell/Patch:	94008(B)/FL – driving lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Shrinkage cracks and linear cracks	
Rating:	3	



Cell/Patch:	94008(B)/FL – passing lane	Material: TCC Materials ProSpec Concrete
Date:	09/27/2019	Patching Mix
Condition:	Linear cracks, over 50% of original patch is gone/repared, debonding	
Rating:	1	



Cell/Patch:	94009/WP	Material: Crafc HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Over 50% of the patch has been repaired, original patch material is still in place	
Rating:	1	



Cell/Patch:	94009/MLJ – driving lane	Material: Crafc HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Over 50% of the patch has been repaired, original patch material is still in place	
Rating:	1	



Cell/Patch:	94009/MLJ – passing lane	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Over 50% of the patch has been repaired, original patch material is still in place	
Rating:	1	



Cell/Patch:	94009/CL	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Over 50% of the patch has been repaired, original patch material is still in place	
Rating:	1	



Cell/Patch:	94009/ML – driving lane	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	No distress	
Rating:	4	



Cell/Patch:	94009/ML – passing lane	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	No distress	
Rating:	4	



Cell/Patch:	94009/CP – driving lane	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	3	



Cell/Patch:	94009/CP – passing lane	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Over 50% of the patch has been repaired, original patch material is still in place	
Rating:	1	



Cell/Patch:	94009/CLJ	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	3	



Cell/Patch:	94009/FL – driving lane	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	3	



Cell/Patch:	94009/FL – passing lane	Material: Crafco HP Concrete Cold Patch
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	3	



Cell/Patch:	94010/CP – driving lane	Material: Crafco Techrete-TBR
Date:	09/27/2019	
Condition:	No distress	
Rating:	4	



Cell/Patch: 94010/CP – passing lane
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: Crafcotechrete-TBR



Cell/Patch: 94010/CLJ
 Date: 09/27/2019
 Condition: Shrinkage cracks
 Rating: 4

Material: Crafcotechrete-TBR



Cell/Patch: 94010/WP
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: Crafcotechrete-TBR



Cell/Patch: 94010/ML – driving lane
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: Crafcotechrete-TBR



Cell/Patch: 94010/ML – passing lane
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: Crafcotechrete-TBR



Cell/Patch: 94010/MLJ – driving lane
 Date: 09/27/2019
 Condition: Debonding
 Rating: 3

Material: Crafcotechrete-TBR



Cell/Patch: 94010/MLJ – passing lane
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: Crafcotechrete-TBR



Cell/Patch: 94010/CL
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: Crafcotechrete-TBR



Cell/Patch: 94010/FL – driving lane
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: Crafco Techrete-TBR



Cell/Patch: 94010/FL – passing lane
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: Crafco Techrete-TBR



Cell/Patch:	94011/MLJ – driving lane	Material: TCC Materials 3U18 Modified
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94011/MLJ – passing lane	Material: TCC Materials 3U18 Modified
Date:	09/27/2019	
Condition:	No distress	
Rating:	4	



Cell/Patch: 94011/CL
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: TCC Materials 3U18 Modified

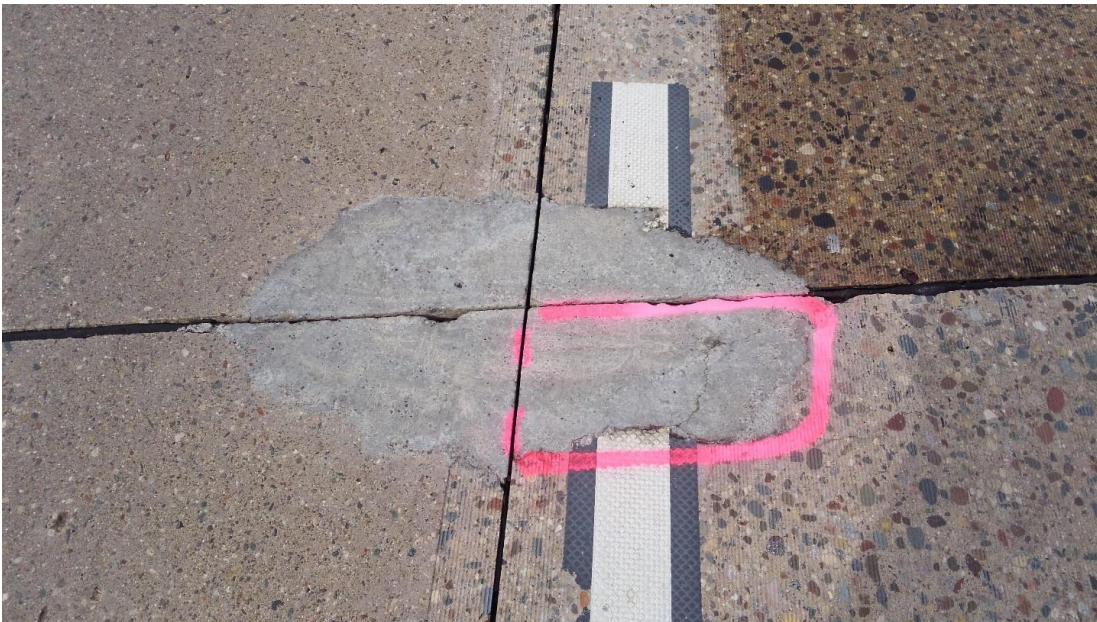


Cell/Patch: 94011/CP – driving lane
 Date: 09/27/2019
 Condition: Linear crack
 Rating: 3

Material: TCC Materials 3U18 Modified



Cell/Patch:	94011/CP – passing lane	Material: TCC Materials 3U18 Modified
Date:	09/27/2019	
Condition:	Linear crack	
Rating:	3	



Cell/Patch:	94011/CLJ	Material: TCC Materials 3U18 Modified
Date:	09/27/2019	
Condition:	Shrinkage cracks, debonding	
Rating:	3	



Cell/Patch:	94011/WP	Material: TCC Materials 3U18 Modified
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94011/ML – driving lane	Material: TCC Materials 3U18 Modified
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94011/ML – passing lane	Material: TCC Materials 3U18 Modified
Date:	09/27/2019	
Condition:	Shrinkage cracks	
Rating:	4	



Cell/Patch:	94011/FL – driving lane	Material: TCC Materials 3U18 Modified
Date:	09/27/2019	
Condition:	Shrinkage cracks, debonding	
Rating:	3	



Cell/Patch: 94011/FL – passing lane

Material: TCC Materials 3U18 Modified

Date: 09/27/2019

Condition: Shrinkage cracks

Rating: 4



Cell/Patch: 94012/CP – driving lane

Material: USG Ecofix

Date: 09/27/2019

Condition: Shrinkage cracks

Rating: 4



Cell/Patch:	94012/CP – passing lane	Material: USG Ecofix
Date:	09/27/2019	
Condition:	Over 50% of patch has been repaired	
Rating:	1	

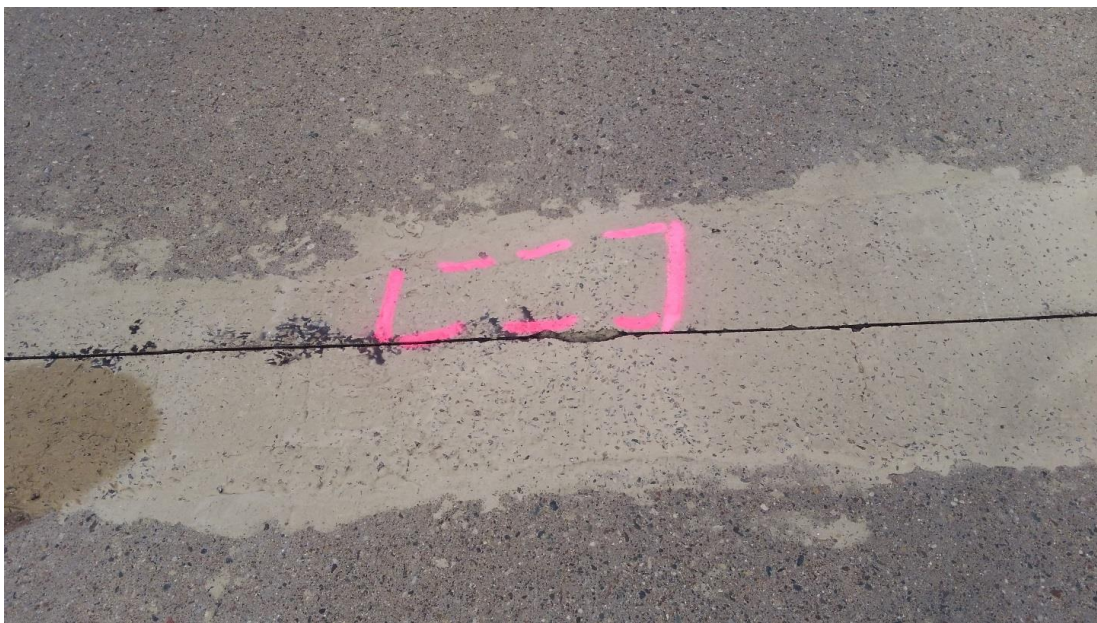


Cell/Patch:	94012/CLJ	Material: USG Ecofix
Date:	09/27/2019	
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch: 94012/FL – driving lane
 Date: 09/27/2019
 Condition: Linear cracks, debonding
 Rating: 3

Material: USG Ecofix



Cell/Patch: 94012/FL – passing lane
 Date: 09/27/2019
 Condition: Shrinkage cracks, debonding
 Rating: 3

Material: USG Ecofix



Cell/Patch: 94012/ML – driving lane

Material: USG Ecofix

Date: 09/27/2019

Condition: No distress

Rating: 4



Cell/Patch: 94012/ML – passing lane

Material: USG Ecofix

Date: 09/27/2019

Condition: Shrinkage cracks

Rating: 4



Cell/Patch: 94012/MLJ – driving lane
 Date: 09/27/2019
 Condition: Shrinkage cracks
 Rating: 4

Material: USG Ecofix



Cell/Patch: 94012/MLJ – passing lane
 Date: 09/27/2019
 Condition: Shrinkage cracks
 Rating: 4

Material: USG Ecofix



Cell/Patch: 94012/CL

Material: USG Ecofix

Date: 09/27/2019

Condition: Shrinkage cracks

Rating: 4



Cell/Patch: 94012/WP

Material: USG Ecofix

Date: 09/27/2019

Condition: Linear cracks, debonding

Rating: 3



Cell/Patch: 94013(A)/FL – driving lane
 Date: 09/27/2019
 Condition: No distress
 Rating: 4

Material: CTS Rapid Set DOT Repair Mix
 with Helix 5-25-Standard BA Fibers



Cell/Patch: 94013(A)/MLJ – driving lane
 Date: 09/27/2019
 Condition: Linear cracks, debonding
 Rating: 3

Material: CTS Rapid Set DOT Repair Mix
 with Helix 5-25-Standard BA Fibers



Cell/Patch:	94013(A)/CL	Material: CTS Rapid Set DOT Repair Mix
Date:	09/27/2019	with Helix 5-25-Standard BA Fibers
Condition:	No distress	
Rating:	4	



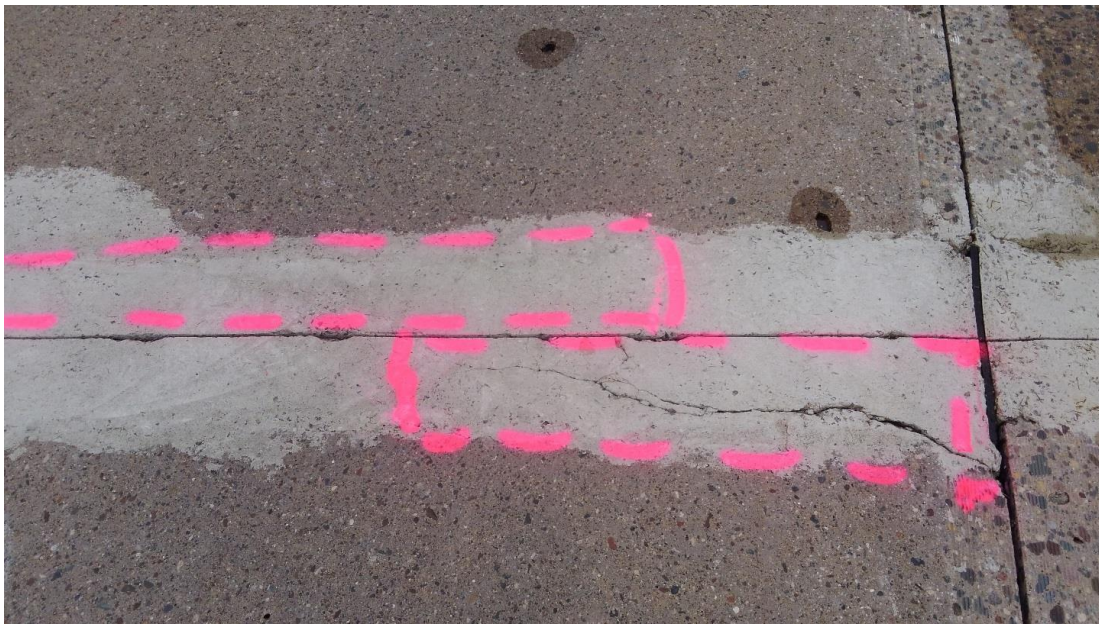
Cell/Patch:	94013(A)/CP – driving lane	Material: CTS Rapid Set DOT Repair Mix
Date:	09/27/2019	with Helix 5-25-Standard BA Fibers
Condition:	No distress	
Rating:	4	



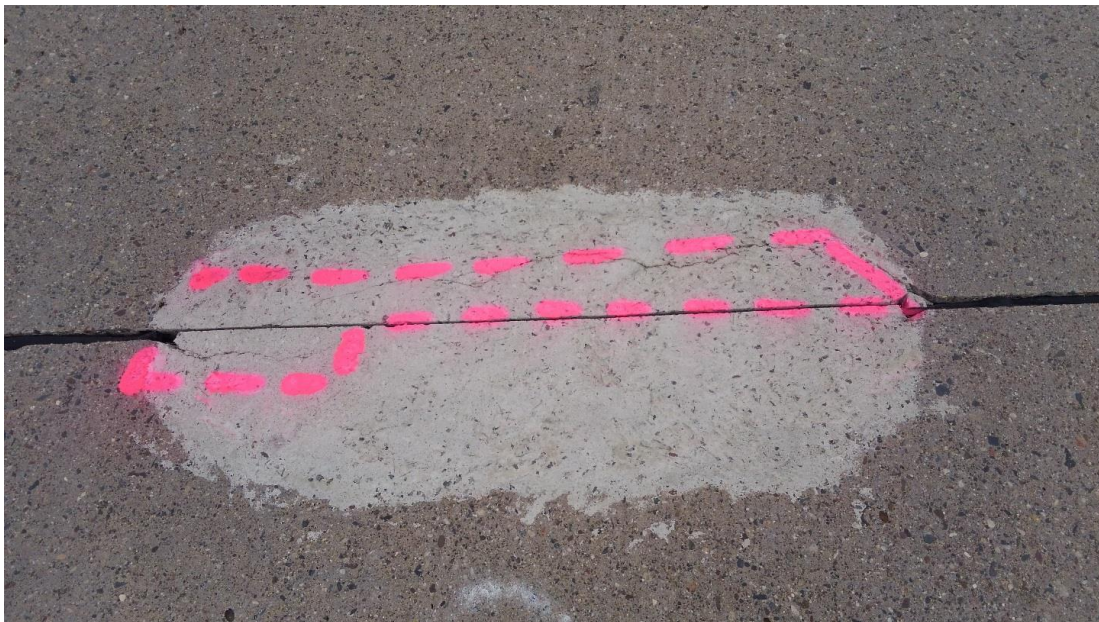
Cell/Patch:	94013(A)/ML – driving lane	Material: CTS Rapid Set DOT Repair Mix
Date:	09/27/2019	with Helix 5-25-Standard BA Fibers
Condition:	No distress	
Rating:	4	



Cell/Patch:	94013(A)/WP – driving lane	Material: CTS Rapid Set DOT Repair Mix
Date:	09/27/2019	with Helix 5-25-Standard BA Fibers
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch:	94013(B)/FL – passing lane	Material: CTS Rapid Set DOT Repair Mix
Date:	09/27/2019	with Helix 5-25-SS BA Fibers
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch:	94013(B)/MLJ – passing lane	Material: CTS Rapid Set DOT Repair Mix
Date:	09/27/2019	with Helix 5-25-SS BA Fibers
Condition:	Linear cracks, debonding	
Rating:	3	



Cell/Patch: 94013(B)/CP – passing lane
 Date: 09/27/2019
 Condition: Linear crack, debonding
 Rating: 3

Material: CTS Rapid Set DOT Repair Mix
 with Helix 5-25-SS BA Fibers



Cell/Patch: 94013(B)/CLJ
 Date: 09/27/2019
 Condition: Linear crack, debonding
 Rating: 3

Material: CTS Rapid Set DOT Repair Mix
 with Helix 5-25-SS BA Fibers



Cell/Patch:	94013(B)/ML – passing lane	Material: CTS Rapid Set DOT Repair Mix
Date:	09/27/2019	with Helix 5-25-SS BA Fibers
Condition:	No distress	
Rating:	4	



Cell/Patch:	94013(B)/WP – passing lane	Material: CTS Rapid Set DOT Repair Mix
Date:	09/27/2019	with Helix 5-25-SS BA Fibers
Condition:	Shrinkage cracks	
Rating:	4	



