FIELD PERFORMANCE EVALUATION OF SELF-LEVELLING SEALANTS DOW CORNING 888-SL AND 890-SL

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16. ABSTRACT

The Oklahoma Department of Transportation (ODOT) has recently completed a field performance evaluation of Dow-Corning's (DC) self- levelling sealants 888-SL and 890-SL. The evaluation was conducted on three new construction projects, where joints were sealed with the evaluated sealants shortly after construction. Also included in the evaluation were two sites where failed sealant was replaced.

Two of the new construction projects were constructed in phases, with one expressway completed approximately one year before the other. On these two projects, the expressways completed first used an accepted non-self-levelling sealant. The second expressway completed was sealed with the evaluated products. A direct comparison with the accepted sealant could not done due to differing traffic conditions.However, a rough comparison of the number of failures in similar sections on both roadways was done.

Both experimental sealants performed well and a conclusion that both should be accepted was made at the completion of the study.

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INTRODUCTION

The Oklahoma Department of Transportation (ODOT) has completed a field performance evalaution of self-levelling sealants Dow Corning 888-SL and Dow Corning 890-SL (888-SL and 890-SL).

This evaluation included applying 888-SL and 890-SL on three new construction projects and two demonstration sites (Figure 1). The construction projects consisted of one jointed PCC roadway and two CRCP roadways. Both demonstration sites were on existing,jointed PCC roadways with AC shoulders.

Individual test sections are described in the section entitled "Performance by Test Site".

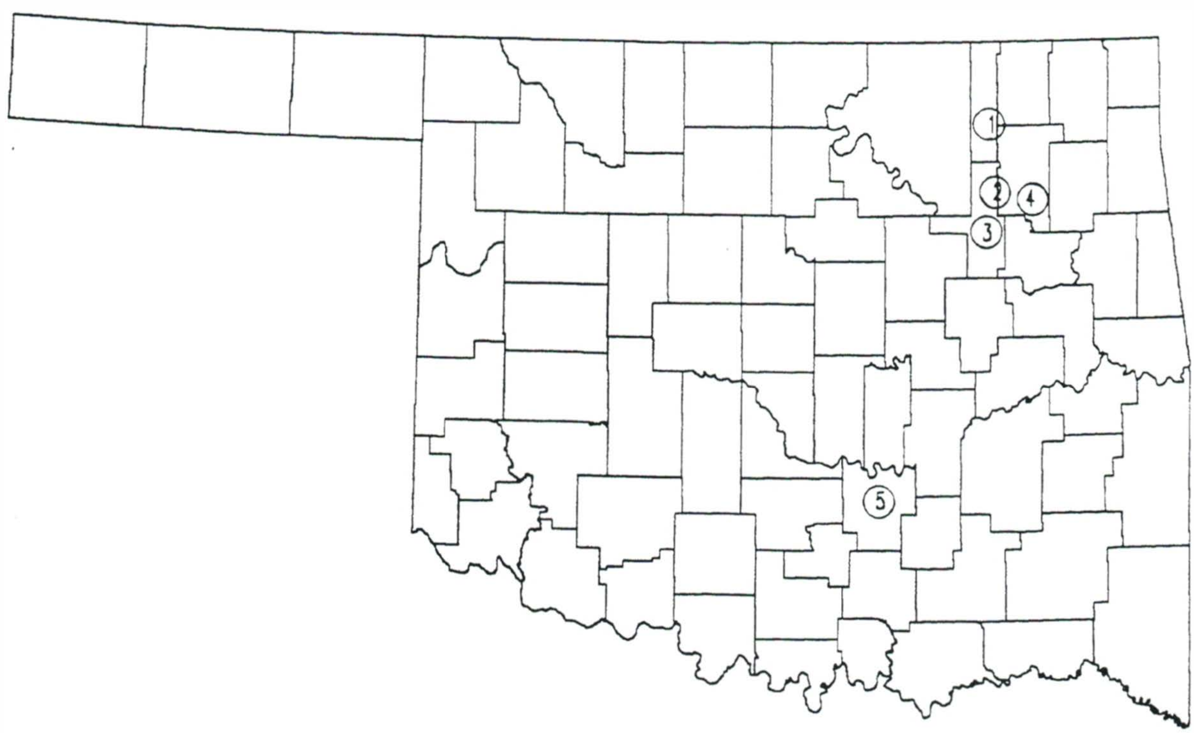


Figure 1. Self-Levelling Sealant Test Sites.

