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15. Abstract

Purpose and Need

Many transverse cracks in asphalt pavements become depressed. The depressed cracks not only provide a poor ride, but also help to accelerate the further deterioration of the crack. Many sealants have been used to bridge over this depression at the crack with no success. Concrete spall repair has not been effective for any length of time.

Objective

The objective of this experimental project is to level out depressed transverse cracks in asphalt pavement. A Crafco experimental product called "Poly-Patch" is to be used. This polymer based product is said to have a greater load bearing capacity than other typical rubberized sealants. Crafco has two new products to repair small concrete spalls. One is for warm weather regions and the other is for cold weather regions. These two products will be tested in selected spall areas.

Location

The “Poly-Patch” used on seven depressed cracks is located on Airport Road northbound from Lee Avenue to Lovett Avenue. The concrete spall repair material was installed in 25 concrete panels on Bismarck’s Main Street beginning at Washington Street westward about 500 feet.

Scope

The cracks were prepared by sandblasting or high pressure air before the crack leveling material was applied to the depressed crack. Special equipment was needed to melt down the “Poly-Patch and the spall repair material.

Summary

The installation of the “Poly-Patch” material was a slow process. The “Poly-Patch material was difficult to level out at the edges do to the small sized light-weight aggregate in the material. It was applied in two lifts and improved the ride by 90%.

For the most part, both the warm and the cold weather materials are performing satisfactorily with only a few small spalls in the material. Some hairline cracks have developed in the material of some of the repaired joint spalls. Some are considered to be reflective cracks. The cold weather material may be performing a little better than the warm weather material. Another evaluation of these test sections is planned during the summer months.

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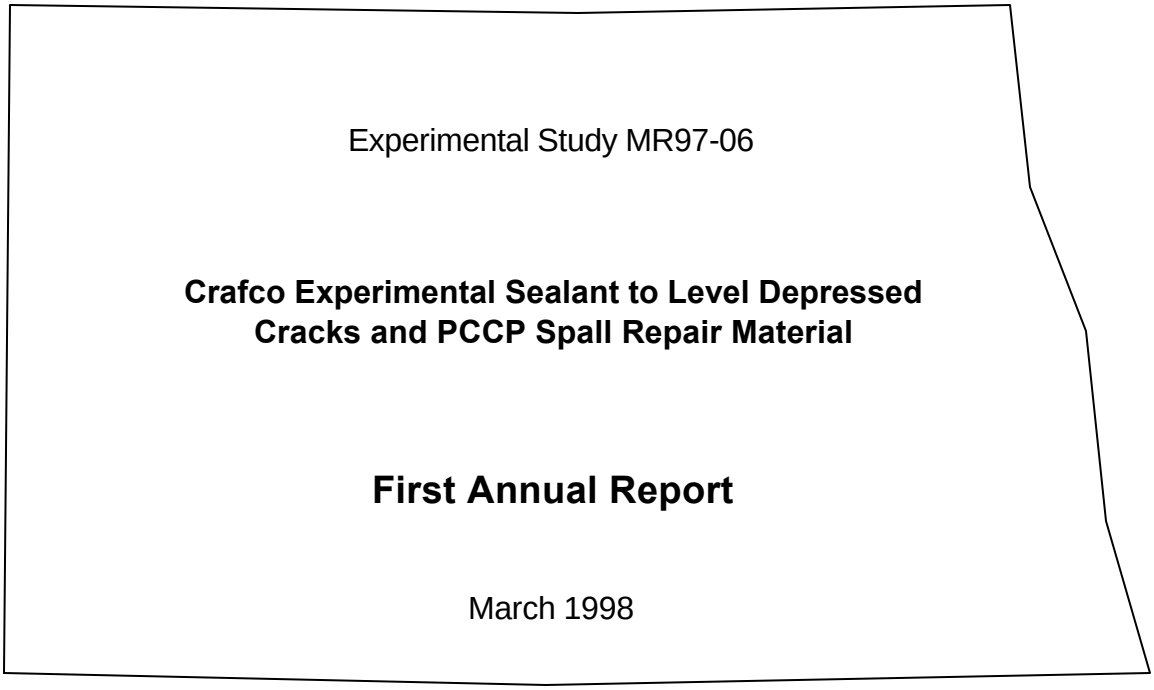

Experimental Study MR97-06

Crafco Experimental Sealant to Level Depressed Cracks and PCCP Spall Repair Material

First Annual Report

March 1998

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EXPERIMENTAL FEATURE

EVALUATION OF CRAFCO EXPERIMENTAL SEALANT TO LEVEL DEPRESSED CRACKS AND PCCP SPALL REPAIR MATERIAL

Airport Road

Bismarck, ND

FIRST ANNUAL REPORT

MR97-06

March 1998

By

Mike Marquart

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CRAFCO EXPERIMENTAL SEALANT TO LEVEL DEPRESSED CRACKS AND PCCP SPALL REPAIR MATERIAL

Crafco experimental sealant to level depressed cracks

Introduction

The Department of Transportation coordinated with the city of Bismarck Public Works to select an area of Airport Road for an experimental section. This section contains depressed transverse cracks. A Crafco experimental leveling sealant is to be used to fill in the depressed crack and alleviate the bump associated with a depressed crack.