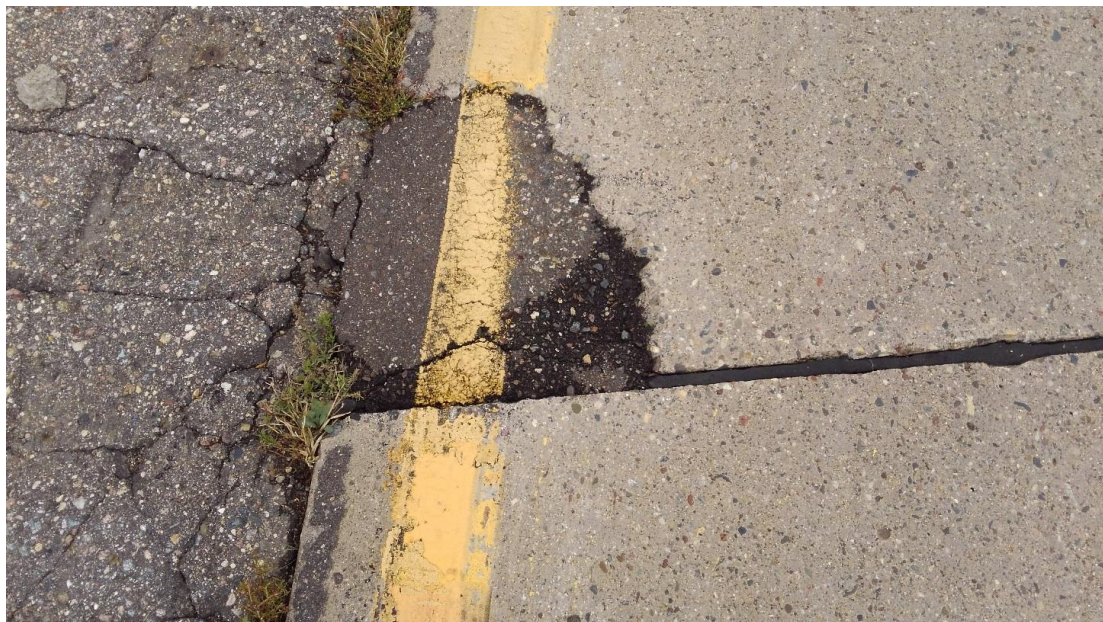
Cell/Patch: 94014/CP – driving lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA



Cell/Patch: 94014/CP – passing lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA



Cell/Patch:	94014/CLJ	Material: Hot Mix Asphalt
Date:	09/27/2019	
Condition:	Linear cracks	
Rating:	NA	



Cell/Patch:	94014/FL – driving lane	Material: Hot Mix Asphalt
Date:	09/27/2019	
Condition:	Linear cracks, less than 50% of patch material gone/repared	
Rating:	NA	



Cell/Patch:	94014/FL – passing lane	Material: Hot Mix Asphalt
Date:	09/27/2019	
Condition:	Linear cracking, less than 50% of patch material gone	
Rating:	NA	



Cell/Patch:	94014/ML – driving lane	Material: Hot Mix Asphalt
Date:	09/27/2019	
Condition:	No distress	
Rating:	NA	



Cell/Patch: 94014/ML – passing lane
 Date: 09/27/2019
 Condition: No distress
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94014/MLJ – driving lane
 Date: 09/27/2019
 Condition: Linear cracks, less 50% of patch material gone
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94014/MLJ – passing lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA



Cell/Patch: 94014/CL

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA



Cell/Patch: 94014/WP
 Date: 09/27/2019
 Condition: Linear cracks
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94015/MLJ – driving lane
 Date: 09/27/2019
 Condition: Patch failed, 100% of original patch replaced
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94015/MLJ – passing lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA



Cell/Patch: 94015/CL

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA



Cell/Patch: 94015/CP – driving lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: No distress

Rating: NA



Cell/Patch: 94015/CP – passing lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA



Cell/Patch: 94015/CLJ
 Date: 09/27/2019
 Condition: Linear cracks
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94015/FL – driving lane
 Date: 09/27/2019
 Condition: Linear cracks
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94015/FL – passing lane
 Date: 09/27/2019
 Condition: Linear cracks
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94015/ML – driving lane
 Date: 09/27/2019
 Condition: No distress
 Rating: NA

Material: Hot Mix Asphalt



Cell/Patch: 94015/ML – passing lane

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: No distress

Rating: NA



Cell/Patch: 94015/WP

Material: Hot Mix Asphalt

Date: 09/27/2019

Condition: Linear cracks

Rating: NA

APPENDIX B

Appendix B.3 Patch Condition Matrix

Cell ID	Product	Patch Location	2017 Rating	2018 Rating	2019 Rating
94001	CTS, Rapid Set DOT Repair Mix	Passing FL	4	4	4
		Driving FL	4	4	3
		Passing MLJ	4	4	4
		Driving MLJ	4	4	4
		CL	4	4	4
		WP	4	4	3
		Passing ML	4	4	4
		Driving ML	4	4	4
		CLJ	4	3	3
		Passing CP	4	4	4
		Driving CP	4	4	4
		AVERAGE	4	3.9	3.7
94002(A)	SpecChem, RepCon 928	CLJ	4	3	3
		Driving CP	4	4	3
		Driving ML	4	4	3
		Driving WP	4	3	1
		Driving MLJ	4	4	3
		CL	4	4	2
		AVERAGE	4	3.7	2.5
94002(B)	HMA	Passing CP	NA	NA	NA
		Passing ML	NA	NA	NA
		Passing WP	NA	NA	NA
		Passing MLJ	NA	NA	NA
		Passing FL	NA	NA	NA
		Driving FL	NA	NA	NA
94003(A)	Western Material and Design - FasTrac 246	CL	4	4	3
		Driving MLJ	4	4	4
		CLJ	4	4	3
		Driving CP	4	4	4
		Driving ML	4	4	4
		Driving FL	4	4	3
		AVERAGE	4	4	3.5
94003(B)	Western Material and Design - CE 700 HPC	Passing MLJ	4	4	4
		Passing CP	4	4	4
		Passing ML	4	4	4
		Passing FL	4	4	4
		WP	4	4	4
		AVERAGE	4	4	4

Cell ID	Product	Patch Location	2017 Rating	2018 Rating	2019 Rating
94004(A)	D.S. Brown, PaveSaver Polymeric Concrete Patch	CLJ	4	4	4
		Passing CP	4	4	3
		Driving CP	4	4	4
		CL	4	4	4
		Passing MLJ	4	4	3
		Driving MLJ	4	4	4
		Passing ML	4	4	4
		Driving ML	4	4	4
		Driving FL - 1/2	4	4	3
		AVERAGE	4	4	3.7
94004(B)	Crafco Cold Patch	WP	4	4	3
		Passing FL	4	4	3
		Driving FL - 1/2	4	4	3
		AVERAGE	4	4	3
94005	FastPatch DPR	CLJ	4	4	4
		Passing CP	4	4	4
		Driving CP	4	4	3
		WP	4	4	3
		Passing ML	4	4	4
		Driving ML	4	4	4
		CL	4	4	3
		Passing MLJ	4	4	3
		Driving MLJ	4	4	3
		Passing FL	4	4	3
		Driving FL	4	4	3
		AVERAGE	4	4	3.4
94006(A)	Five Star Products - Rapid Surface Repair Easy Mix	CLJ	4	4	1
		Driving CP	4	4	3
		CL	4	4	3
		Driving MLJ	4	4	2
		Driving WP	4	1	1
		Driving ML	4	4	3
		AVERAGE	4	3.5	2.2
94006(B)	Five Star Products - Rapid Surface Repair Epoxy Fix	Passing CP	4	4	3
		Passing MLJ	4	1	0
		Passing WP	4	4	0
		Passing ML	4	4	0
		Passing FL	4	4	0
		Driving FL	4	1	0
		AVERAGE	4	3	0.5

Cell ID	Product	Patch Location	2017 Rating	2018 Rating	2019 Rating
94007	TCC Materials - ProSpec Concrete Patching Mix	CLJ	4	4	3
		Passing CP	4	4	3
		Driving CP	4	4	4
		Passing FL	4	2	1
		Driving FL	4	4	4
		Passing ML	4	4	3
		Driving ML	4	2	0
		CL	4	4	3
		Passing MLJ	4	2	2
		Driving MLJ	4	4	3
		WP	4	2	2
		AVERAGE	4	3.3	2.5
94008(A)	Aqua Patch Road Materials, Aqua Patch	Passing ML	4	4	2
		WP	4	2	0
		Driving ML	4	4	2
		CL	4	2	0
		Passing MLJ	4	1	1
		Driving MLJ	4	2	0
		CLJ	4	4	0
		Passing CP	4	4	2
		Driving CP	4	1	1
		AVERAGE	4	2.7	0.9
94008(B)	TCC Materials - ProSpec Concrete Patching Mix	Passing FL	4	2	1
		Driving FL	4	4	3
		AVERAGE	4	3	2
94009	Crafco - HP Concrete Cold Patch	WP	4	4	1
		CL	4	4	1
		Passing MLJ	4	4	1
		Driving MLJ	4	4	1
		Passing ML	4	4	4
		Driving ML	4	4	4
		CLJ	4	4	3
		Passing CP	4	4	1
		Driving CP	4	4	3
		Passing FL	4	4	3
		Driving FL	4	4	3
		AVERAGE	4	4	2.3

Cell ID	Product	Patch Location	2017 Rating	2018 Rating	2019 Rating
94010	Crafco - Techrete-TBR	CLJ	4	4	4
		Passing CP	4	4	4
		Driving CP	4	4	4
		WP	4	4	4
		Passing ML	4	4	4
		Driving ML	4	4	4
		CL	4	4	4
		Passing MLJ	4	4	4
		Driving MLJ	4	4	3
		Passing FL	4	4	4
		Driving FL	4	4	4
		AVERAGE	4	4	3.9
94011	TCC 3U18 Modified	CL	4	4	4
		Passing MLJ	4	4	4
		Driving MLJ	4	4	4
		CLJ	4	4	3
		Passing CP	4	4	3
		Driving CP	4	4	3
		WP	4	4	4
		Passing ML	4	4	4
		Driving ML	4	4	4
		Passing FL	4	4	4
		Driving FL	4	4	3
		AVERAGE	4	4	3.6
94012	USG Ecofix	CLJ	4	3	3
		Passing CP	4	4	1
		Driving CP	4	4	4
		Passing FL	4	4	3
		Driving FL	4	4	3
		Passing ML	4	4	4
		Driving ML	4	4	4
		CL	4	4	4
		Passing MLJ	4	4	4
		Driving MLJ	4	4	4
		WP	4	4	3
		AVERAGE	4	3.9	3.4

Cell ID	Product	Patch Location	2017 Rating	2018 Rating	2019 Rating
94013(A)	CTS, Rapid Set DOT Repair Mix w/Helix 5-25-Standard BA (Zinc Coated) Fibers	Driving FL	4	4	4
		CL	4	4	4
		Driving MLJ	4	4	3
		Driving CP	4	4	4
		Driving ML	4	4	4
		Driving WP	4	3	3
		AVERAGE	4	3.8	3.7
94013(B)	CTS, Rapid Set DOT Repair Mix w/Helix 5-25-SS BA (Stainless Steel) Fibers	Passing FL	4	4	3
		Passing MLJ	4	4	3
		CLJ	4	3	3
		Passing CP	4	4	3
		Passing ML	4	4	4
		Passing WP	4	4	4
		AVERAGE	4	3.8	3.3
94014	Hot Mix Asphalt	CLJ	NA	NA	NA
		Passing CP	NA	NA	NA
		Driving CP	NA	NA	NA
		Passing FL	NA	NA	NA
		Driving FL	NA	NA	NA
		Passing ML	NA	NA	NA
		Driving ML	NA	NA	NA
		CL	NA	NA	NA
		Passing MLJ	NA	NA	NA
		Driving MLJ	NA	NA	NA
		WP	NA	NA	NA
94015	Hot Mix Asphalt	CL	NA	NA	NA
		Passing MLJ	NA	NA	NA
		Driving MLJ	NA	NA	NA
		CLJ	NA	NA	NA
		Passing CP	NA	NA	NA
		Driving CP	NA	NA	NA
		Passing FL	NA	NA	NA
		Driving FL	NA	NA	NA
		Passing ML	NA	NA	NA
		Driving ML	NA	NA	NA
		WP	NA	NA	NA

APPENDIX C

Material Technical Data Sheets

DOT REPAIR MIX

High Performance Concrete Repair Material



PRODUCT DATASHEET

DESCRIPTION: Rapid Set® DOT REPAIR MIX is a high performance, fast setting, multi-purpose repair material. Durable in wet environments, DOT REPAIR MIX is a blend of Rapid Set hydraulic cement, high performance additives and ASTM C33 concrete sand. DOT REPAIR MIX is non-metallic and no chlorides are added. Mix DOT REPAIR MIX with water to produce a flowable, quality repair material that is ideal where fast strength gain, high durability and low shrinkage are desired. DOT REPAIR MIX is ready for traffic and loading within 1 hour.*

USES: Use DOT REPAIR MIX for concrete repair, highway repair, dowel bar retrofit, construction of pavements and bridges, parking decks and ramps, sidewalks and steps, joint repair and formed work. DOT REPAIR MIX contains an air-entraining admixture, in some geographical regions, for freeze thaw durability.

ENVIRONMENTAL ADVANTAGES: Use DOT REPAIR MIX to reduce your carbon footprint and lower your environmental impact. Production of Rapid Set cement emits far less CO₂ than portland cement. Contact your Rapid Set representative for LEED values and further environmental information.

APPLICATIONS: Apply DOT REPAIR MIX in thicknesses from 1/2" to 4" (1.2 cm to 10.2 cm). For thicker applications, DOT REPAIR MIX can be extended with up to 100% clean, dry coarse aggregate (up to 3/4") conforming to ASTM C33.

SURFACE PREPARATION: For repairs, application surface shall be clean, sound and free from any materials that may inhibit bond such as oil, asphalt, curing compound, acid, dirt and loose debris. Mechanically abrade surface and remove all unsound material. Apply DOT REPAIR MIX to a thoroughly saturated surface with no standing water.

MIXING: The use of a power driven mechanical mixer, such as a mortar mixer or a drill-mounted mixer, is recommended. Organize work so that all personnel and equipment are in place before mixing. Use clean potable water. **DOT REPAIR MIX may be mixed using 3 to 4.5 quarts (2.8 L to 4.3 L) of water per 55-lb (25 kg) bag. Use up to 5 quarts (4.7 L) when extended with dry coarse aggregate. Use less water to achieve higher strengths.** Place the desired quantity of mix water into the mixing container. While the mixer is running, add DOT REPAIR MIX. Mix for the minimum amount of time required to achieve a lump-free, uniform consistency (usually 1 to 3 minutes). Do not retemper.

PLACEMENT: DOT REPAIR MIX may be placed using traditional construction methods. Organize work so that all personnel and equipment are ready before placement. Place, consolidate and screed quickly to allow for maximum finishing time. Use a method of consolidation that eliminates air voids. On flat work, do not install in layers; install full depth sections and progress horizontally. Do not wait for bleed water. Apply final finish as soon as possible. DOT REPAIR MIX may be troweled, floated or broom finished. The working time for DOT REPAIR MIX is 10 to 25 minutes at 70°F (21°C). To extend working time, use Rapid Set® SET Control® retarding admixture from the Rapid Set® Concrete Pharmacy® or use cold mix water. Do not install on frozen surfaces. DOT REPAIR MIX may be applied in temperatures ranging from 45°F to 90°F (7°C to 32°C).

OVERVIEW

Highlights:

Fast: Ready for traffic and loading in 1 hour

Durable: Formulated for long life in critical applications

Structural: For repair and new construction

Extendable: Add rock for large placements

Easy To Use: Mix to fluid or stiff consistency

Multi-Purpose: Use for concrete repair, highway repair, dowel bar retrofit, construction of pavements, bridges, parking decks, ramps, sidewalks, steps, joint repair, formed work and more

Conforms to:

ASTM C928

California Test No. 551

MasterFormat® 2016

03 01 30	Maintenance of Cast-in-Place Concrete
03 01 40	Maintenance Of Precast Concrete
03 01 50	Maintenance of Cast Decks and Underlayment
03 01 70	Maintenance of Mass Concrete

Manufacturer:

CTS Cement Manufacturing Corp.
11065 Knott Ave., Suite A
Cypress, CA 90630
Tel: 800-929-3030 | Fax: 714-379-8270
Web: www.CTScement.com
E-mail: info@CTScement.com



DOT REPAIR MIX

High Performance Concrete Repair Material

CURING: Water cure all Rapid Set® DOT REPAIR MIX installations by keeping exposed surfaces wet for a minimum of 1 hour. Begin curing as soon as the surface starts to lose its moist sheen. When experiencing extended setting time due to cold temperature or the use of retarder, longer curing times may be required. The objective of water curing shall be to maintain a continuously wet surface until the product has achieved sufficient strength.

COLD WEATHER: Environmental and material temperatures below 70°F (21°C) may delay setting time and reduce the rate of strength gain. Lower temperatures will have a more pronounced effect. Thinner sections will be more significantly affected. To compensate for cold temperatures, keep material warm, use heated mix water, and follow ACI 306 Procedures for Cold Weather Concreting.

WARM WEATHER: Environmental and material temperatures above 70°F (21°C) may shorten setting time and increase the rate of strength gain. Higher temperatures will have a more pronounced effect. To compensate for warm temperatures, keep material cool, use chilled mix water and follow ACI 305 Procedures for Hot Weather Concreting. The use of Rapid Set® SET Control® retarding admixture from the Rapid Set® Concrete Pharmacy® will help offset the effects of high temperatures.

YIELD & PACKAGING: DOT REPAIR MIX is available in 55 lb (25 kg) bags. One 55 lb (25 kg) bag of DOT REPAIR MIX will yield approximately 0.5 ft³. When extended 60% by weight with quality coarse aggregate, yield is approximately 0.7 ft³. When extended 100% by weight with quality coarse aggregate, yield is approximately 0.9 ft³.

SHELF LIFE: DOT REPAIR MIX has a shelf life of 12 months when stored properly in a dry location, protected from moisture, out of direct sunlight, and in an undamaged package.

USER RESPONSIBILITY: Before using CTS products, read current technical data sheets, bulletins, product labels and safety data sheets at www.CTScement.com. It is the user's responsibility to review instructions and warnings for any CTS products prior to use.