Application

Both 888-SL and 890-SL are one-component, cold applied, silicone sealants. Both are self-levelling. No tooling is required to install either sealant, resulting in decreased labor requirements relative to conventional sealants. 890-SL and 888-SL are proprietary products. Both products are low-modulus silicone sealants. The only obvious difference between them is in their recommended uses. 888-SL is for use in sealing joints in PCC (both sides of the joint to be sealed should be PCC). 890-SL can be used for sealing joints in PCC, but also has the capability of sealing joints where both PCC and AC are used. An example of this use be sealing an edge joint between a PCC roadway and an AC shoulder.

888-SL and 890-SL are applied using air-powered pumping systems (Figure 2). The pumping systems are commonly mounted on pickups, small flatbed trucks, or trailers. Installation is normally done as shown in Figure 2, with one man installing the sealant with a wand-type applicator, while another drives the vehicle hauling the pumping system. Installation can be done at a slow walking speed.

As with other sealants, backer rod must be placed in the joint to form a "bottom" before sealant is applied. The installation procedure for self-levelling sealants is similar to that for other sealants, except that tooling is not required. Both sealants are compatible with commonly used closed-cell foam backer rod. On all locations included in this evaluation, joint were installed as shown in Figure 3, with the sealants recessed 0.125 to 0.375 inch (3.17 to 9.53 mm) below the roadway surface.

Surfaces to be sealed with the self-levelling sealants must be clean, dry, and frost-free. No priming is necessary for the application of either sealant.

Skin-over time is after application is less than 75 minutes for all temperatures above 40 degreees F (4.44 degrees C), The lowest temperature at which ODOT specifiications permit joint sealing.