Objective

The objective of this experimental project is to level out depressed transverse cracks in asphalt pavement. A Crafco experimental product called "Poly-Patch" is to be used. This polymer based product is said to have a greater load bearing capacity than other typical rubberized sealants.

Location

This experimental section is located on Airport Road in the city of Bismarck, North Dakota. Airport Road is a five lane roadway with two northbound lanes, two southbound lanes, and a common left turn lane. The section includes both northbound lanes beginning at Lee Avenue and ending at Lovett Avenue. A total of seven transverse cracks were rehabilitated.

Construction

The work on this project was performed on September 24, 1997. A four person Crafco crew and a city crew constructed the experimental section. Of the seven transverse cracks that were rehabilitated, two cracks were routed and filled with Crafco 231 by the city crew. The other transverse cracks were left in their original state. All of these cracks were leveled using the

Crafco "Poly Patch" material. Performance of the cracks will determine if there is any benefit to route and fill the cracks before they are leveled with "Poly Patch".

The Crafco material used to level the depressed cracks is an experimental product and is called poly-patch for now. The new product contains a unique light-weight aggregate. No data sheets are available on this product because of its newness. The product is being applied for the first time.

Photo 1 -- Transverse crack depression (Approx.½")

The Crafco crew used one of their small melting kettles to melt the sealant and bring it to 400 degrees Fahrenheit. The material comes in small blocks, like other Crafco material. The entire operation was not very well organized and took about three hours to fill the seven transverse cracks. It should be mentioned that no one has ever worked with this material before and did not know what to expect. Photo 1 shows the amount of depression in the cracks.

Photo 2 -- Pouring poly-patch material and straight-edging

Photo 2 shows the pail method of applying the poly-patch material and one type of straight edge used.

The small kettle used to melt the poly-patch material was not set up for large applications. Thus the material was retrieved from the kettle by gravity flow through a small nozzle. The nozzle had to be heated with a torch at times to keep the material flowing. A pail was used to apply the material. The short straight-edge used was extended by a broken lath clamped to the straight-edge. This worked much better, but should have been even longer. If the straight-edge is too short, the depressed crack will not be completely filled.

The patch material cooled quite fast from the time the pail was filled to the time it was poured and leveled. This made it difficult to level and often built up on the straight-edge. Another factor in this leveling process was the light weight aggregate in the material. The aggregate was of a size that did not feather out to a smooth finish. This can be seen in photo 3.

Photo 3 -- Close-up of material texture

It was difficult to obtain a smooth level joint. Crafco personnel heated the surface of two existing cracks to see if it would aid the leveling process. The material sets up very quickly. This preheating provided some benefit, but was not worth the time and effort. Crafco tried another new product. This product is sprayed on top of the poly-patch material after leveling to prevent tracking. It seemed to work, but traffic control was provided and no material tracking was encountered.

A new type of straight-edge was used. It was not very rigid and not wide enough. See photo 4.

Photo 4 -- Preheating surface with torch and new straight-edge

After the material was installed and hardened, a test drive over the repaired cracks improved the ride by about 50% compared to the ride before the cracks were repaired. This is well below what was expected. The main reason being the straight-edge was not wide enough. The crack depression extends out from the crack at least a foot or more in many places. This usually occurs in the wheel paths. Crafco said that they did not ship enough product to North Dakota to go over the cracks again. They will ship more product and obtain a longer straight-edge to do the second and final leveling of the depressed cracks.

Crafco finished the final application of their experimental sealant\leveling material in October 1997. The material extended to over a foot from the crack in many places. A road test estimated the ride improved from 50 percent with the first leveling process to 90 percent with the second leveling process. These percentages are comparisons to the ride before the cracks were repaired.

Evaluation

The experimental section was observed over the winter months and visited on March 3, 1998. The section rides as good as it did after construction, with the exception of one transverse crack where the leveling material is gone in the outer wheel path of the outside lane. Most likely the patch material was removed by snowplows. It is also possible that poor adhesion was to blame. Using a pail to distribute the material from the kettle is a slow process and allows the material to cool. Being this material hardens rapidly, adhesion could

Photo 6 -- Poly-patch material missing---Probably by snowplows

have been poor at that location. A typical leveled crack after six months of service is shown in photo 5.

Photo 6 shows the crack where with the poly-patch material missing in the outer wheel path. The roadway has some rutting which is responsible for the snowplows removing patch material at the higher points between the wheel paths.

The poly-patch material extends out from the crack up to one and a half feet. The texture is rough and the material seems to be performing very well to date. There is some evidence that the poly-patch material is becoming brittle and developing small cracks. See photo 7. None of the cracks leveled with poly-patch material have stopped reflective cracking. The poly-patch material is slightly raised from the roadway due to the size of the light weight aggregate in the poly-patch. This makes it easier for the snowplows to catch the edges of the patch and chip away at it.