WARNING: DO NOT BREATHE DUST. AVOID CONTACT WITH SKIN AND EYES. Use material in well-ventilated areas only. Exposure to cement dust may irritate eyes, nose, throat, and the upper respiratory system/lungs. Silica exposure by inhalation may result in the development of lung injuries and pulmonary diseases, including silicosis and lung cancer. Seek medical treatment if you experience difficulty breathing while using this product. The use of a NIOSH/MSHA-approved respirator (P-, N- or R-95) is recommended to minimize inhalation of cement dust. Eat and drink only in dust-free areas to avoid ingesting cement dust. Skin contact with dry material or wet mixtures may result in bodily injury ranging from moderate irritation and thickening/cracking of skin to severe skin damage from chemical burns. If irritation or burning occurs, seek medical treatment. Protect eyes with goggles or safety glasses with side shields. Cover skin with protective clothing. Use chemical resistant gloves and waterproof boots. In case of skin contact with cement dust, immediately wash off dust with soap and water to avoid skin damage. In case of skin contact with wet concrete, wash exposed skin areas with cold running water as soon as possible. In case of eye contact with cement dust, flush immediately and repeatedly with clean water, and consult a physician. If wet concrete splashes into eyes, rinse eyes with clean water for at least 15 minutes and go to the hospital for further treatment.

PROPOSITION 65 WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Please refer to the SDS and www.CTScement.com for additional safety information regarding this material.

LIMITED WARRANTY: CTS CEMENT MANUFACTURING CORP. (CTS) warrants its materials to be of good quality and, at its option, will replace or refund the purchase price of any material proven to be defective within one (1) year from date of purchase. The above remedies shall be the limit of CTS's responsibility. Except for the foregoing, all warranties expressed or implied, including merchantability and fitness for a particular purpose, are excluded. CTS shall not be liable for any consequential, incidental, or special damages arising directly or indirectly from the use of the materials.

TYPICAL PHYSICAL DATA

Neat Bag (3.0 to 4.5 quarts)	60% Extension (3.5 to 4.75 quarts)	100% Extension (3.5 to 5.0 quarts)
Yield		
0.5 ft³	0.7 ft³	0.9 ft³
Compressive Strength		
ASTM C109 Mod.	ASTM C39	ASTM C39
1 hr* 3300 psi	1 hr* 2800 psi	1 hr* 2500 psi
3 hrs 5000 psi	3 hrs 4600 psi	3 hrs 4200 psi
24 hrs 7000 psi	24 hrs 6800 psi	24 hrs 6500 psi
7 days 7500 psi	7 days 7200 psi	7 days 7000 psi
28 days 9500 psi	28 days 9000 psi	28 days 8500 psi
Flexural Strength, ASTM C78		
4 hrs 450 psi	4 hrs 400 psi	4 hrs 400 psi
7 days 700 psi	7 days 650 psi	7 days 600 psi
28 days 900 psi	28 days 850 psi	28 days 800 psi
Modulus of Elasticity, ASTM C469		
7 days 4,400,000 psi	7 days 4,100,000 psi	7 days 3,900,000 psi
28 days 5,100,000 psi	28 days 4,500,000 psi	28 days 4,000,000 psi
Slant Shear Bond Strength, ASTM C882 per C928		
1 day 1500 psi	1 day 1200 psi	1 day 1100 psi
7 days 2000 psi	7 days 1800 psi	7 days 1700 psi
Splitting Tensile Strength, ASTM C496		
7 days 700 psi	7 days 500 psi	7 days 390 psi
28 days 900 psi	28 days 600 psi	28 days 415 psi
Resistance of Concrete to Rapid Freezing and Thawing, ASTM C666 Procedure A		
Durability factor 300 Cycles: 95%	Durability factor 300 Cycles: 95%	Durability factor 300 Cycles: 95%
Scaling Resistance, ASTM C672 per C928		
Scaling of material at 25 cycles: 0.05 lb/ft²	Visual rating at 25 cycles - 2	Visual rating at 25 cycles - 1
Length Change, ASTM C157 modified per ASTM C928		
Air Cure: -0.08% Water Cure: 0.02%	Air Cure: -0.07% Water Cure: 0.01%	Air Cure: -0.05% Water Cure: 0.05%
*Data obtained at flow consistency of 105 by ASTM C1437 at laboratory conditions	*Data obtained at slump consistency at 6" by ASTM C143 at laboratory conditions	*Data obtained at slump consistency at 6" by ASTM C143 at laboratory conditions

*After final set
Results will vary depending on aggregates and jobsite conditions



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REPCon® 928



Polymer-modified rapid setting concrete repair mortar with corrosion inhibitor

DESCRIPTION

RepCon® 928 is a single component, polymer modified, fiber reinforced, rapid setting concrete repair mortar with corrosion inhibitor for use on concrete floors, highway pavements, bridge decks and other applications requiring early resumption of traffic or use. RepCon® 928 is formulated to meet the requirements of ASTM C928 Packaged, Dry, Rapid Hardening Cementitious Material for Concrete Repair and AASHTO T260. RepCon® 928 incorporates the latest in polymer technology offering superior durability, performance and ease of application without liquid activators for horizontal and vertical form & pour applications.

FEATURES/BENEFITS

- One component, dry-polymer modified. Just add water.
- Fiber-reinforced for added flexural strength
- Air entrained for excellent freeze-thaw durability
- Natural concrete-gray color
- Suitable for horizontal and formed vertical application
- Takes foot traffic in 1 hour after set
- Long work time for hot weather applications (available in fast-set version RepCon® 928 FS)

APPLICATION

Surface Preparation: The concrete must be sound and free of all foreign material, including oil, grease, dust, laitance or other surface contaminants. For maximum durability, saw cut the perimeter of the repair 1/8" deeper than the depth of the repair, creating a notched, reinforced edge. Mechanically abrade the surface by an engineered approved method in accordance with ICRI 310.2 Guideline to a minimum CSP 5. **All concrete surfaces to be repaired must be in a saturated-surface-damp (SSD) condition with no standing water on the surface.**

Priming/Scrub Coat: Thoroughly clean all exposed steel reinforcing of rust and coat with **SpecPrep SB**.

Prepared concrete must be SSD and primed with a spray or brush coat of **SpecPrep SB** and the repair mortar applied wet on wet or up to the recommended open time (see **SpecPrep SB** technical data sheet).

As an alternative, apply a scrub coat of the properly mixed repair mortar by scrubbing a thin layer into the pre-dampened substrate with a stiff brush. Place the repair mortar immediately before the bond coat dries.

Mix 4.75 - 5.25 pints (depending on desired consistency) of clean water per 50 pound bag of material. Mix with a low speed drill or mortar mixer. Add recommended amount of clean water into the container, followed by slowly adding the RepCon® 928 powder. Mix 2-3 minutes. Mix only what can be applied within the setting period. Depending on the area dimensions, RepCon® 928 can be applied in applications from 1" to 6" in

a lift without extension.

Deep Applications: For repair applications over 2", RepCon® 928 can be extended with clean, SSD, 3/8" aggregate up to 60% by weight (30lbs) and mixed an additional 2 min. Choose a clean (free of organic material) well-graded 3/8" aggregate. Aggregate should be pre-dampened prior to mixing with RepCon® 928. The total mixing water for the batch shall be reduced by the amount of free water found in the aggregate. This extension will add approx 0.18 cu-ft to the unit yield and should be placed within 15-20 min.

Placement: Trowel, or screed RepCon® 928 firmly into the prepared area, ensuring intimate contact with the bonding surface. Finish RepCon® 928 level with the surrounding concrete and allow to take an initial set. After the initial set, when RepCon® 928 is surface hard, finish by hand trowelling. Excessive troweling is not required.

Finishing/Curing: Finish the repair material to the desired texture to best match the surrounding concrete. Do not add additional water to the surface during finishing.

TYPICAL TEST DATA

Test Data based on 5.0 pints water	
Set Time at 70°F (ASTM C-266)	
Initial Set	40 min
Final Set	45 min
Compressive Strength (ASTM C-109)	
3 hours	3200 psi
1 day	6100 psi
7 days	8250 psi
28 days	9,625 psi
Bond Strength (ASTM C-882 modified)	
7 days	2545 psi
Flexural Strength (ASTM C-348)	
7 days	750 psi
28 days	1150 psi
Freeze-Thaw Resistance (ASTM C 666)	
Procedure A (300 cycles)	99% Durability Factor
Yield	
Yield Per Bag	.42 cu-ft

SPEC CHEM
Solution to Service

1511 Baltimore Ave, Suite 600
Kansas City, MO 64108
www.specchemllc.com 866.791.8700

Lightly spray SpecFilm as a finishing aid on this and any other polymer modified mortars to assist in finishing. RepCon® 928 is self-curing under most conditions. In severe drying conditions, use an ASTM C-309 compliant, water based SpecChem curing compound.

SPECIFICATIONS/COMPLIANCE

ASTM C-928 (Rapid Hardening Mortar)
AASHTO T-260

PACKAGING

- 50 lb bag
- 3,000 lb SuperSack

Coverage: approx 20 sq-ft @ 1/4"

SHELF LIFE

Shelf life of unopened bags stored in a dry facility is 12 months. Excessive temperature differential and/or high humidity can shorten the shelf life expectancy. Store in a cool, dry area away from direct sunlight.

LIMITATIONS/PRECAUTIONS

Minimum thickness for horizontal repairs subjected to heavy or severe traffic is 1/2". Do not retemper after initial mixing. Do not add other cements or additives to this product. RepCon® 928 is a fast setting product, so mixing equipment should be cleaned with water as soon as possible. Use only potable water for mixing.

Application range 55°F to 85°F. Please consult SpecChem for special instructions on any application outside this temperature range.

Adverse Weather Application: In adverse temperatures, follow ACI recommendations for hot/cold weather concreting practices. For optimum results, condition material to between 65°F and 85°F.

Application in cold weather should follow procedures outlined in ACI 306. Heating the repair area, using warm water for mixing, and tenting or insulating the patch area after application will increase strength development. Do not use direct, unvented heat on the patch after installation. Do not allow repairs to freeze until the material has reached a minimum of 1000 psi compressive strength.

Caution: Contains Portland Cement and sand. Cement will cause irritation. Avoid contact. A dust respirator, safety goggles, and rubber gloves are recommended. Avoid prolonged contact with clothing. In case of contact with eyes, immediately flush with water for at least 15 minutes. Get prompt medical attention. Do not wear contact lenses when working with this product. DO NOT take internally. Keep out of reach of children.

Avoid hazards by following all precautions found in the Material Safety Data Sheet (MSDS), product labels, and technical literature. Please read this information prior to using the product.

CLEAN UP

Tools and equipment may be cleaned with water before RepCon® 928 hardens.

WARRANTY

NOTICE-READ CAREFULLY

CONDITIONS OF SALE

SpecChem offers this product for sale subject to and limited by the warranty which may only be varied by written agreement of a duly authorized corporate officer of SpecChem. No other representative of or for SpecChem is authorized to grant any warranty or to waive limitation of liability set forth below.

WARRANTY LIMITATION

SpecChem warrants this product to be free of manufacturing defects. If the product when purchased was defective and was within use period indicated on container or carton, when used, SpecChem will replace the defective product with new product without charge to the purchaser. SpecChem makes no other warranty, either expressed or implied, concerning this product. There is no warranty of merchantability. NO CLAIM OF ANY KIND SHALL BE GREATER THAN THE PURCHASE PRICE OF THE PRODUCT IN RESPECT OF WHICH DAMAGES ARE CLAIMED.

INHERENT RISK

Purchaser assumes all risk associated with the use or application of the product.



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Kansas City, MO 64108
www.specchemllc.com 866.791.8700



FasTrac 246 Concrete

Rapid-setting concrete

Description

FasTrac 246 Concrete is a one-component, shrinkage compensated, proprietary blend of cements, aggregates, and performance enhancing chemical additives. This rapid setting concrete is mixed with water on site, used for large-scale horizontal concrete repairs, and form and pour vertical applications that require high early-strength gain.

Features/Benefits

- Very rapid setting; allows structures to be opened to vehicular traffic in 3 hours
- Non-gypsum based with volume stability
- Excellent resistance to freeze/thaw with outstanding durability
- Shrinkage compensation minimizes cracking from drying shrinkage

Yield

Approx. 0.45-cu.ft. /60 lb. bag when mixed with the recommended amount of water.

Packaging

60# bag

3,000 lb bulk bags

Shelf Life

12 mos. properly stored

Storage

Store and transport in clean, dry conditions.

Application Temperature Range

40° F to 90° F

Where to Use

- Airport runways
- Concrete slab replacement
- Repair of bridges
- Parking decks
- Horizontal concrete surfaces
- Interior or exterior

How to Apply

Surface Preparation (See ICRI guidelines)

1. Concrete must be sound and fully cured (28 days).
2. Saw cut the perimeter of the area being patched into a square with a minimum depth of 1" (25 mm).
3. Remove all unsound concrete and roughen the surface to min. 1/4" profile amplitude.
4. Remove all laitance, oil, grease, curing compounds, and other contaminants that could prevent adequate bond.
5. The concrete substrate should be saturated surface-dry (SSD), without standing water, before application.
6. Apply the mixed material onto the prepared saturated surface-dry (SSD) substrate by trowel or screed. Ensure proper consolidation of the mortar and compaction around reinforcing steel. Minimum application thickness is 1" based on a 3/8" max. coarse aggregate. Finish the completed repair, as required, taking care not to overwork the surface.

Reinforcing Steel

Remove all oxidation and scale from the exposed reinforcing steel in accordance with ICRI Technical Guideline No. 03730 "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion."

Mixing

Mix with required amount of cool, potable water for desired application characteristics, from 2.19 to 2.48 U.S. qts (2.07 to 2.34L) per 60lbs. (27.2kg) bag. Conduct field trials to verify proper slump, (approx 8") yield and a thoroughly mixed product.

Working time- Approx. 15-25 min

Set time- min. at 72° F (22° C) ASTM C 191

Initial 20-30 minutes

Final 30-40 minutes



FasTrac 246 Concrete pg 2 of 3

Curing

Cure immediately after finishing. Use a curing compound that complies with ASTM C 309. In extreme heat, keep the patches covered and damp.

Clean Up

Clean tools and equipment with clean water immediately after use. Cured material must be removed mechanically.

Health and Safety

Make certain the most current versions of product data sheet and MSDS are being used

Risks

Product contains portland cement and sand (crystalline silica); it can cause skin and eye irritation. Ingestion or inhalation of dust may cause tract irritation. This contains free respirable quartz, which has been listed as a suspected human carcinogen by NTP and IARC. Repeated or prolonged overexposure to free respirable quartz may cause silicosis or other serious and delayed lung injury.

Precautions

KEEP OUT OF THE REACH OF CHILDREN. Prevent contact with skin and eyes. Prevent inhalation of dust. DO NOT take internally. Use only with adequate ventilation. Use impervious gloves, eye protection and if the TLV is exceeded or is used in a poorly ventilated area, use NIOSH/MSHA approved respiratory protection in accordance with applicable federal, state and local regulations.

First Aid

In case of eye contact, flush thoroughly with water for at least 15 minutes, and seek medical attention. In case of skin contact, wash affected areas with soap and water. If the irritation persists seek medical attention. Remove and wash contaminated clothing. If inhalation causes physical discomfort, remove to fresh air. If the discomfort persists, breathing difficulty occurs, or if swallowed seek medical attention. Refer to Material Safety Data Sheet (MSDS) for further information.

Proposition 65

This product contains material listed by California as known to cause cancer, birth defects, or other reproductive harm.

VOC Content

0 lbs/gal or 0 g/L

Limited Warranty Notice

Every reasonable effort is made to apply exacting standards both in the manufacture of "FasTrac 246 Concrete" product and in the information, which we issue concerning these products and their use. We warrant our products to be good quality and will replace or, at our election, refund the purchase price of any products proved defective. Satisfactory results depend not only on quality products, but also upon many factors beyond our control. Therefore, except for such replacement or refund, Western Material and Design, LLC makes no warranty or guarantee, express or implied, including warranties of fitness for a particular purpose or merchantability, respecting its products, and Western Material and Design, LLC shall have no other liability with respect thereto. Any claim regarding product defect must be received in writing within one year from the date of shipment. No claim will be considered without such written notice or after the specified time interval. User shall determine the suitability of the products for the intended use and assume all risks and liability in connection therewith. Any authorized change in the printed recommendations concerning the use of our products must bear the signature of the Western Material and Design, LLC technical manager.



FasTrac 246 Concrete pg 3 of 3

Technical Data, Conforms to ASTM C928

Property (Test Method)

Compressive Strength (ASTM C39)

3 hrs

1 day

7 days

28 days

Bond Strength (ASTM C882)

3hrs

1 day

7 days

28 days

Length Change (ASTM C157, Mod. by C928)

Air Cure

Water Cure

Resistance to Scaling (ASTM C672)

Visual Rating

Scaled Material

Result

4080 psi

5620 psi

7280 psi

8420 psi

1240 psi

1310 psi

1620 psi

1840 psi

-0.032%

0.06%

0

0.0 lbs/ft²

CE700 HPC



CE700 HPC

TECHNICAL DATA

Shelf Life:	2 years in original unopened container.
Condition material to:	65°F – 85°F (18°C – 29°C) before using.
Mix Ratio (Polymer)	1:1 by volume
Mix Ratio (Polymer with aggregate)	4-gallon mixed polymer to 300 Lb aggregate
Viscosity (Polymer)	1,200 cps @ 77°F
Gel Time (60 g Polymer)	20 minutes
Tack Free Time (73°F)	3 hours
Tensile Properties (Polymer only, ASTM D638), 7 day cure Tensile Strength: Tensile Elongation:	2,000 psi (13.8 MPa) 40%
Slant Shear Bond Strength (ASTM C882) 2 day cure: 14 day cure:	1,500 psi (10.3 MPa) 2,000 psi (13.8 MPa)
Compressive Strength (ASTM C579) 3 hour cure: 24 hour cure:	1,200 psi (8.3 MPa) 5,000 psi (34.5 MPa)
Bond Strength (ASTM C1583/ACI 503R)	500 psi (3.4 MPa), 100% substrate failure
Flexural Strength (ASTM D790)	3,000 psi (23.4 MPa)
Shrinkage on Cure (ASTM D2566)	0.2%
Thermal Compatibility (ASTM C884)	Pass
Water Absorption (Binder only, ASTM D570)	0.2% (24 hr)
Chloride Ion Permeability (AASHTO T277)	0.0 coulomb

MINIMUM CURING TIME:

TEMPERATURE (°F)	60	65	70	75	80
MINIMUM CURING TIME (HRS)	5	4	3.5	3	2

APPLICATION

SURFACE PREPARATION:

Prepare surface in accordance with ICRI Technical guideline no. 03732. Surface must be clean and sound. Surface must be free of standing water. Remove curing compounds-laitance, grease, rubber and any foreign matter or unsound surface. For best results, shot blasting, sandblasting and scarifying are the preferred methods of preparation. (¼" – CSP 5, 6 or 7). Remove rust from exposed reinforcing steel. Have all necessary equipment near area to permit rapid and continuous placement. All bagged aggregates and liquid resins should be stored in a clean, cool, dry environment. Remove all unsound concrete and establish a sound concrete foundation.