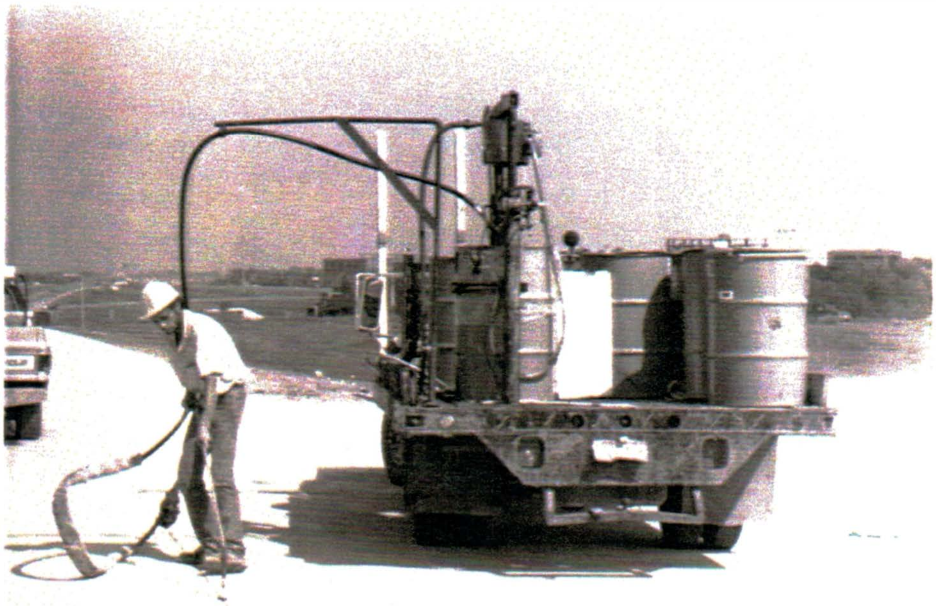


Figure 2. **Installing Self-Levelling Joint Sealants.**

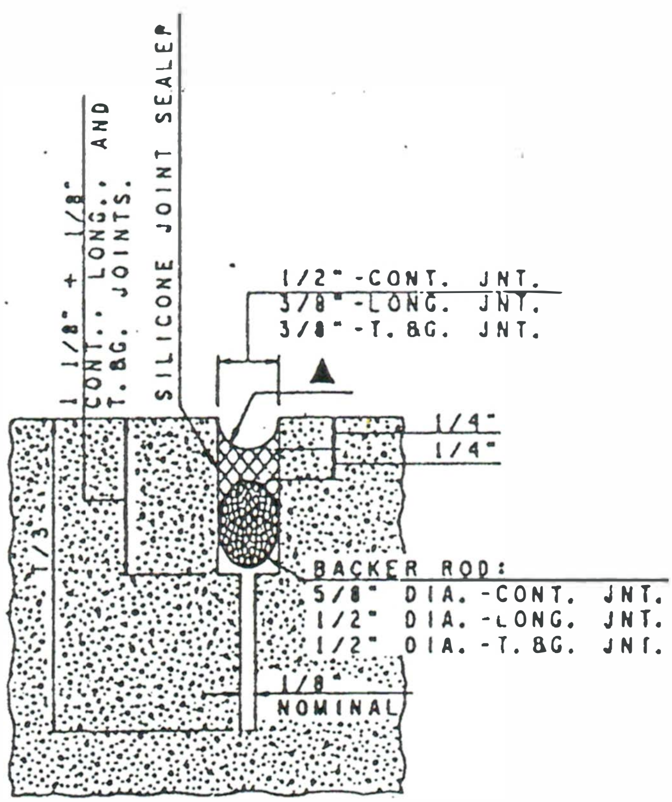


Figure 3. **Cross Section of Backer Rod and Joint Sealant in Saw Cut.**

Evaluation

This evaluation was done on the sealed joints of three new construction projects and two demonstration sites. Test and Comparison Sections on each location have been inspected at six month intervals since joint sealing was completed. During the inspections, all full-depth failures were listed. A full-depth failure is defined as a failure extending all the way through the sealant, such that water leaking through it would go onto the backer rod and the subgrade.

The three Construction Projects involved were MAF-15(209), MAF-521(38), and MAF-521(075). All three projects included construction of new roadways, and the entire project of each one was sealed with one of the self-levelling sealants.

Projects MAF-15(209) and MAF-521(075) were CRCP, with no transverse joints, other than those at bridges and on shoulders. Project MAF-15(209) was a jointed PCC roadway. Project MAF-15(209) was a jointed PCC roadway.

Projects MAF-521(38) and MAF-15(209) consisted of building two lanes (one expressway) of four-lane roads. On both projects, the Northbound Expressway was built. Also on both of these projects, the Southbound Expressways were completed one year earlier. Joints of the Southbound Expressways of these projects were sealed with Dow Corning 888 Silicone Sealant. 888 is a non-self-levelling silicone sealant which had been accepted for use on ODOT projects for several years before this evaluation began. Both expressways of Project MAF-521(075) were built under that project.

Sections in the Southbound Lanes of MAF-521(38) and MAF-15(209) were used as "Comparison Sections". Performance of the sealant in each of these is graphically compared to that of the experimental self-levelling sealant in the corresponding position of the Northbound Expressway.

The graphical comparisons cannot be considered more than a rough comparison due to differing traffic conditions and completion dates. The Southbound Expressways (comparison sections) were opened to traffic one year earlier than the Northbound, and carried traffic in both directions these projects were completed.

Sites involved in this evaluation are discussed further in the following section.

Performance by Test Site

Project MAF-15(209)

This project consisted of building the Northbound Expressway of U.S. 75, south of Ramona (Figure 2). The project was completed in November, 1988.

The Southbound Expressway had been completed one year before this. Construction of the Southbound Expressway was similar to that of the Northbound except that the Southbound Expressway was sealed with Dow Corning 888 rather than 888-SL. Locations of the Test Sections on this project are shown on the map below.

Construction of this section is nine inch (22.86 cm) thick CRCP. Shoulders are jointed PCC with joints at 15 foot (4.57 m) intervals. ADT for this section of U.S. 75 is 8,800.

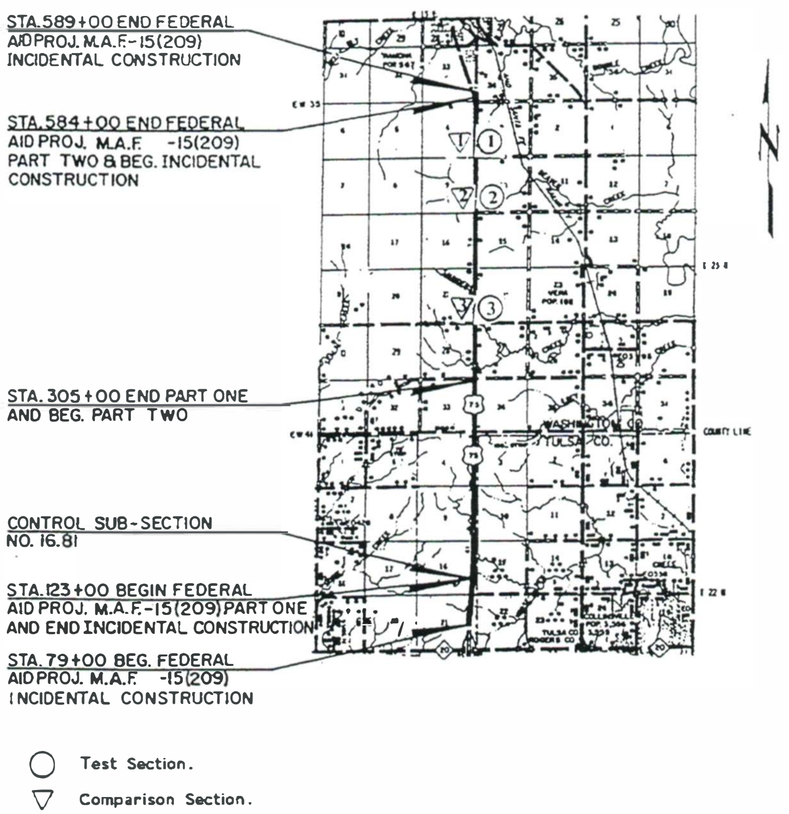


Figure 4. Project MAF-15(209) Location Map.