Photo 7 -- Small cracks developing in poly-patch material

Photo 8 -- Poly-patch material in good condition

The last depressed transverse crack in the section that was leveled with poly-patch is in good condition. Part of it runs down a slightly rutted wheel path. The poly-patch has reflected the old crack and shows a 4" spall in the inner wheel path of the left or inner lane. This crack is shown in photo 8.

Summary

The installation of the poly-patch material in depressed transverse cracks was a slow process. This was the first time anyone worked with this new experimental material. The Crafco crew did not have a straight-edge that was long enough to completely bridge the crack depression. They had to ship in more material to finish the project.

The poly-patch material posed no big problems to apply, except that the material could not be feathered out on the edges. This was due to the size of the light weight aggregate in the poly-patch material. There are no data sheets on this material or what specifications it may meet. The material does have a rough texture and seems to stick well to the roadway surface.

The first application by Crafco improved the ride by 50 percent and the second application improved it to 90 percent compared to the ride before the cracks were repaired. Snowplows do some damage to the poly-patch material in certain locations. The poly-patch material is performing satisfactorily.

PCCP EXPERIMENTAL SPALL REPAIR MATERIAL

Introduction

Along with the installation of the Crafco experimental material designed to level depressed cracks, Crafco has a new experimental PCCP spall repair material that they want to try in a cold weather region. The North Dakota Department of Transportation and the city of Bismarck agreed to place some on a Bismarck street.

Objective

The objective was to see how well this new product would perform in concrete spall areas that are both large and small.

Location

This experimental test section is located in the outside lane on Main Street. The section begins near Washington Street westward for about 25 concrete panels or 500 feet.

Construction

Concrete spall patching was done on Bismarck's Main Street on September 25, 1997. The sections are marked with orange paint on the curb. Two types of experimental material were used. One type was for warm weather and one was for cold weather. All spalls repaired were first sandblasted and then blown clean. Both materials were heated to 400 degrees Fahrenheit and were gray in color. These materials are new blends and have no names other than spall patch material.

Each material comes in paper boxes that divide the material into quarters. This makes it easier to use in small quantities for experimental projects. The material can be cooled and reheated again without changing its characteristics. Both materials were put into the spalls in ½" lifts to avoid shrinkage cracks in the material. A few spalls required five lifts. The material

must be allowed to set or cool a little while before the next lift is put on. In the deeper spall areas, the material took 15 minutes to cool adequately before the next lift could be applied. This was a slow process.

The material spread easily and no problems were encountered. Care must be exercised when handling this very hot material.

Warm weather patch material

Photo 9 -- Crafco experimental warm weather spall patch material

See photo 1 for a typical box of product.

There are 11 repaired spalls in this section and includes 7 concrete panels. The last joint in this section is in line with the steps to the water slide at the pool to the north.

A typical spall that has been sandblasted and blown clean is shown in photo 10. Photo 11 shows the final lift being put into a spall. If the spall is several inches deep, a beginning ½" lift of material is left to cool before installing the next lift. The crew moves on to other spalls, returning to install the next lift when the material has cooled enough. This is done until the final lift is

reached. Putting the material into spalls in lifts prevents the material from developing shrinkage cracks.

Photo 10 --Spall area cleaned by sandblasting and high pressure air

Photo 11 -- Applying final lift of spall repair material

Cold weather patch material

Paint mark on curb marks the beginning of the cold weather spall material and is at the joint that lines up with the curb on the street to the north of the section. This section includes 18 panels. It has 13 repaired spalls. This material is installed the same way and looks the same as the warm weather material. Photo 12 shows a spall repaired with the cold weather material.

Photo 12 -- Typical spall filled with cold weather repair material

Evaluation

This part of the experimental project was evaluated on March 13, 1998. Some of the repaired spalls were covered with frozen sand and ice. As the temperature increased, most of the spalls were cleaned and swept. The repair material has a very smooth surface. This would present a slick condition in large spall areas. Most of the spall repair material is still in place. Small pieces have been removed by the snowplows. Much of the material is slightly below the concrete surface and protects it from plows.

Photo 13 is an overview of the test section. Photo 14 shows the material still in place except for a few small missing pieces. This photo is the same as shown in photo 10. Photo 14 is the warm weather material.

Photo 13 -- Overview of test section--driving lane

Photo 14 -- Warm weather repair material ---good condition

The cold weather material is shown in photos 15 and 16.

Photo 15 -- Cold weather repair material --looks good

Photo 16 -- Cold weather repair material ----some cracking

Summary

For the most part , both the warm and the cold weather materials are performing satisfactorily with only a few small spalls in the material. Some hairline cracks have developed in the material of some of the repaired joint spalls. Some are considered to be reflective cracks. The cold weather material may be performing a little better than the warm weather material. Another evaluation of these test sections is planned during the summer months.