MIXING: Preferred method is to use automated installation equipment. When mixed and applied manually, mix only the amount of material that can be used within its pot life. Proportion each liquid component carefully into a clean pail. Mix thoroughly for 3 minutes with a Jiffy mixer on low speed (400-600rpm). Scrape the sides and bottom of the container. To prepare a repair mortar, slowly add 300 lbs. of the engineered aggregate to every 4-gal of mixed epoxy. Mix only until all aggregate is wetted out. Volumetric mixers may be utilized to increase production or the FasTrac 750 Concrete Mixer.

INSTALLATION and FINISHING: use CE700 HPC liquid polymer part only as a primer when necessary. Place CE700 HPC with a vibratory strike off screed. Standard hand tools can also be used for small patches. CE700 HPC can be finished to the designed roughness. Broadcast aggregate and lightly roll it into CE700 HPC to further improve friction.

LIMITATIONS

Minimum substrate temperature is 50°F (10°C). Do not thin. Solvents will prevent proper cure. Material is a vapor barrier after cure.



CE700 HPC

CLEAN UP

Collect with absorbent material. Flush area with water. Dispose of in accordance with local, state and federal disposal regulations. Uncured material can be removed with CE Clean or approved solvent. Cured material can only be removed mechanically.

HANDLING PRECAUTIONS

Refer to the Safety Data Sheet for FasTrac CE700 HPC before using.

WARRANTY

LIMITED WARRANTY

All information provided by Western Material & Design, LLC (WMD) concerning WMD products, including but not limited to, any recommendations and advice relating to the application and use of WMD products, is given in good faith based on WMD's current experience and knowledge of its products when properly stored, handled and applied under normal conditions in accordance with WMD's instructions. In practice, the differences in materials, substrates, storage and handling conditions, actual site conditions and other factors outside of WMD's control are such that WMD 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 WMD product(s) must test the product(s) for suitability for the intended application and purpose before proceeding the full application of the product(s). WMD reserves the right to change the properties of its products without notice. All sales of WMD product(s) are subject to its current terms and conditions of sale.

Prior to each use of any WMD product, the user must always read and follow the warnings and instructions on the product's most current Technical Data Sheet, product label and Safety Data Sheet which are available at www.WMD.com. Nothing contained in any WMD materials relieves the user of the obligation to read and follow the warnings and instruction for each WMD product as set forth in the current Technical Data Sheet, product label and Safety Data Sheet prior to product use.

WMD 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 when used in accordance with the written instructions. 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. WMD SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. WMD 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.

PaveSaver™ Polymeric Concrete Patch

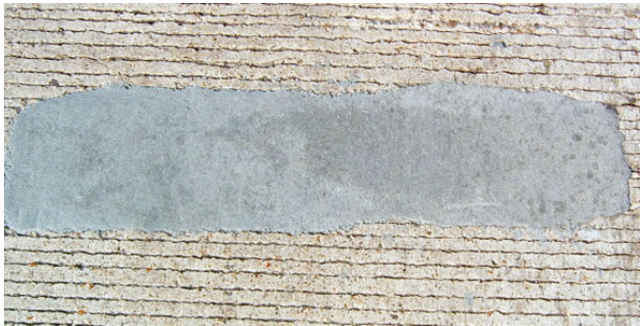
Pavements



Bridge the World with Leading Infrastructure Solutions



Top and Center images: Highway Spall Repair, Highway 99, Fort Bend County, TX.



Dowel Bar Retrofit.

PaveSaver™ Polymeric Concrete Patch

General

PaveSaver™ is a new generation of non-shrink epoxy-based elastomeric concrete featuring an ideal balance for both flexibility and strength. This unique combination provides an excellent long-term patching solution for repairing cracks and spalls on airfield, bridge decks, bridge expansion joint headers, and highway pavements.

PaveSaver™ Advantages

1. **High-load bearing capacity** – Handles the weight of C-4s, 747s and heavy truck traffic.
2. **Outstanding anti-spalling properties** – PaveSaver™ is a long-term solution for high-performance pavement repairs.
3. **Impact resistant** – Under bitterly cold conditions, PaveSaver™ withstands heavy impact and resists shattering, unlike conventional concrete and imitation epoxy-based materials.
4. **High compressive strength** – PaveSaver™ can handle heavy psi pressure before deflecting.
5. **Chemical resistant** – PaveSaver™ resists commonly used chemicals such as ASTM Oil #1, ASTM Fuel A, Ethylene Glycol, Freon, Isopropyl Alcohol, JP-4 Jet Fuel, Silicone Grease, Sodium Chloride, Mineral Oil, Trisodium Phosphate and Potassium Acetate.
6. **Easy to install** – PaveSaver™ is semi self-leveling and has a rapid cure time. This minimizes expensive downtime and allows for the return of traffic often within 3 hours after final pour. It also protects work crews by minimizing exposure to heavy traffic. PaveSaver™ can be mixed in 5-gallon buckets or in approved mortar mixers for high volume applications.
7. **Flexibility** – Cement, phosphate, and most other high early strength repair materials prematurely fail because they are rigid. Rigid repair materials installed in rigid pavement require that the materials have similar coefficient of expansion. Most do not and, as a result, destroy the patch and the surrounding concrete. PaveSaver™ utilizes a unique epoxy chemistry to provide a flexible patch that will deflect as surrounding concrete expands and contracts.



PaveSaver™ Airfield Repair Application



PaveSaver™ Bridge Expansion Joint Header Application

PaveSaver™ Polymeric Concrete Patch Physical and Performance Properties

Test Method	Property Tested	Requirements	Results
ASTM C501	Abrasion Resistance	Weight Loss H-22 Grams 1.0 Max.	Pass
ASTM C531	Linear Shrinkage	Negligible	Pass
ASTM C579 Method B	Compressive Strength	PSI @ 4 Hours 1500 Min. PSI @ 24 Hours 4500 Min.	Pass Pass
ASTM C882	Bond Strength	PSI of 2500 Min.	Pass
ASTM C884	Thermal Compatibility	No delamination or cracking	Pass
AASHTO T-277	Chloride Ion Permeability	Coulombs, 1.0 Max	Pass

PaveSaver™ meets and/or exceeds ASTM C881 Type III (Mortar) and the following physical property requirements

Test Method	Property Tested	Requirements	Results
ASTM C579 Method B	Compressive Strength	PSI @ 4 Hours 1500 Min. PSI @ 24 Hours 4500 Min.	Pass Pass
Tex-614-J	Gel Time	1 Minute Min. - 60 Minutes Max.	Pass
Tex-618-J	Wet Bond Strength to Concrete	PSI of 350 Min.	Pass
Tex-618-J	Compressive Strength	PSI of 3000 Min. @ 0.1 in. for 7 days	Pass
Tex-618-J	Resilience	75% Min.	Pass
ASTM C884	Thermal Compatibility	No delamination or cracking	Pass

Pavements

Bridge the World with Leading Infrastructure Solutions

Area Preparation

Saw cut, chip, or mill area to be repaired, leaving only sound concrete. Carefully sandblast all areas which will be in contact with PaveSaver™. The repair area must be clean and dry and the substrate must be a minimum temperature of 40°F (5°C). The minimum age of hardened concrete for bonding should be 5-7 days.

Materials/Equipment

Jiffy style mixing attachment, heavy-duty drill, clean and dry mixing bucket, spatula, bucket scrapers, and finishing trowels.

A D.S. Brown approved mortar mixer may be used for large projects.

Storage Conditions

Store at 40°- 95°F (5°- 35°C). For best results, condition material to 65°- 85°F (18°- 29°C) before using.



Mixing and Placing

Step 1

Pour premeasured amounts of Part A and B liquids into the mixing bucket. Using a spatula, thoroughly scrape the sides and bottoms of the cans to get as much of the resin liquids as reasonably possible into the mixing bucket. Failure to do this could result in irregular color or a dry mix.

Step 2

Place Jiffy type mixer at bottom of pail to avoid introducing air and thoroughly mix on low-speed (300 rpm) for 3 minutes. The material should have a uniform consistency with no visual color streaks.

Step 3

Slowly add component C (aggregate) to the mixed liquid components.

Step 4

Mix thoroughly until all aggregate is wetted out.

Step 5

Immediately place mortar. Thoroughly compact and trowel finish the surface.

Step 6

For repairs along existing joints, the joints should be maintained by the use of forming materials or saw cutting method.



1.0 Cubic Foot Unit of PaveSaver™

Packaging

1.0 cubic foot unit (.028 cubic meter)
(7.48 mixed gallons)

One can Part A (1 gallon gray liquid)

One can Part B (1 gallon clear liquid)

Two 50 lb. bags Aggregate



Willamette Valley Company
www.wilvaco.com
800.333.9826

Partnering through service,
innovation, and integrity

FastPatch DPR Kit

Distressed Pavement Repair

DESCRIPTION

FastPatch DPR is an easy-to-apply, long-lasting repair material for distressed pavement. It is supplied in complete, ready-to-use kits with a polymer blend of recycled and renewable materials. Each kit comes with two color options of Gray or Black, and topping sand to blend repair areas with the surrounding pavement. It can be applied in warm conditions, or in cooler conditions with the aid of FastPatch Kicker accelerator, to form a permanent repair that is quickly ready for traffic.

WHERE TO USE

- **Roadways**—spalls, wheel path areas, approaches and departures
- **Parking Lots**—holes, walkways, broken areas
- **Warehouses**—floors, spalls, loading areas
- **Sidewalks**—trip hazards, walkways, “repair instead of replace”

FEATURES AND BENEFITS

- **Easy-to-Apply**—Mix with cordless drill, pour, & finish in minutes
- **Lasting Repair**—Excellent adhesion & absorbs impact
- **Open to Traffic Quickly**—Reduce traffic interruptions
- **Recycled & Renewable Materials**—Sustainable sources
- **Odorless**—100% solids & suitable for indoor applications
- **Freeze-Thaw Resistant**—Long term repair for colder climates

PACKAGING

5-gallon pail

COLORS

Gray or Black

YIELD

3 US gal (11 Liters)*

SHELF LIFE

1 year when properly stored.

STORAGE

Store and ship this product in a clean, dry, low-humidity, shaded or covered environment at 60-90° F (15-32° C).

*Depending on application method

TECHNICAL INFORMATION

Typical Properties and Parameters:

VOC , lbs/gal (g/L), ASTM D 2369	0
Service Temperature , ° F (° C)	-30 to 170 (-34 to 77)
Work-life min., 70° F (21° C)	9 minutes
Adhesion , ASTM D 7234	> 400 psi, 100% substrate failure
Application Temp ° F (° C)	40 to 105 (4 to 40)
Application Method	Mechanical mix & pour
Recommended Thickness	> 1/4 in. (0.635 cm)
Recommended Repair Area	< 16 ft2 (1.49m2).

Set Time (with Aggregate):

Temp. °F (°C)	Set Time (min.)	With Optional FastPatch Kicker (1 oz.)
110 (40)	7	3
75 (21)	30	18
40 (10)	80	40

APPLICATION

PAVEMENT PREPARATION

1. Pavement must be structurally sound (200psi or greater according to ASTM D7234), clean (ASTM D4258), and dry (less than 5%, ASTM E1907).
2. Moisture or oil in repair areas will result in poor adhesion. Apply product only if surface is dry and ambient temperature is 5° F (3° C) above dew point.
3. Remove all contaminants (e.g., oil, dust, sand, moisture) from surface for proper adhesion.
4. For maximum adhesion, profile surface according to ICRI Guide 03732, to a minimum of CSP 3, by abrasive blasting.
5. Shape spall perimeter into a square by saw cut, 1-3 inches (2.54-7.6 cm) deep. Hammer repair area and remove debris. Remove all loose rebar. Exposed non-moving rebar can remain. Maximum recommended repair size is less than 16 ft² (1.49m²).
6. Use a minimum 120 PSI continuously dry compressed air to blow out loose debris, dirt and dust prior to applying product. Moist pavement can be torched dry. If moisture returns immediately after torching, stop and do not install FastPatch in this area.
7. Use a steel bristle brush to remove dirt on vertical and horizontal pavement surfaces. Use a minimum 120 PSI continuously dry compressed air to blow out repair area, prior to applying product.
8. As necessary, plug all gaps or joints surrounding the repair area with foam.
9. Protect surrounding surfaces to the repair area with tape to prevent contamination.
10. Priming all surfaces with POLYPrime is recommended to strengthen bonding surface and maximize adhesion. Refer to primer TDS sheets for detailed instructions.
11. Honor all moving joints or moving cracks in the repair area by saw-cutting after FastPatch has cured or installing form board during application. Joints or cracks without movement do not require honoring. Contact manufacture for more details.

OTHER MATERIALS

1. Previously installed polymer materials must be tested to determine best method of preparation for acceptable adhesion. Typically, methods will include solvent cleaning, abrading, and vacuuming surfaces.
2. Avoid installing FastPatch on bare ground, dirt, grass or other non-structural surfaces. Applications surfaces must be dry.

PROCESSING

1. Precondition Kits to 70°F (21°C) for 24 hours before use.
2. For colder temperature conditions, use FastPatch Kicker to shorten cure time. Kits can be heated up to 100°F (38°C) to speed cure at colder temperatures. Kits can be cooled 50°F to extend work time in warmer conditions.

3. Overly cold kits will not flow or level properly, and cure time will be slow. Overly hot kits will shorten work time.
4. Check that primed surfaces are ready for application before mixing and applying FastPatch.
5. Protect surfaces around the repair area with tape to prevent contamination of surrounding surface.
6. Place mixing station a short distance from the application area.
7. Wear gloves and safety glasses while mixing and applying material.
8. Attach a clean, "eggbeater-style" mixing paddle to a mechanical drill with a minimum of 500RPM.
9. Use entire kit and do not divide.

APPLICATION

1. Remove contents of FastPatch kit and leave aggregate in the bucket.
2. Open Part A package and pour over aggregate. Mix 2 minutes.
3. OPTION 1: For gray, mix Part B with aggregate mixture.
OPTION 2: For black, add BLACK pigment to aggregate mixture then add Part B.
OPTION 3: For speeding system, add FastPatch Kicker to aggregate mixture then add Part B. FastPatch Kicker is sold separately, and recommended in cold weather.
OPTION 4: For extending kit yield up to 3.5 gallons (14L), 1.5 gallons (6L) of 3/8" (1 cm) pea gravel may be added to aggregate mixture. Up to half bag of excess topping sand may be added to kit to improve slope application.
4. Mix for 2 minutes. Scrape sides and bottom while mixing. MATERIAL WILL NOT SET IF POORLY MIXED. Signs of poor mixing include dark swirls and tacky material that does not solidify.
5. Immediately pour in area. Level to surrounding surface.
6. After 10 minutes, sprinkle NATURAL or BLACK topping sand to match surrounding surfaces.
7. Material is typically ready for traffic in 1-hour at 70°F (21°C). Colder temperatures will slow cure. Warmer temperatures will speed cure.

SKID RESISTANCE: It is the responsibility of the Applicator to ensure product meets minimum skid resistance requirements. Refer to the agency or end-user friction management policy or specifications to determine minimum skid resistance and test method requirements. Aggregate (Sand, pumice, flint) can be added topically at the gel stage or Fastpatch can be ground, sanded or abraded to achieve any necessary skid resistant texture.

CLEANING & MAINTENANCE

Clean equipment with POLYQuik® Cleaner or acetone immediately after use. Cured material must be removed mechanically.

HEALTH AND SAFETY

Before handling, you should become familiar with the Material Safety Data Sheet (MSDS) regarding the risks and safe use of this product. To obtain an MSDS please call 800 333 9826 or send an email to: msds@wilvaco.com.

DISCLAIMER OF WARRANTY

TEST RESULTS ARE TO BE CONSIDERED AS REPRESENTATIVE OF CURRENT PRODUCTION AND SHOULD NOT BE TREATED AS SPECIFICATIONS. WHILE ALL THE INFORMATION PRESENTED IN THIS DOCUMENT IS BELIEVED TO BE RELIABLE AND TO REPRESENT THE BEST AVAILABLE DATA ON THESE PRODUCTS, NO GUARANTEE, WARRANTY, OR REPRESENTATION IS MADE, INTENDED, OR IMPLIED AS TO THE CORRECTNESS OR SUFFICIENCY OF ANY INFORMATION, OR AS TO THE SUITABILITY OF ANY CHEMICAL COMPOUNDS FOR ANY PARTICULAR USE, OR THAT ANY CHEMICAL COMPOUNDS OR USE THEREOF ARE NOT SUBJECT TO A CLAIM BY A THIRD PARTY FOR INFRINGEMENT OF ANY PATENT OR OTHER INTELLECTUAL PROPERTY RIGHT. EACH USER SHOULD CONDUCT A SUFFICIENT INVESTIGATION TO ESTABLISH THE SUITABILITY OF ANY PRODUCT FOR ITS INTENDED USE. PROPER APPLICATION IS THE RESPONSIBILITY OF THE USER. AS WITH ANY PRODUCT THE USE OF THE THIS PRODUCT IN A GIVEN APPLICATION MUST BE TESTED (INCLUDING BUT NOT LIMITED TO FIELD TESTING) IN ADVANCE BY THE USER TO DETERMINE SUITABILITY. TESTING IS THE REQUIREMENT OF BOTH ENGINEERS AND CONTRACTORS ALIKE. WVCO DOES NOT WARRANT THE APPLICATION UNDER ANY OR ALL CIRCUMSTANCES.

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Revision Date: September 2014



Rapid Surface Repair Easy Mix™

Fast Turnaround Surface Repair for Roads & Bridges

PRODUCT DESCRIPTION

Five Star® Rapid Surface Repair Easy Mix is a self-leveling, low viscosity, two-part liquid polyurethane-hybrid polymer. When supplemented with its proprietary blended aggregate, this product is used to repair and rehabilitate concrete and asphaltic concrete pavements. The enhanced polymer is high performance, rapid setting, and can be used to make an impact and traffic resistant polymer concrete that can be used at temperatures down to 0°F (-18°C). Within minutes of placement, durable, long-lasting repairs are able to handle vibration, heavy traffic, and thermal movement.

ADVANTAGES

- No priming required to bond to concrete, asphalt, steel or wood
- Waterproof, chemically resistant membrane protects substrates from freeze-thaw spalling
- Use neat or with aggregate
- Stops further corrosion of reinforcing steel
- Traffic ready in as little as 30 minutes*
- Very low odor
- Make repairs year round — can be used in temperatures down to 0°F (-18°C)

USES

- Expansion joint and bridge header reconstruction
- Control joint filler
- Repair cracks, potholes, spalls
- Resurface runways, walkways, floors, and parking lots

PACKAGING AND YIELD

Five Star® Rapid Surface Repair Easy Mix is packaged in either .64 gal. (2.42 L) kits containing .32 gal. (1.21 L) "A" & .32 gal. (1.21 L) "B" and 50 lbs. of aggregate yielding approximately .41 ft³ (.011 m³) per kit, or in 55 gal. (208.2 L) "A" & 55 gal. (208.2 L) "B" drums. Aggregate for the drum kits is sold separately. When mixed with 172 bags of aggregate (50 lb.), drum kits will yield 70.4 ft³ (2.0 m³).

SHELF LIFE

One year in original unopened packaging when stored in dry conditions; high relative humidity and temperature will reduce shelf life.

**Traffic time dependent upon air and substrate temperature.*

TYPICAL PROPERTIES AT 77°F (25°C)	
Mix Ratio by Volume	(1) Part A : (1) Part B
Viscosity @ 77°F (25°C) - mixed	60 cps
Gel Time, Neat	2 to 3 minutes
Working time with Aggregate	Approx. 5 minutes
Cured	
Color	Dark Grey
Cure Time (reopen to traffic)	30 minutes
Hardness, Durometer D, ASTM D-2240	70
Tensile Strength, ASTM D-412	3,000 psi (20.7 MPa)
Compressive Strength, ASTM C-579B	
1 hour	2,000 psi (13.8 MPa)
1 day	6,000 psi (41.3 MPa)
7 days	7,000 psi (48.2 MPa)
28 days	8,000 psi (55.1 MPa)
Elongation, ASTM D-638	10 - 15%
Bond Strength, ASTM C-882	2,000 psi (13.8 MPa)

The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown may result. Test methods are modified where applicable.

PLACEMENT GUIDELINES

SURFACE PREPARATION

1. Prepare concrete surfaces to a minimum CSP-4 (Concrete Surface Profile per ICRI Technical Standard 03732. Ensure surfaces are clean, sound and rough prior to repair.
2. For overlays, cut keyway channel (groove) using concrete saw equipped with dry cut diamond blade around perimeter of area to be resurfaced. Keyway channel (groove) depth shall be a minimum of 1/2 inch (12.7 mm). Surfaces adjacent to a vertical plane (such as curbs, walls, tanks, etc.) shall have keyway channels cut approximately 4 – 6 inches (101.6 - 152.3 mm) back from vertical plane towards the interior of area to be resurfaced. Keyway channel shall be 1/2 inch (12.7 mm) deep by 1/2 inch (12.7 mm) wide.
3. For overlays, chip 2 inch (50.8 mm) wide taper back from interior edge of keyway channel at all termination edges (i.e., drains, doors, etc.). Using bush hammer or chipping gun equipped with a 1 – 2 inch (25.4 - 50.8 mm) wide spade blade, chip a 2 inch (50.8 mm) wide taper back from edge of interior keyway channel (groove) inward towards the area being resurfaced. Taper shall match depth of keyway channel at its deepest point, which is the edge of the keyway, and taper out to 0 inches at its most shallow point, 2 inches (50.8 mm) towards the interior of the area to be resurfaced.
4. For crack filling, route out as necessary to a maximum 1/2 inch wide by 1/2 inch deep.
5. Vacuum dust and dirt from all surfaces.
6. Surfaces must be completely dry and free of moisture prior to installation.

MIXING INSTRUCTIONS: Mix ratio is 1:1 by volume. Mix a small sample and test prior to actual placement. Larger mix volumes can generate significant exotherm. Mix Components A & B thoroughly with drill and paddle for 30 seconds then add aggregate. Continue mixing for 30 seconds until aggregate is completely wetted.

NOTE: PRIOR TO APPLICATION, READ ALL PRODUCT PACKAGING THOROUGHLY. For more detailed placement procedures, refer to Five Star® Design-A-Spec™ installation guidelines or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

CLEAN-UP: Clean tools immediately after use with xylene or MEK.

CONSIDERATIONS

- Product should be stored at 50–80°F (10–27°C).
- Product may be installed between 0–100°F (-18–37°C). For temperatures above or below these limits please consult Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.
- Keep material out of sun or hot areas prior to applying, as this may cause working time to be diminished and could cause poor appearance and/or adhesion.

CAUTION

This product may cause skin and eye irritation. Do not inhale vapors. Provide adequate ventilation. Protect against contact with skin and eyes. Wear rubber gloves, long sleeve shirt, goggles with side shields. In case of contact with eyes, flush repeatedly with water and contact a physician. Areas of skin contact should be promptly washed with soap and water. Do not take internally. Keep product out of reach of children. **PRIOR TO USE, REFER TO SAFETY DATA SHEET.**

For worldwide availability, additional product information and technical support, contact your local Five Star® distributor, local sales representative, or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

SKU / PRODUCT CODE	DESCRIPTION	#UNITS/PALLET	UNIT SIZE
30928	Five Star® Rapid Surface Repair Easy Mix Kit	120	Resin (A): 0.32 gal (1.2 L) Hardener (B): 0.32 gal (1.2 L) Aggregate (C): 50 lb. (22.7 kg) bag
30931	Five Star® Rapid Surface Repair Easy Mix Drums	4 drums	Resin (A): 55 gal (208.2 L) Hardener (B): 55 gal (208.2 L) Aggregate not included
30929	Five Star® Rapid Surface Repair Easy Mix Aggregate	60	50 lb. (22.7 KG) Bag

WARRANTY: "FIVE STAR PRODUCTS, INC. (FSP) PRODUCTS ARE MANUFACTURED TO BE FREE OF MANUFACTURING DEFECTS AND TO MEET FSP'S CURRENT PUBLISHED PHYSICAL PROPERTIES WHEN APPLIED IN ACCORDANCE WITH FSP'S DIRECTIONS AND TESTED IN ACCORDANCE WITH ASTM AND FSP STANDARDS. HOWEVER, SHOULD THERE BE DEFECTS OF MANUFACTURING OF ANY KIND, THE SOLE RIGHT OF THE USER WILL BE TO RETURN ALL MATERIALS ALLEGED TO BE DEFECTIVE, FREIGHT PREPAID TO FSP, FOR REPLACEMENT. THERE ARE NO OTHER WARRANTIES BY FSP OF ANY NATURE WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IN CONNECTION WITH THIS PRODUCT. FSP SHALL NOT BE LIABLE FOR DAMAGES OF ANY SORT, INCLUDING PUNITIVE, ACTUAL, REMOTE, OR CONSEQUENTIAL DAMAGES, RESULTING FROM ANY CLAIMS OF BREACH OF CONTRACT, BREACH OF ANY WARRANTY, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR FROM ANY OTHER CAUSE WHATSOEVER. FSP SHALL ALSO NOT BE RESPONSIBLE FOR USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT HELD BY OTHERS."

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Shelton, CT 06484 USA
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FiveStarProducts.com

Specifications Subject to Change.

For most current version of datasheet, go to FiveStarProducts.com



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Rapid Surface Repair EpoxyFix™

Concrete and Asphalt Pavement Repair

PRODUCT DESCRIPTION

Five Star® Rapid Surface Repair EpoxyFix™ is a unique, low viscosity, two-part liquid, epoxy-hybrid polymer. When supplemented with aggregates, this product is used to repair and rehabilitate concrete and asphaltic concrete pavements. The enhanced polymer is high performance, rapid setting, has a high tolerance for moisture, and can be used to make a resilient polymer concrete. Fast curing, durable, long-lasting repairs are able to handle vibration, heavy traffic, and thermal movement.

ADVANTAGES

- High moisture tolerance
- Superior bond strength
- No priming required to bond to concrete, asphalt or steel
- Traffic ready in as little as 35-40 minutes¹
- No toxic fumes during application.
- Use any clean, locally sourced stone (does not need to be kiln-dried)
- Make repairs, resurface pavements and apply protective coating year round — hot or cold.
- No VOCs

USES

- Control joint filler
- Spall and pothole repairs on concrete and asphalt pavement
- General concrete patching where flexibility is required
- Surface repairs on roads, bridges, runways, industrial floors, parking lots
- Expansion joint and bridge header reconstruction

PACKAGING AND YIELD

Five Star® Rapid Surface Repair EpoxyFix™ comes packaged in:

- 10 gal. (37.9 L) kits: 5 gal. (18.9 L) "A" & 5 gal. (18.9 L) "B"
- 100 gal. (379.0 L) kits: 50 gal. (189.0 L) "A" & 50 (189.0 L) gal. "B"

Typically, one cubic foot repair requires 3.2 gallons (12.1 liters) of liquid.

SHELF LIFE

Two years in original unopened packaging when stored in dry conditions; high relative humidity and temperature will reduce shelf life.

¹Traffic time dependent upon air and substrate temperature and depth of application.

TYPICAL PROPERTIES AT 70°F (21°C)

Mix Ratio	(1) Part A : (1) Part B
Viscosity @ 73°F	Part A: 1,600 cps / Part B: 500 cps
Specific Gravity	Part A: 1.15 / Part B: 1.08
Cured	
Color	Clear to Amber/Assumes Color of Aggregate
Specific Gravity, ASTM D-792	1.08 g/cc
Hardness, Durometer D, ASTM D-2240	55 +/- 5
Tensile Strength, ASTM D-412	800 psi (5.5 MPa)
Compressive Strength, ASTM C-579B ²	2,800 psi (19.3 MPa)
Elongation at Break, ASTM D-638	95%
Bond Strength, ASTM C-882	Concrete Failure

²With commercially available dried 3/8" crushed stone.

The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown may result. Test methods are modified where applicable.

PLACEMENT GUIDELINES

SURFACE PREPARATION

1. Prepare concrete surfaces to a minimum Concrete Surface Profile (CSP) 4 to 5 in accordance with ICRI Technical Standard 310.1R (International Concrete Repair Institute) guidelines. As an alternative, roughen concrete surfaces to coarse aggregate exposure. Blow out all repair areas thoroughly with oil free compressed air, removing all dust, debris and bond inhibiting substances. Vertical saw-cut surfaces should be sandblasted and clean.
2. All surfaces should be visibly dry prior to placement. Surfaces may be damp but best adhesion is to dry surfaces, use a torch or heat gun to dry excessively wet areas.
3. For optimum performance, liquid components should be conditioned to between 70-90°F (21-32°C) prior to use. Aggregate should be heated to a minimum 90°F (32°C) and a maximum 140°F (60°C).

MIXING: NOTE: Mix ratio is 1:1 by volume. Material may be mixed through a self-dispensing injection unit such as plural component dispensing/mixing equipment. For machine installed product refer to your operator's manual and/or consult Five Star Products' Engineering and Technical Service Center at 1-800-243-2206 for specifics.

HAND MIX INSTRUCTIONS: Five Star® Rapid Surface Repair EpoxyFix™ may be used for small repairs. Measure exactly equal amounts by volume of components A & B. Mix together for 1 to 2 minutes depending on volume and temperature. Remember, as material quantities increase, heat generated by the product increases and the pot life of mixed product will decrease respectively. Place material IMMEDIATELY after mixing.

AUTOMATED DISPENSING METHOD: Five Star® RSR EpoxyFix™ products are applied using heated liquid polymer dispensing systems and utilize an Automated Dispensing Method (ADM) for fast cure times that shorten return to traffic time considerably. Part A and Part B liquids are heated to 145-150°F (63-66°C) using drum/ band heaters, then pumped, blended by static mixer and applied directly into the aggregate. This heating method lowers the viscosity of the liquids to around 100cps and allows for a higher rate of dispensing and relatively low power usage for the pumps.

APPLICATION

1. Repair areas should have aggregate pre-placed at thicknesses of 1 to 4 inches per lift. Use 3/8" aggregate.
2. The liquids are dispensed using a Five Star® FAST-CAT (dispensing/mixing injection equipment) via a static mixer through pre-placed aggregate or poured in place. Placement must be continuous to prevent cold joints. Continue applying liquids through aggregate until liquids can be seen puddling on top surfaces of aggregate and aggregate no longer accepts liquids. For multiple lifts, pre-place additional aggregate immediately, spread and level and continue applying liquids through the next layer of aggregate. Repeat as necessary depending upon thickness of repair.
3. A topping sand or similar may be broadcast on top for skid resistant surfaces. Remove excess once material hardens.

NOTE: PRIOR TO APPLICATION, READ ALL PRODUCT PACKAGING THOROUGHLY. For more detailed placement procedures, refer to Five Star® Design-A-Spec™ installation guidelines or call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

CLEAN-UP: Clean tools immediately after use with xylene or MEK.

CONSIDERATIONS

- Product should be stored at 60 - 110°F (15 - 43°C), and conditioned to a minimum of 70°F (21°C) prior to installation.
- Product may be installed between 40 - 110°F (4 - 43°C). For temperatures above or below these limits please consult Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.
- Minimum substrate temperature 40°F (4°C) and rising with conditioned materials.
- Colder temps will reduce strength gain and time to traffic.
- For temperatures below 40°F (4°C), use Five Star® RSR EpoxyFix™ LT.

CAUTION

This product may cause skin and eye irritation. Do not inhale vapors. Provide adequate ventilation. Protect against contact with skin and eyes. Wear rubber gloves, long sleeve shirt, safety goggles. In case of contact with eyes, flush repeatedly with water and contact a physician. Areas of skin contact should be promptly washed with soap and water. Do not take internally. Keep product out of reach of children. **PRIOR TO USE, REFER TO SAFETY DATA SHEET.**

For worldwide availability, additional product information and technical support, contact your local Five Star® distributor, local sales representative, or you may call Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

SKU / PRODUCT CODE	DESCRIPTION	# UNITS/PALLET	UNIT SIZE
30936	Five Star® Rapid Surface Repair EpoxyFix™ Kit (Part A & B)	36 (18 kits)	Resin (A): 5 gal (18.9 L) Hardener (B): 5 gal (18.9 L)
30939	Five Star® Rapid Surface Repair EpoxyFix™ Drums (Part A & B)	4 (2 kits)	Resin (A): 50 gal (189.3 L) Hardener (B): 50 gal (189.3 L)
17620	Five Star® 3/8" Crushed Stone Aggregate	60	50 lb. (22.7 kg) Bag
17630	Five Star® 6-10 Broadcast Sand	60	50 lb. (22.7 kg) Bag

WARRANTY: "FIVE STAR PRODUCTS, INC. (FSP) PRODUCTS ARE MANUFACTURED TO BE FREE OF MANUFACTURING DEFECTS AND TO MEET FSP'S CURRENT PUBLISHED PHYSICAL PROPERTIES WHEN APPLIED IN ACCORDANCE WITH FSP'S DIRECTIONS AND TESTED IN ACCORDANCE WITH ASTM AND FSP STANDARDS. HOWEVER, SHOULD THERE BE DEFECTS OF MANUFACTURING OF ANY KIND, THE SOLE RIGHT OF THE USER WILL BE TO RETURN ALL MATERIALS ALLEGED TO BE DEFECTIVE, FREIGHT PREPAID TO FSP, FOR REPLACEMENT. THERE ARE NO OTHER WARRANTIES BY FSP OF ANY NATURE WHATSOEVER, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IN CONNECTION WITH THIS PRODUCT. FSP SHALL NOT BE LIABLE FOR DAMAGES OF ANY SORT, INCLUDING PUNITIVE, ACTUAL, REMOTE, OR CONSEQUENTIAL DAMAGES, RESULTING FROM ANY CLAIMS OF BREACH OF CONTRACT, BREACH OF ANY WARRANTY, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR FROM ANY OTHER CAUSE WHATSOEVER. FSP SHALL ALSO NOT BE RESPONSIBLE FOR USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT HELD BY OTHERS."

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Specifications Subject to Change.

For most current version of datasheet, go to FiveStarProducts.com



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1. PRODUCT NAME

ProSpec® Concrete Patching Mix

2. MANUFACTURER

Akona® Manufacturing, LLC, a TCC Materials® company
(Akona® Manufacturing is a licensed manufacturer of ProSpec®)
2025 Centre Pointe Blvd, Suite 300
Mendota Heights, MN 55120 USA

Phone: 1.651.688.9116
Fax: 1.651.688.9164
Internet: tccmaterials.com

3. PRODUCT DESCRIPTION

ProSpec® Concrete Patching Mix is a dry mixed combination of Portland Cement and aggregates that is proportioned and manufactured according to MnDOT specification 3105 for grade 3U18. When mixed according to specifications with water and admixtures, it is an ideal mixture for repairing concrete pavement, industrial floors, and structural concrete.

Features and Benefits

- Pre-blended concrete mixture
- High compressive strength
- Excellent durability
- Freeze/thaw resistant (when used with Air Entraining Admixture and water reducing admixture)
- Plasticized

*Call TCC Materials for state DOT approvals

Uses

- Full and partial depth repairs
- Roads and highways
- Parking structures
- Industrial floors
- New construction

SAFETY

READ THE SAFETY DATA SHEET (SDS) BEFORE USING THIS PRODUCT. SDS information is available on our website: tccmaterials.com or contact TCC Materials® at 651-688-9116 (7:30 AM to 4:00 PM, M-F, Central US Time).

CAUTIONS

Read complete cautionary information printed on product container prior to use.

This Product Data Sheet has been prepared in good faith on the basis of information available at the time of publication. It is intended to provide users with information about and guidelines

for the proper use and application of the covered ProSpec® brand product(s) under normal environmental and working conditions. Because each project is different, neither ProSpec® nor TCC Materials® can be responsible for the consequences of variations in such conditions, or for unforeseen conditions.

4. TECHNICAL DATA

Complies with ASTM C387

Typical Values • ProSpec Concrete Patching Mix		
	Mixed with water only	Mixed with Air Entraining Admixture and water reducing admixture
Unit Weight	147.2 lb./ft ³	145.8 lb./ft ³
Air Content	3.1%	5.9%
Slump	1 in. (25 mm)	1 in. (25 mm)
Water/Cement Ratio	0.385	0.345
Initial Set (hr:min)	~ 3:00	3:15
Final Set (hr:min)	~ 4:40	4:15
Compressive Strength ASTM C 39 (Moist Cured)		
24 hours	4,400 psi (30.3 MPa)	5,230 psi (36 MPa)
3 days	6,150 psi (42.4 MPa)	7,170 psi (49.4 MPa)
7 days	7,090 psi (48.9 MPa)	8,290 psi (57.1 MPa)
28 days	7,820 psi (53.9 MPa)	8,390 psi (57.8 MPa)
Flexural Strength ASTM C 78 (Moist Cured)		
7 days	840 psi (5.8 MPa)	1,035 psi (7.1 MPa)
28 days	1,060 psi (7.3 MPa)	1,055 psi (7.3 MPa)
Rapid Chloride Permeability ASTM C 1202		
RCP 28 day	2,400 C	1,191 C
RCP 56 day	1,174 C	1,153 C

Test results obtained under controlled laboratory conditions. Reasonable variations can occur due to atmospheric and job site conditions.

LEED® Eligibility¹

- Regional Materials (MR-c4, MR-c5)

Packaging

50 lb. (22.7 kg.) bag (BOM #126198)

Shelf Life

12 months from the date of manufacture when stored in the original, unopened container, away from moisture, under cool, dry conditions and out of direct sunlight.

Commercial Approvals

- Meets MNDOT specification 3105 for Grade 3U18 patching mixes

5. INSTALLATION

Preparation

All materials should be conditioned to 50°-75°F (10°-24°C) 24 hours prior to installation. Proper surface repair preparation is crucial to achieving a successful application.

1. Roughen surface and remove all unsound concrete. Clean area and remove grease, oil, paint, and any other foreign materials that will inhibit performance.
2. All concrete surfaces must be fully cured, structurally sound and non-flexing.
3. The surface should be saturated with water, Saturated Surface Dry (SSD) with no puddling of water, prior to placement.

Note: It is the responsibility of the installer/applicator to ensure the suitability of the product for its intended use.

Job Mockups

The manufacturer requires that when its ProSpec® products are used in any application or as part of any system that includes other manufacturers' products, the contractor and/or design professional shall test all the system components collectively for compatibility, performance and long-term intended use in accordance with pertinent and accepted industry standards prior to any construction. Written documentation of the tests performed shall be satisfactory to the design professional and contractor. Test results must include the means and methods of application, products used, project-specific conditions being addressed, and standardized tests performed for each proposed system or variation.

Mixing

Mixture should be placed within 60 minutes of batching. For best results use a concrete drum mixer or a paddle mixer. For concrete that will be exposed to freezing and thawing, use an Air Entraining Admixture meeting ASTM C260, such as ProSpec Liquid Air Entraining Admixture, and use a High Range Water Reducing Admixture meeting ASTM C494 Type F. Admixtures should be dosed based on manufacturer's recommendations and should be verified with test batches. Concrete should obtain 1 in. (25 mm) maximum slump and 6.5% air and should not use more than 4.75 pints of water per 50 lb. bag. Use of less water will result in higher compressive strength.

1. Start with a clean mixer that has been wetted down but does not have any standing water.
2. Place water and admixtures into mixer according to guidelines listed above. Mixing the admixtures thoroughly into the mix water will help evenly disperse them and aid with mixture consistency.
3. Place desired number of bags in the mixer. Always use full bags only. Do not exceed mixer capacity
4. Mix 3-5 minutes to a uniform, lump free consistency
5. Maintain water content, admixture dosages and mixing time from batch to batch to ensure product consistency.

If concrete mixture will be placed in an interior application, water reducer and air entrainment are not required for concrete durability. In that case, use the same mixing steps as listed above, but Maintain water and mixing time consistency among batches. but use 4-5 pints of water per bag (adjust water content to get 1 in. (25 mm)" slump).

Application

Apply only when air and substrate temperatures are between 50°-90°F (10°-32°C) within 24 hours of application and placement, and when rain is not forecast 24 hours after.

1. Shovel or place mixture immediately into pre-dampened prepared area. Application should be between 1½ in. (38 mm) to full depth.
2. Once the mixture has been compacted and spread to completely fill forms or patch, strike off with a straight board or screed, moving the edge back and forth with a saw-like motion. Use a darby or bull float to level any ridges and fill voids left by the screed.
3. Concrete shall be used and placed in final position within 1 hour after initial mixing or discarded at that time under normal temperatures. Warm temperatures will accelerate set.
4. Allow the concrete to reach initial set, wait for all water to evaporate from the surface before finishing with a trowel or broom. Can be open to foot traffic in 6 hours, wheeled traffic in 24 hours.
5. Do not retemper Concrete Patching Mix. Do not overwork the concrete mixture.

Curing

Always follow industry standard practices for finishing and curing concrete patches as described in ACI Manual of Concrete Practice.

Refer to:

ACI 308 Standard Practice for Curing Concrete

Cleaning

Use clean potable water to clean all tools immediately after use. Dried material must be mechanically removed. Use a waste water hardener (e.g. Conglez™ or similar product) for cementitious waste disposal.

Limitations

- Apply only to surfaces that are fully cured, frost free and above 50°F (10°C) and below 90°F (32°C) within 24 hours of application and 48 hours thereafter.
- Shade and protect patch in windy and/or hot weather conditions.
- During weather warm conditions, keeping mixing water and material cool should assist in maintaining open time of the product. During cold weather conditions, the use of warm mixing water and warming surfaces should accelerate set times.
- Do not over-work, over-water, retemper or overmix.
- Do not bridge over existing expansion or control joints.
- Do not mix more concrete than can be placed in 1 hour.
- ProSpec® Concrete Patching Mix should be installed in accordance with local building code provisions and all applicable ASTM standards.

Coverage

50 lb. (22.7 kg) bag yields approximately 0.45 cu. ft. (12.7 L) at a flowable consistency.

6. AVAILABILITY

To locate ProSpec® products in your area, please contact:

Phone: 1.651.688.9116
Website: tccmaterials.com

7. WARRANTY

Seller warrants that its product will conform to and perform in accordance with the product specifications. The foregoing warranty is in lieu of all other warranties, expressed or implied, including, but not limited to those concerning merchantability and fitness for a particular purpose. Because of the difficulty in ascertaining and measuring damages hereunder, it is agreed that Seller's liability to the Buyer shall not exceed the total amount billed and billable to the Buyer for the product hereunder.

8. MAINTENANCE

Not applicable.

9. TECHNICAL SERVICES

Technical Assistance:

Information is available by calling TCC Materials®

(hours 7:30 AM to 4:00 PM, M-F, CST):

Phone: 1.651.688.9116

Fax: 1.651.688.6164

Web: tccmaterials.com

Technical and Safety Literature:

To acquire technical and safety literature, please visit our website at: tccmaterials.com.

10. FILING SYSTEM

Division 3

¹ ProSpec® products can contribute to LEED® credits within the Material Resource, (Recycled Content & Regional Materials) and Indoor Environmental Quality (Low Emitting Materials).

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ProSpec® is a trademark of H.B. Fuller Construction Products Inc.

LEED® is a registered trademark of U.S. Green Building Council.

Data Sheets are subject to change without notice. For the latest revision, check our website at tccmaterials.com



AQUA PATCH

Save money by eliminating repeat repairs!

Fast - Traffic-ready immediately

Easy - Just add water

Environmentally friendly

Permanent - As hard as hot mix asphalt

Convenient - Use in Winter or
Summer, rain or shine!

U.S. Patented



**Doing the job right - the first time,
is now faster and easier than ever!**

AQUA PATCH saves time and money while delivering a superior, permanent repair to asphalt and concrete surfaces. This cold-mix, water-activated product is environmentally friendly. It sets up quickly and is traffic-ready immediately.

Unlike other asphalt patching solutions, AQUA PATCH provides a permanent solution, using revolutionary organic renewable additives, so you don't have to continually repair the same trouble spot, or replace a temporary fix with a permanent solution.

Don't let weather interfere with your production schedule. You can use AQUA PATCH all year round, in all types of weather, hot or cold, wet or dry. Rain and moisture actually helps accelerate the process.

AQUA PATCH is traffic-ready immediately after compaction, so road repairs don't tie up traffic as long.

AQUA PATCH comes ready to use and application is quick and easy. Simply clear debris from the repair area, apply AQUA PATCH, add water and tamp it down. Fast, easy and permanent!

Environmentally friendly
AQUA PATCH is water activated, environmentally friendly and non-toxic. No hydrocarbon leaching or evaporation.

1. Apply AQUA PATCH



2. Add water



3. Tamp down



AQUA PATCH

Permanent Asphalt/Concrete Repair Solution

AQUA PATCH is a cold-mix, permanent repair solution for asphalt and concrete applications that reacts with water to harden quickly, being traffic-ready immediately. The proprietary hardening agent is environmentally friendly and renewable.

Instant Strength Development

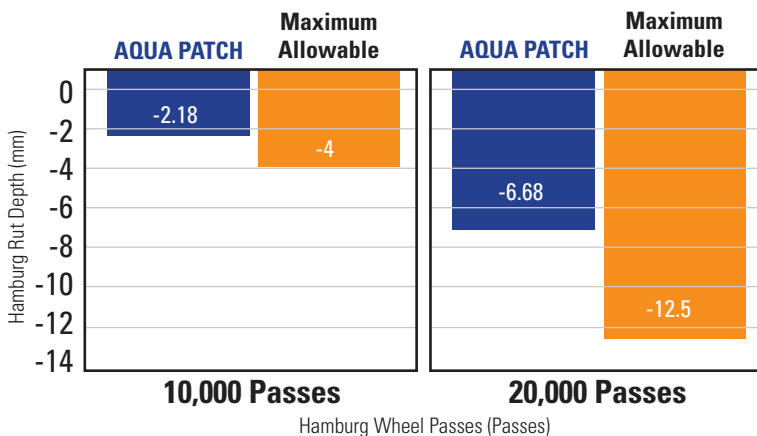
Applications:

- Asphalt road patching
- Concrete road repairs
- Pothole repairs
- Driveways, walkways and parking lots
- Utility cuts and manhole repairs
- Bridge joints

Benefits:

- Easy - pour, add water and tamp
- Durable - as hard as hot mix asphalt
- Fast & hard - traffic-ready immediately
- Saves money - eliminates repeat repairs
- Environmentally friendly
- Can be sealed with a seal coat immediately after one hour cure.

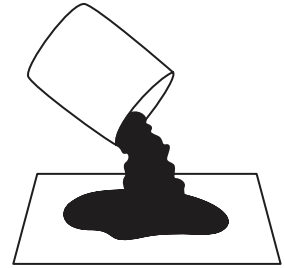
Hamburg Wheel Tracking Test (AASHTO T324)



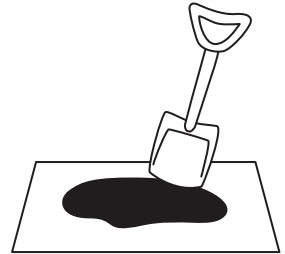
- 1 Remove loose debris and clean the area to be patched.



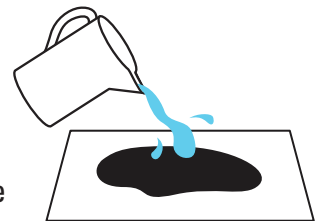
- 2 Pour AQUA PATCH in the hole.



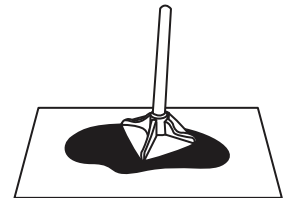
- 3 Spread and level. If deeper than 2 inches, apply in two layers.



- 4 Pour water over AQUA PATCH evenly. Excess water does not damage the material, or undermine the repair.



- 5 Compact into a smooth finish.



**AQUA
PATCH**

AquaPatchAsphalt.com • 844-869-8873



6165 W. Detroit St. • Chandler AZ 85226
1-800-528-8242 • (602) 276-0406 • FAX (480) 961-0513
www.crafco.com

PRODUCT DATA & INSTALLATION INSTRUCTIONS

HP CONCRETE COLD PATCH

PART NO. 34969

October 2013

READ BEFORE USING THIS PRODUCT

GENERAL Crafco HP Concrete Cold Patch is a unique, gray color, cold applied, single component patching material used for repairing potholes, spalls, cracks and other confined voids and distresses over 1 inch wide and greater than ½ inch deep, in portland cement concrete pavement, slab and deck surfaces. It can be used to repair roads, highways, streets, airport pavements, parking lots, bridge and parking decks, sidewalks, walkways and floors. HP Concrete Cold Patch is composed of a specially designed thermoplastic binder and a unique aggregate composition that produces an easy to use durable patching material that is a gray color like portland cement concrete. HP Concrete Cold Patch can be used in most weather conditions and will adhere in cold and damp conditions. Unlike most other concrete patching materials, no mixing, heating or special installation equipment is required. HP Concrete Cold Patch is the easiest to use and has the fastest installation of all types of concrete patching materials. To use, HP Concrete Cold Patch is simply removed from the bag, placed into the prepared area to be patched, leveled and then compacted. The patch is then ready for traffic immediately after compaction. No additional curing time is needed.

PROPERTIES Properties of Crafco HP Concrete Cold Patch are as follows:

Compacted In Place Unit Weight	125 pcf
Compacted In Place Density	2.0
Weight per Bag	50 lbs
Volume per Bag	0.40 cu ft
Workability	30 to 100F
Aggregate Size	100% passing 3/8 inch
Aggregate Durability	40% maximum Loss
Binder Coating Durability	95% minimum

INSTALLATION The repair area is to be swept clean of all loose debris and blown clean before applying patching material. The repair area surfaces can be damp but should not have free moisture present during installation. The HP Concrete Cold Patch is removed from the bag and placed into the prepared repair area. For best performance, HP Concrete Cold Patch should be applied at least ½ inch in thickness. For repairs from ½ inch to 2 inches thick, apply product in a single layer and compact. Repairs deeper than 2 inches should be filled in layers, from 1 to 2 inches thick, with compaction of each layer. The final layer should be placed approximately ¼ to ½ inch above the surface, and then be compacted to surface level with a hand or mechanical tamper or multiple passes from a vehicle tire. Compaction should be sufficient to produce firm material in the repair. Following compaction, any excess patch material is then cleaned up and the repair area can be opened to traffic. Just after installation and compaction, HP Concrete Cold Patch will be a malleable material that will not be dislodged by traffic. Over time the surface will harden. If needed at warm temperatures, initial surface tack can be reduced with a light sprinkle application of portland cement, calcium carbonate powder, or fine sand over the compacted surface. HP Concrete Cold Patch should be installed when pavement temperatures are between 30 and 100F. If applying when pavement temperatures are below 30F, the repair area can be warmed to at least 30F using a torch or heat lance. To improve workability when installing product at colder temperatures, product can be stored in a warmer area not exceeding 90F prior to use, and bags can be dropped on the ground to loosen the material, if needed.

STORAGE Pallets and bags of HP Concrete Cold Patch should be kept intact and stored under cover. Shelf life of properly stored product in unopened pallets and bags is up to 1 year. To maintain workability, leftover HP Concrete Cold Patch from an opened bag should be placed in an airtight container such as a pail or bucket with a tight fitting lid.

PACKAGING Packaging consists of individual 50 pound plastic bags which are stacked on standard 40 by 48 inch pallets. Each pallet contains 56 bags, producing a pallet weight of 2800 lbs. Palletized units are protected from the weather using a plastic pallet cover, and a minimum of two layers of six month u.v. protected stretch wrap. Pallets are labeled with the product name, part number, lot number and net product weight.

WARRANTY CRAFTCO, Inc. warrants that CRAFTCO products meet applicable specifications at time of shipment. Techniques used for the preparation of the areas to be repaired are beyond our control as are the use and application of the product; therefore, Crafco shall not be responsible for improperly applied or misused product. Remedies against Crafco, Inc., as agreed to by Crafco, are limited to replacing nonconforming product or refund (full or partial) of purchase price from Crafco, Inc. All claims for breach of this warranty must be made within three (3) months of the date of use or twelve (12) months from the date of delivery by Crafco, Inc. whichever is earlier. There shall be no other warranties expressed or implied. For optimum performance, follow Crafco recommendations for product installation.

READ BEFORE USING THIS PRODUCT

GENERAL TechCrete is gray in color, aesthetically suitable in all concrete pavements, and is used in sealing wide cracks and joints, and repairing a large variety of pavement distresses in Portland Cement Concrete Pavement and Asphalt Concrete Pavement. Pavement distresses appropriate for TechCrete include but are not limited to: A) Cracking (Corner breaks, Longitudinal and transverse cracking), B) Joint Deficiencies (Spalling of longitudinal and transverse joints), C) Surface Defects (Map cracking and scaling, Popouts), and D) Miscellaneous distresses (Blowups, Faulting of transverse joints and cracks, Lane-to-shoulder dropoff, Lane-to-shoulder separation, and Patch/Patch deterioration). TechCrete is used in highway, street, road, parking lot, bridge decks, airport taxiways and runways, and other pavement surfaces. The unique design features of TechCrete produce an impervious, impact-resistant; load-bearing, flexible repair that withstands vehicle traffic, aircraft, movement and climatic conditions.
 VOC = 0 g/l.

TechCrete-R ("TC-R") and TechCrete-TBR ("TC-TBR") are hot-applied, flexible mastic sealant compounds made of polymer-modified synthetic resin containing fibers, fillers, fines and high quality aggregate. TC-R and TC-TBR are supplied in powder / granular form in meltable bags. To use, bags of TC-R or TC-TBR are placed in an approved melter (Crafco Patcher I or II) where it is mixed and heated to the required installation temperature range. Heated TC-R or TC-TBR is then poured into the prepared pavement section and leveled as described in the Installation Instructions. The repair is then covered with a specific surfacing aggregate (Crafco Part No. 33374) or a surfacing aggregate specified in the project plan and approved by Crafco. The repair is allowed to cool and solidify prior to opening to traffic.

Read all information prior to using TC-R or TC-TBR: 1) Product Data Sheet, 2) Safety Data Sheet, 3) Installation Instructions, and 4) Patcher Equipment Safety Manual.

TechCrete is supplied as TechCrete-R and TechCrete-TBR.

Product	Recommended Use
TechCrete-R ("TC-R") Part Number 34952 Contains ideal pre-measured, pre-mixed combination of proprietary binder and fine aggregate designed to provide all the benefits of TechCrete. TC-R contains smaller aggregate than TC-TBR and is used in shallow repairs where neat edge feathering is required.	Wide Cracks and Joints TC-R is designed to treat wide cracks and joints with a minimum width of 1.5 inches (38 mm) and up to 4 inches (100 mm) wide and up to full-depth repairs. Surface Defects and Miscellaneous Distresses TC-R is designed for treating most other distresses as partial-depth repairs less than to 0.75 inch (20 mm) deep.
TechCrete-TBR ("TC-TBR") Part Number 34953 Contains ideal pre-measured, pre-mixed combination of proprietary binder and aggregate designed to provide all the benefits of TechCrete. TC-TBR contains larger aggregate than TC-R and is used in larger and deeper repairs- a minimum of 1.5-inch depth (38 mm) is required to install	Wide Cracks and Joints TC-TBR is designed to treat wide cracks and joints greater than or equal to 2 inches (50 mm) wide and up to full-depth repairs. Surface Defects and Miscellaneous Distresses TC-TBR is designed for treating most other distresses as partial-depth repairs from 0.75 to 8 inches (20 to 200 mm) deep, recognizing that the minimum application depth is 1.5 inches (38 mm). For deeper repairs, while not required, TechCrete-R & TBR can be bulked with additional aggregate - contact your Crafco representative.

SPECIFICATION CONFORMANCE Specification limits for TC-R and TC-TBR are as follows:

PARAMETER	TechCrete-R	TechCrete-TBR
Color	Gray	Gray
Form	Powder	Powder
Specific Gravity (ASTM D2726 Modified)	2.08	2.03
Binder Content (ASTM D6307 Method A), %	15 – 25	15 – 25
Aggregate Passing the 0.625 inch (ASTM D5444), % Retained on the No. 16, %	--	100 minimum
Passing the No. 4 Sieve, %	100 minimum	55 minimum
Flow (ASTM D5329 Modified), 5 h 140°F(60°C), mm	5 maximum	5 maximum
Tensile Test (Briquette) (AASHTO T140 Modified TTM5) at 20°F (-7°C), 3 specimens, pounds.	50 – 200 (222 – 890 N)	50 – 200 (222 – 890 N), at least 2 out of 3 fail between grips
Tensile Adhesion, (ASTM D5329 Modified), psi (kPa)	12 psi (83 kPa) minimum, 0.5 inches (12 mm) minimum elongation	12 psi (83 kPa) minimum, 0.5 inches (12 mm) minimum elongation
Impact Testing (ASTM D2794, 2 inch (50 mm) diameter, 1 inch (25 mm) thick specimen, 0.625 inch (16 mm) impact dart	No cracking, chipping or separation at 6 ft·lb (8.1 N·m) at 20°F (-7°C)	No cracking, chipping or separation at 6 ft·lb (8.1 N·m) at 20°F (-7°C)
Flexibility, Lab Standard Conditions (ASTM D3111)	No Cracking or Loss of Aggregate Adhesion	No Cracking or Loss of Aggregate Adhesion
Minimum Application Temperature	375°F (190°C)	375°F (190°C)
Maximum Heating Temperature	400°F (204°C)	400°F (204°C)
Shelf Life	2 years	2 years

INSTALLATION Prior to use, the user must read and follow Installation Instructions for TC-R or TC-TBR to verify proper product selection, heating methods, pavement preparation procedures, application geometry, usage precautions and safety procedures. These instructions are provided with each shipment.

PACKAGING TC-R and TC-TBR are packaged in meltable bags each containing approximately 35 +/- 2 pounds (15.8 +/- 1 kg) of product. Bags are stacked and stretch wrapped on pallets containing approximately 2700 lb (1225 kg). Pallets are weighed and the product is sold by net weight. Each 35 lb bag of TC-R fills a void ~ 0.27 cu ft (0.008 cu m). Each TC-R pallet fills a void ~20 cu ft (0.59 cu m). Each 35 lb bag of TC-TBR fills a void ~ 0.28 cu ft (0.008 cu m). Each TC-TBR pallet fills a void ~21 cu ft (0.59 cu m).

WARRANTY CRAFTCO, Inc. warrants that CRAFTCO products meet applicable ASTM, AASHTO, Federal or State specifications at time of shipment. Techniques used for the preparation of the cracks and joints prior to sealing or filling are beyond our control as are the use and application of the products; therefore, Crafcro shall not be responsible for improperly applied or misused products. Remedies against Crafcro, Inc., as agreed to by Crafcro, are limited to replacing nonconforming product or refund (full or partial) of purchase price from Crafcro, Inc. All claims for breach of this warranty must be made within three (3) months of the date of use or twelve (12) months from the date of delivery by Crafcro, Inc. whichever is earlier. There shall be no other warranties expressed or implied. **For optimum performance, follow Crafcro recommendations for product installation.**

Product Description

TCC Materials® Air-Entrained Concrete Patching Mix (3U18M) is ideal for repairing concrete pavement, bridge decks, industrial floors, concrete parking lots and garage decks. When mixed with water, this pre-blended mixture of cement, aggregate and special additives will produce a high-strength concrete repair material that is extremely durable and works well in harsh environments. **Additionally, when used with TCC Fast-Set Liquid Activator surfaces can be reopened to traffic within four to five hours under typical conditions.**

Air-Entrained Concrete Patching Mix is a modified version of TCC Concrete Patching Mix which has been designed to meet the requirements of MNDOT specification 3105 "Bagged Portland Cement Concrete Patching Mix 3U18".

When/Where to Use

Use for full and partial depth repair of concrete pavements, parking structures, bridge deck repair, industrial floors, new slab construction, formed concrete work, and grouting.

Advantages

- Excellent flowability and workability
- Durable patching material
- High compressive strength mix
- Pre-blended mixture
- Freeze/thaw and salt resistance properties
- Includes water reducer for improved strength, durability and workability
- Air entrained concrete patch

Typical Yield

50 lb. (22.7 kg) bag will yield approximately 0.375 cubic feet (wet). 72 bags will cover approximately 1 cubic yard.

Packaging

50 lb. (22.7 kg) bags

Helpful Items:



Surface Preparation

Surface to be repaired should be clean, sound, and free from any materials that may inhibit bond such as oil, asphalt, curing compounds, acids, dirt and loose debris. Roughen surface and remove all unsound concrete. Immediately prior to placement the repair surface shall be thoroughly saturated with no standing water. For optimal bond in partial-depth repair applications, apply a cement/water slurry to the repair surface immediately prior to placing the patch. Slurry must still be damp when patch is placed.

Mixing and Application

Place the desired number of bags of mix into the mixer. Use full bags only and do not exceed mixer capacity. Add clean, potable water to mix. Total water should be approximately 3-4 pints per 50 lb. bag. Water content may vary based on desired slump and ambient temperature. **When using with TCC Fast-Set Liquid Activator refer to mixing instructions on the Activator Data Sheet instead of the standard instructions here.** Mix initially for about 3 minutes. Let the mix stand for 3 minutes. Mix again for about 2 minutes. Designed slump is about 4-6". Targeted air content is 6.5% ($\pm 1.5\%$). Do not add additional additives unless noted above. After placement, follow industry practices for curing concrete patches.

Technical Data	
Tests Performed	Air Entrained Concrete Patching Mix
Compressive Strength, psi (ASTM C39)	
1 day	4,040
3 day	5,230
7 day	6,160
28 day	6,930
Tensile Strength, psi (ASTM C496)	
7 day	460
28 day	550
Shelf Life	One year in original, unopened bags
Storage Conditions	Store dry at 40-95°F (4°C -35°C). Condition material to 65-75°F before using.
Color	Gray
Batching Method	Per ASTM C387



Warning

This product contains Portland cement. Contact with cement, freshly mixed concrete, or mortar can cause severe burns. The cementitious materials mixed onsite are alkaline in nature and on contact with water may irritate the eyes and skin. If contact with eyes occurs, flood eyes repeatedly with clean water and see a physician immediately. Do not rub eyes. Wash hands thoroughly after handling or before eating. Do not take internally. This product may contain silica. Inhaled silica dust may cause respiratory or other health problems.

Warranty

Seller warrants that its product will conform to and perform in accordance with the product specifications. The foregoing warranty is in lieu of all other warranties, express or implied, including, but not limited to, those including merchantability and fitness for a particular purpose. Because of the difficulty in ascertaining and measuring damages hereunder, it is agreed that, the seller's liability to the buyer at no point for any particular project shall exceed the total purchase price of said product.

WARNING: INJURIOUS TO EYES!

KEEP OUT OF REACH OF CHILDREN!



USG ECOFIX™ RAPID REPAIR PATCH

Innovative polymer-modified cementitious infrastructure repair material

- Next generation technology for infrastructure repair applications
- Environmentally sustainable – high recycled content, low embodied energy, low carbon footprint
- Sets rapidly in about 30 minutes; provides rapid repair and return to service one hour after set
- Ideal for concrete pavement repairs on expressways, roads, ramps, bridges, parking lots, and industrial concrete floors
- Superior bond to concrete substrates without bonding primers
- Versatile—product can be placed in a variety of environmental conditions including hot, humid, and cold weather conditions
- Extremely water durable
- Extremely durable even under the most severe environmental conditions — freezing and thawing, salt application, and heavy traffic
- Suitable for full depth repairs, partial depth repairs, and on-grade applications
- May assist in obtaining LEED® credits and achieving local, state, and state DOT's sustainability objectives
- Meets ASTM C928 standard specification
- NTPEP-tested (Project No. 15-01-010)

DESCRIPTION

USG EcoFix™ Rapid Repair Patch is a high-performance, air-entrained, rapid-setting, eco-friendly cementitious mortar for use in infrastructure repair applications. Whether used neat or with aggregate, USG EcoFix Rapid Repair Patch provides superior working properties and excellent water and freeze-thaw resistance. In addition, USG EcoFix Rapid Repair Patch is a highly dimensionally stable product and provides excellent resistance to sulfates and salt-scaling.

Due to its special chemical composition, USG EcoFix Rapid Repair Patch develops excellent bond to concrete substrates without requiring a bonding primer. The product's 65% recycled content in the cementitious binder, low embodied energy, and low carbon footprint makes it an environmentally sustainable material. USG EcoFix Rapid Repair Patch may also assist in obtaining various LEED credits for the project.

USG EcoFix Rapid Repair Patch meets the ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repair.

LIMITATIONS

1. Keep all raw materials at temperatures above freezing (32 °F (0 °C)). The application, neat or aggregate, must be at temperatures above 32 °F (0 °C).
2. Consult a United States Gypsum Company representative or the structural design engineer on record for use in new structural construction.
3. Contact USG (800-874-4968) for below-grade and vertical applications.

SURFACE PREPARATION

Consult *ICRI Guideline No. 310.2 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlay* for surface preparation equipment and methods. Mark off damaged areas and make a 2 in. vertical cut with a concrete saw or other suitable equipment around the perimeter of the damaged area. Break out all material within the cut area and clean all debris from the hole. A structurally sound base is essential for ensuring a good repair job. Ensure that the application surface is clean, sound, and free from contaminants that may inhibit bond such as oil, wax, asphalt, acid, curing compound, dirt and loose debris. It is important to have the damaged areas prepared prior to mixing USG EcoFix Rapid Repair Patch. Note - the existing concrete does not require a bonding primer. Lightly dampen the surrounding concrete, especially in hot weather conditions. Apply USG EcoFix Rapid Repair Patch to saturated surface dry (SSD) substrate with no standing water.

For on-grade full depth or partial depth repairs, please follow the procedures as outlined by the U.S. Department of Transportation Federal Highway Administration. These procedures are available at the following weblinks: Full Depth Repair - <http://www.fhwa.dot.gov/pavement/concrete/full.cfm>; Partial Depth Repair - <http://www.fhwa.dot.gov/pavement/concrete/repair00.cfm>.

NOTE Per ACI CT-13 ACI Concrete Terminology Standard, saturated surface dry (SSD) is defined as the condition of an aggregate particle or other porous solid when the permeable pores are filled with water and no water is on the exposed surfaces.

EQUIPMENT

Use a standard concrete mixer for mixing the material. Per *ICRI Guideline No. 320.5R Pictorial Atlas of Concrete Repair Equipment*, the acceptable concrete mixers include: Type A Horizontal Shaft Mixer, Type B Tumble Mortar Mixer, and Type D Pan-Type Mortar Mixer. The batch size will be controlled by the size of the mixer. However, due to the rapid setting behavior of USG EcoFix Rapid Repair Patch, the total mix should be limited to a quantity that can be mixed and placed in about 15 minutes. Do not use high shear mixers that tend to entrap excessive amounts of air in the material. Ensure that all equipment is properly cleaned prior to mixing.

TYPICAL MIXING PROPORTIONS

USG EcoFix Rapid Repair Patch is a pre-sanded cementitious powder packaged in 50 lb. bags. The pre-sanded material can be used neat or extended with clean 3/8" to 1/2" aggregate and a measured amount of water.

Neat Mix

- 50 lb. USG EcoFix Rapid Repair Patch
- 2.25 quarts potable water

Extended Mix

- 50 lb. USG EcoFix Rapid Repair Patch
- 32.5 lb. clean aggregate (3/8" to 1/2" maximum aggregate size)
- 2.25 quarts potable water

For an extended mix, use only 3/8" to 1/2" clean, saturated surface dry (SSD) aggregates meeting ASTM C33 specification. When using wet aggregate, adjust water quantity for the aggregate moisture content. **Because USG EcoFix Rapid Repair Patch is pre-sanded, do not add any field sand to the mixture.**

The batch may be scaled up as long as the mixer capacity is not exceeded. Maintain the leading edge in workable consistency to ensure proper homogeneity of poured material from successive batches. Note that the material has a manufactured set time of about 25 to 35 minutes.

MIXING PROCEDURES

1. Introduce measured amount of water to mixer.
2. Add half the amount of aggregate into mixer (for mixes with aggregate extension).
3. Add USG EcoFix Rapid Repair Patch into mixer with mixer operating.
4. Slowly add the remainder of the aggregates into mixer (for mixes with aggregate extension).
5. Mix for three minutes. Then, if necessary, add more water in small amounts during additional mixing to obtain desired fluidity. See *USG EcoFix Products – Mixing Proportions Chart* (IG5132) for additional mixing information.
6. Mix until lump free, but not for more than six minutes.
7. Dump batch and immediately deliver the mixed material to the prepared pavement area. For an area that requires more than one batch, material should preferably be poured in layers. Clean mixer by adding water and allowing mixer to run. Dispose cleaning water in accordance with local storm water regulations before starting another batch.
Note Prior to placing USG EcoFix Rapid Repair Patch, the area to be repaired should be wetted with water to minimize water withdrawal from the material. The substrate must be in saturated surface dry condition and there should be no freestanding water in the cavity to be patched.
8. Level the USG EcoFix Rapid Repair Patch to the surrounding pavement with an appropriate screeding device, and before set, broom finish if necessary. If a smooth finish is desired, trowel lightly before set.
9. Allow USG EcoFix Rapid Repair Patch to develop strength for a minimum of one hour after set. After this time, traffic can resume over the patched area.

YIELD

USG EcoFix Rapid Repair Patch is available in 50 lb. multiwall paper bags with a 3-mil thick polyethylene liner. The 50 lb. bag material when mixed with specified amount of water has a yield of about 0.42 cu.ft. The 50 lb. bag material when extended with 32.5 lb. aggregate and mixed with specified amount of water has a yield of about 0.62 cu.ft.

PRECAUTIONS

1. Do not overwater or overmix.
2. Do not add additional sand to USG EcoFix Rapid Repair Patch.
3. Do not add additional cement, fly ash, or other chemical or mineral admixtures to the product.
4. Do not use reactive aggregates that can potentially cause alkali-silica reaction.
5. Damaged pavement must be completely removed, and the cavity cleared free of debris. Provide at least a vertical cut at the perimeter of the prepared area. Do not trowel EcoFix Rapid Repair Patch to a thin, feathered edge.
6. Do not permit USG EcoFix Rapid Repair Patch mix to freeze before set has taken place. If USG EcoFix Rapid Repair Patch is to be used at or near freezing temperatures, the following is recommended.
 - (a) Keep materials and equipment as warm as possible.
 - (b) Keep mortar and adjacent pavement above 32 °F (0 °C) until USG EcoFix Rapid Repair Patch has set.
7. Under hot, windy conditions, use of an approved concrete curing membrane may be required to prevent surface dry out.
8. If USG EcoFix Rapid Repair Patch is being used to patch an area adjacent to non-concrete materials such as control or expansion joints, a bonding agent approved by appropriate government regulatory agencies and used in accordance with manufacturer's recommendations is suggested.
9. Determine that the patch has set for at least one hour before allowing traffic to resume over patched area.
10. Do not leave material in mixer for longer than 15 minutes. If excessive buildup is detected on the equipment, clean prior to the next batch mixing.

TECHNICAL DATA

PROPERTIES	TESTING STANDARD	NEAT MATERIAL FROM BAG USG EcoFix: 50 lb. Water: 2.25 quart	MATERIAL WITH AGGREGATE EXTENSION USG EcoFix: 50 lb. Aggregate (3/8" to 1/2"): 32.5 lb. Water: 2.25 quarts
Setting Time	ASTM C191/ AASHTO T131	25-35 min.	25-35 min.
Length Change	ASTM C157 (modified per ASTM C928)	Air cure at 28 days -0.10% Water cure at 28 days +0.02%	Air cure at 28 days -0.05% Water cure at 28 days +0.01%
Compressive Strength (2" Cubes)	ASTM C109 ¹	2 hours 2500 psi 3 hours 3500 psi 4 hours 4000 psi 24 hours 6500 psi 7 days 8500 psi 28 days 10500 psi	2 hours 2500 psi 3 hours 3500 psi 4 hours 4000 psi 24 hours 6000 psi 7 days 8000 psi 28 days 10000 psi
Compressive Strength (3"x6" Cylinders)	ASTM C39/ AASHTO T22 ¹	2 hours 2500 psi 3 hours 3000 psi 4 hours 3500 psi 24 hours 5500 psi 7 days 7000 psi 28 days 8000 psi	2 hours 2500 psi 3 hours 3000 psi 4 hours 3500 psi 24 hours 5000 psi 7 days 6500 psi 28 days 7500 psi
Direct Bond Strength to Concrete Substrate (ICRI CSP 5 Surface Profile Substrate)	ASTM C1583	28 days > 250 psi	28 days > 300 psi
Bond Strength to Concrete Substrates	ASTM C882 (modified per ASTM C928)	24 hours >2500 psi 7 days >3500 psi	24 hours >2500 psi 7 days >3000 psi
Freeze-Thaw Resistance	ASTM C666/ AASHTO T161 (Procedure A)	1200 Cycles	1200 Cycles
	ASTM C215	Relative Dynamic Modulus >95%	Relative Dynamic Modulus >95%
Salt Scaling Resistance	ASTM C672	Excellent No significant weight loss (<0.10 lb/sq. ft. after 75 cycles)	Excellent No significant weight loss (<0.10 lb/sq. ft. after 75 cycles)
Chloride Permeability	ASTM C1202/ AASHTO T277	Permeability Class - Low	Permeability Class - Very Low
Thermal Compatibility	ASTM C884	PASS (no delamination)	PASS (no delamination)
Yield (50 lb. Dry Powder)	ASTM C1107	0.42 cu.ft.	0.62 cu.ft.

1. Samples dry cured at 50% relative humidity and 75 °F (24 °C) temperature

STORAGE AND USE

When properly used, USG EcoFix Rapid Repair Patch is easy to work with. Keep indoors at temperatures between 65 °F – 75 °F (18 °C – 24 °C) and 45% – 55% RH. Do not stack more than two pallets high. Keep from drafts. Rotate stock. USG EcoFix Rapid Repair Patch should be used within one year of the manufacturing date located on the package. Always follow handling and use directions and safety warnings on the package.

SUBMITTAL APPROVALS

Job Name	
Contractor	Date

PRODUCT INFORMATION
See usg.com for the most up-to-date product information.

LEED INFORMATION
For the most up-to-date information on LEED rating systems, project certification and the U.S. Green Building Council, please visit usgbc.org.

DANGER
Causes skin irritation. Causes serious eye damage. May cause an allergic skin reaction. Harmful if swallowed. Avoid breathing dust. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection. Use only in a well-ventilated area, wear a NIOSH/MSHA-approved respirator. If swallowed, inhaled, or skin irritation occurs get medical attention. If on skin: Wash with plenty of water. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses and continue rinsing. Do not eat drink or smoke when using this product. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reuse. Dispose of in accordance with local, state, and federal regulations. For more information call Product Safety: 800-507-8899 or see the SDS at usg.com.

KEEP OUT OF REACH OF CHILDREN.

TRADEMARKS
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NOTICE
We shall not be liable for incidental or consequential damages, directly or indirectly sustained, nor for any loss caused by application of these goods not in accordance with current printed instruction or for other than the intended use. Our liability is expressly limited to replacement of defective goods. Any claim shall be deemed waived unless made in writing to us within thirty (30) days from date it was or reasonably should have been discovered.

SAFETY FIRST!
Follow good safety/industrial hygiene practices during installation. Wear appropriate personal protective equipment. Read SDS and literature before specification and installation.

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IG1932-USA-ENG/rev. 1-18
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DOT REPAIR MIX

High Performance Concrete Repair Material



PRODUCT DATASHEET

DESCRIPTION: Rapid Set® DOT REPAIR MIX is a high performance, fast setting, multi-purpose repair material. Durable in wet environments, DOT REPAIR MIX is a blend of Rapid Set hydraulic cement, high performance additives and ASTM C33 concrete sand. DOT REPAIR MIX is non-metallic and no chlorides are added. Mix DOT REPAIR MIX with water to produce a flowable, quality repair material that is ideal where fast strength gain, high durability and low shrinkage are desired. DOT REPAIR MIX is ready for traffic and loading within 1 hour.*

USES: Use DOT REPAIR MIX for concrete repair, highway repair, dowel bar retrofit, construction of pavements and bridges, parking decks and ramps, sidewalks and steps, joint repair and formed work. DOT REPAIR MIX contains an air-entraining admixture, in some geographical regions, for freeze thaw durability.

ENVIRONMENTAL ADVANTAGES: Use DOT REPAIR MIX to reduce your carbon footprint and lower your environmental impact. Production of Rapid Set cement emits far less CO₂ than portland cement. Contact your Rapid Set representative for LEED values and further environmental information.

APPLICATIONS: Apply DOT REPAIR MIX in thicknesses from 1/2" to 4" (1.2 cm to 10.2 cm). For thicker applications, DOT REPAIR MIX can be extended with up to 100% clean, dry coarse aggregate (up to 3/4") conforming to ASTM C33.

SURFACE PREPARATION: For repairs, application surface shall be clean, sound and free from any materials that may inhibit bond such as oil, asphalt, curing compound, acid, dirt and loose debris. Mechanically abrade surface and remove all unsound material. Apply DOT REPAIR MIX to a thoroughly saturated surface with no standing water.

MIXING: The use of a power driven mechanical mixer, such as a mortar mixer or a drill-mounted mixer, is recommended. Organize work so that all personnel and equipment are in place before mixing. Use clean potable water. **DOT REPAIR MIX may be mixed using 3 to 4.5 quarts (2.8 L to 4.3 L) of water per 55-lb (25 kg) bag. Use up to 5 quarts (4.7 L) when extended with dry coarse aggregate. Use less water to achieve higher strengths.** Place the desired quantity of mix water into the mixing container. While the mixer is running, add DOT REPAIR MIX. Mix for the minimum amount of time required to achieve a lump-free, uniform consistency (usually 1 to 3 minutes). Do not retemper.

PLACEMENT: DOT REPAIR MIX may be placed using traditional construction methods. Organize work so that all personnel and equipment are ready before placement. Place, consolidate and screed quickly to allow for maximum finishing time. Use a method of consolidation that eliminates air voids. On flat work, do not install in layers; install full depth sections and progress horizontally. Do not wait for bleed water. Apply final finish as soon as possible. DOT REPAIR MIX may be troweled, floated or broom finished. The working time for DOT REPAIR MIX is 10 to 25 minutes at 70°F (21°C). To extend working time, use Rapid Set® SET Control® retarding admixture from the Rapid Set® Concrete Pharmacy® or use cold mix water. Do not install on frozen surfaces. DOT REPAIR MIX may be applied in temperatures ranging from 45°F to 90°F (7°C to 32°C).

OVERVIEW

Highlights:

Fast: Ready for traffic and loading in 1 hour

Durable: Formulated for long life in critical applications

Structural: For repair and new construction

Extendable: Add rock for large placements

Easy To Use: Mix to fluid or stiff consistency

Multi-Purpose: Use for concrete repair, highway repair, dowel bar retrofit, construction of pavements, bridges, parking decks, ramps, sidewalks, steps, joint repair, formed work and more

Conforms to:

ASTM C928

California Test No. 551

MasterFormat® 2016

03 01 30 Maintenance of Cast-in-Place Concrete

03 01 40 Maintenance Of Precast Concrete

03 01 50 Maintenance of Cast Decks and Underlayment

03 01 70 Maintenance of Mass Concrete

Manufacturer:

CTS Cement Manufacturing Corp.
11065 Knott Ave., Suite A
Cypress, CA 90630
Tel: 800-929-3030 | Fax: 714-379-8270
Web: www.CTScement.com
E-mail: info@CTScement.com



DOT REPAIR MIX

High Performance Concrete Repair Material

CURING: Water cure all Rapid Set® DOT REPAIR MIX installations by keeping exposed surfaces wet for a minimum of 1 hour. Begin curing as soon as the surface starts to lose its moist sheen. When experiencing extended setting time due to cold temperature or the use of retarder, longer curing times may be required. The objective of water curing shall be to maintain a continuously wet surface until the product has achieved sufficient strength.

COLD WEATHER: Environmental and material temperatures below 70°F (21°C) may delay setting time and reduce the rate of strength gain. Lower temperatures will have a more pronounced effect. Thinner sections will be more significantly affected. To compensate for cold temperatures, keep material warm, use heated mix water, and follow ACI 306 Procedures for Cold Weather Concreting.

WARM WEATHER: Environmental and material temperatures above 70°F (21°C) may shorten setting time and increase the rate of strength gain. Higher temperatures will have a more pronounced effect. To compensate for warm temperatures, keep material cool, use chilled mix water and follow ACI 305 Procedures for Hot Weather Concreting. The use of Rapid Set® SET Control® retarding admixture from the Rapid Set® Concrete Pharmacy® will help offset the effects of high temperatures.

YIELD & PACKAGING: DOT REPAIR MIX is available in 55 lb (25 kg) bags. One 55 lb (25 kg) bag of DOT REPAIR MIX will yield approximately 0.5 ft³. When extended 60% by weight with quality coarse aggregate, yield is approximately 0.7 ft³. When extended 100% by weight with quality coarse aggregate, yield is approximately 0.9 ft³.

SHELF LIFE: DOT REPAIR MIX has a shelf life of 12 months when stored properly in a dry location, protected from moisture, out of direct sunlight, and in an undamaged package.

USER RESPONSIBILITY: Before using CTS products, read current technical data sheets, bulletins, product labels and safety data sheets at www.CTScement.com. It is the user's responsibility to review instructions and warnings for any CTS products prior to use.

WARNING: DO NOT BREATHE DUST. AVOID CONTACT WITH SKIN AND EYES. Use material in well-ventilated areas only. Exposure to cement dust may irritate eyes, nose, throat, and the upper respiratory system/lungs. Silica exposure by inhalation may result in the development of lung injuries and pulmonary diseases, including silicosis and lung cancer. Seek medical treatment if you experience difficulty breathing while using this product. The use of a NIOSH/MSHA-approved respirator (P-, N- or R-95) is recommended to minimize inhalation of cement dust. Eat and drink only in dust-free areas to avoid ingesting cement dust. Skin contact with dry material or wet mixtures may result in bodily injury ranging from moderate irritation and thickening/cracking of skin to severe skin damage from chemical burns. If irritation or burning occurs, seek medical treatment. Protect eyes with goggles or safety glasses with side shields. Cover skin with protective clothing. Use chemical resistant gloves and waterproof boots. In case of skin contact with cement dust, immediately wash off dust with soap and water to avoid skin damage. In case of skin contact with wet concrete, wash exposed skin areas with cold running water as soon as possible. In case of eye contact with cement dust, flush immediately and repeatedly with clean water, and consult a physician. If wet concrete splashes into eyes, rinse eyes with clean water for at least 15 minutes and go to the hospital for further treatment.

PROPOSITION 65 WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm. Please refer to the SDS and www.CTScement.com for additional safety information regarding this material.

LIMITED WARRANTY: CTS CEMENT MANUFACTURING CORP. (CTS) warrants its materials to be of good quality and, at its option, will replace or refund the purchase price of any material proven to be defective within one (1) year from date of purchase. The above remedies shall be the limit of CTS's responsibility. Except for the foregoing, all warranties expressed or implied, including merchantability and fitness for a particular purpose, are excluded. CTS shall not be liable for any consequential, incidental, or special damages arising directly or indirectly from the use of the materials.

TYPICAL PHYSICAL DATA

Neat Bag (3.0 to 4.5 quarts)	60% Extension (3.5 to 4.75 quarts)	100% Extension (3.5 to 5.0 quarts)
Yield		
0.5 ft³	0.7 ft³	0.9 ft³
Compressive Strength		
ASTM C109 Mod.	ASTM C39	ASTM C39
1 hr* 3300 psi	1 hr* 2800 psi	1 hr* 2500 psi
3 hrs 5000 psi	3 hrs 4600 psi	3 hrs 4200 psi
24 hrs 7000 psi	24 hrs 6800 psi	24 hrs 6500 psi
7 days 7500 psi	7 days 7200 psi	7 days 7000 psi
28 days 9500 psi	28 days 9000 psi	28 days 8500 psi
Flexural Strength, ASTM C78		
4 hrs 450 psi	4 hrs 400 psi	4 hrs 400 psi
7 days 700 psi	7 days 650 psi	7 days 600 psi
28 days 900 psi	28 days 850 psi	28 days 800 psi
Modulus of Elasticity, ASTM C469		
7 days 4,400,000 psi	7 days 4,100,000 psi	7 days 3,900,000 psi
28 days 5,100,000 psi	28 days 4,500,000 psi	28 days 4,000,000 psi
Slant Shear Bond Strength, ASTM C882 per C928		
1 day 1500 psi	1 day 1200 psi	1 day 1100 psi
7 days 2000 psi	7 days 1800 psi	7 days 1700 psi
Splitting Tensile Strength, ASTM C496		
7 days 700 psi	7 days 500 psi	7 days 390 psi
28 days 900 psi	28 days 600 psi	28 days 415 psi
Resistance of Concrete to Rapid Freezing and Thawing, ASTM C666 Procedure A		
Durability factor 300 Cycles: 95%	Durability factor 300 Cycles: 95%	Durability factor 300 Cycles: 95%
Scaling Resistance, ASTM C672 per C928		
Scaling of material at 25 cycles: 0.05 lb/ft²	Visual rating at 25 cycles - 2	Visual rating at 25 cycles - 1
Length Change, ASTM C157 modified per ASTM C928		
Air Cure: -0.08% Water Cure: 0.02%	Air Cure: -0.07% Water Cure: 0.01%	Air Cure: -0.05% Water Cure: 0.05%
*Data obtained at flow consistency of 105 by ASTM C1437 at laboratory conditions	*Data obtained at slump consistency at 6" by ASTM C143 at laboratory conditions	*Data obtained at slump consistency at 6" by ASTM C143 at laboratory conditions

*After final set
Results will vary depending on aggregates and jobsite conditions



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Micro-Rebar

Data Sheet

Product: Helix 5-25

Description:

The unique, twisted design of Helix allows for efficient tensile stress re-distribution within the concrete prior to concrete cracking. The result is a significant increase in the concrete's strain capacity and pre-crack properties. Unlike rebar and other forms of reinforcement, Helix provides proactive reinforcement which engages the concrete before large cracks form.

Applications:

- Structural Walls
- Structural Floors
- Foundations
- Beams/Columns
- Shotcrete
- Paving
- Precast
- Rebar Replacement

Approvals:

Uniform ES Evaluation Report 0279

www.helixsteel.com/technical

www.iapmoes.org

Meets Specifications:

ACI 318

ACI 360

ASTM A820-Type I



Geometry:

Length: 25 mm (1.00 in)

Diameter: 0.50 mm (0.02 in)

25,307 fibers/kg (11,500 fibers/lb)

Tensile Strength:

Tensile Strength: 246.5 ksi minimum
(1700 Mpa minimum)

Material: High Carbon Steel Wire

Coating:

Coating: Electroplated Zinc

For more information, visit **www.helixsteel.com** or call 734-322-2114.

Helix Steel - 2300 Washtenaw Ave, Suite 201, Ann Arbor, MI 48104



Made in USA



Micro-Rebar

Data Sheet

Dosing Instructions:

Mixing should be done in accordance with ASTM C94 and the mixing instructions below. The dosages of Helix added to the mix should be noted on the batch documentation in accordance with Uniform Evaluation Service ER 279 Section 5.15, and verified using the procedure in ER 279 Appendix A.

Mixing Instructions:

Ready Mix Plants (Dry) - TRUCK MIXER

To prevent Helix from clumping (small cluster of Helix), rigorously follow the procedures below: (1) Add a minimum of 20 gallons (75 liters) of the mix water into the drum. (2) With the drum at full charging speed, add the Helix into the truck drum. (3) Turn truck drum at charging speed for six minutes immediately prior to the addition of mix into truck. (4) Add the sand, aggregate and cement (or concrete) in the normal manner.

Ready Mix Wet (Central Mix)

- (1) For dosages below 15 lb/cyd (9kg/m³) follow dry procedures with 7 gallons (27 liters) of water in the drum.
- (2) For higher dosage please use the Site Batching instructions below.

Site Batching Into Mix Trucks (Loaded Truck at Construction Site)

- (1) Set the drum to charging speed. (2) Sift Helix through a 2"x 2" (50mm x 50mm) Mesh or use Helix Dosing Unit (contact Helix to order). The dosing unit breaks up clumps and ensures Helix goes into the truck at a controlled rate (about 1 box per minute). When Helix is added at this stage, it must enter the mixer clump free.
- (3) When adding Helix, it may collect on any residual concrete on the interior surfaces of the hopper. Push the Helix into the drum avoiding clumps. Adding a slippery lining, such as PVC sheeting, to the hopper may help avoid these buildups. (4) Mix at charging speed for 5 minutes (60 revolutions) after Helix is added.

Pan Mixer/Drum Mixer

- (1) Set the mixer to the proper speed. (2) Add Helix at a rate of 45-60 seconds per 45 lbs (20 kgs). (3) Helix should be added with the aggregates. (4) Mix at max speed for 5 minutes after Helix is added.

Approvals:

Uniform ES Evaluation Report 0279

www.helixsteel.com/technical

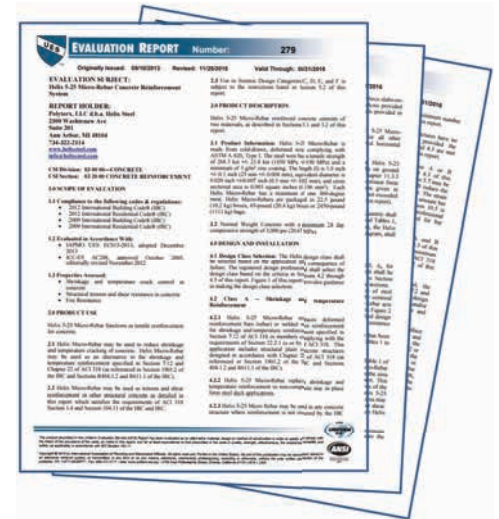
www.iapmoes.org

Meets Specifications:

ACI 318

ACI 360

ASTM A820-Type I



For more information, visit **www.helixsteel.com** or call 734-322-2114.

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