Test Section 1.

On the date of the final survey of this location (5-11-94) eight sealant failures had occurred. Of these, two were cohesion failures. The cohesion failures had the appearance of holes (approximately 1/4 inch diameter) through the sealant down to the backer rod. Six adhesion failures were also observed. All were located in the outside edge line joint. Adhesion failures were one inch and two inches long. The adhesion failures began to appear when the sealant had been in service for 3.5 years. Two of the adhesion failures were located where thermoplastic striping crossed the sealed joint.

Comparison Section 1

By the end of the evaluation period, 13 failures were observed in this section. Nine of these were adhesion failures. Six of the failures were located in the outside edge line joint. The remainder were randomly located in the transverse joints on the shoulders. There were also four cohesion failures, which appeared as (1/4 - 3/8 inch diameter) holes through the sealant. The holes extended down to the backer rod.

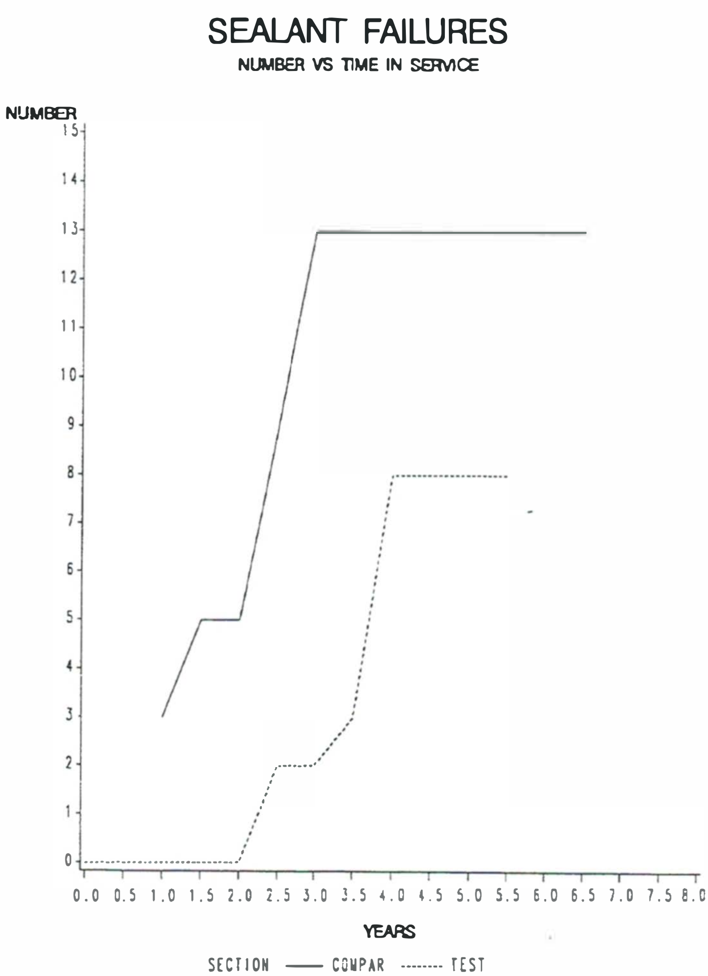


Figure 5. Failures vs. Time, Test Section and Comparison Section 1.

Test Section 2.

This section was last surveyed on May 11, 1994. At that time, four failures were observed (Two adhesion and two cohesion failures). All failures were located in the outside edge line joint.

The formation of small cracks, with spalls along the sawed joints (Figure 8), was a common condition on this project. The cracks extended below the sealant, causing the joints to be unsealed where this occurred. The sealant was generally in good condition and adhering to the concrete in these cases.

Comparison Section 2.

Of 13 failures observed during the last survey, 10 were adhesion failures. The majority of the adhesion failures were located in the edge line joints. Nine of these failures were located in the outside edge line joint, with one in the inside joint. Lengths of adhesion failures ranged from one inch (2.54 cm) to one foot (30.48 cm).

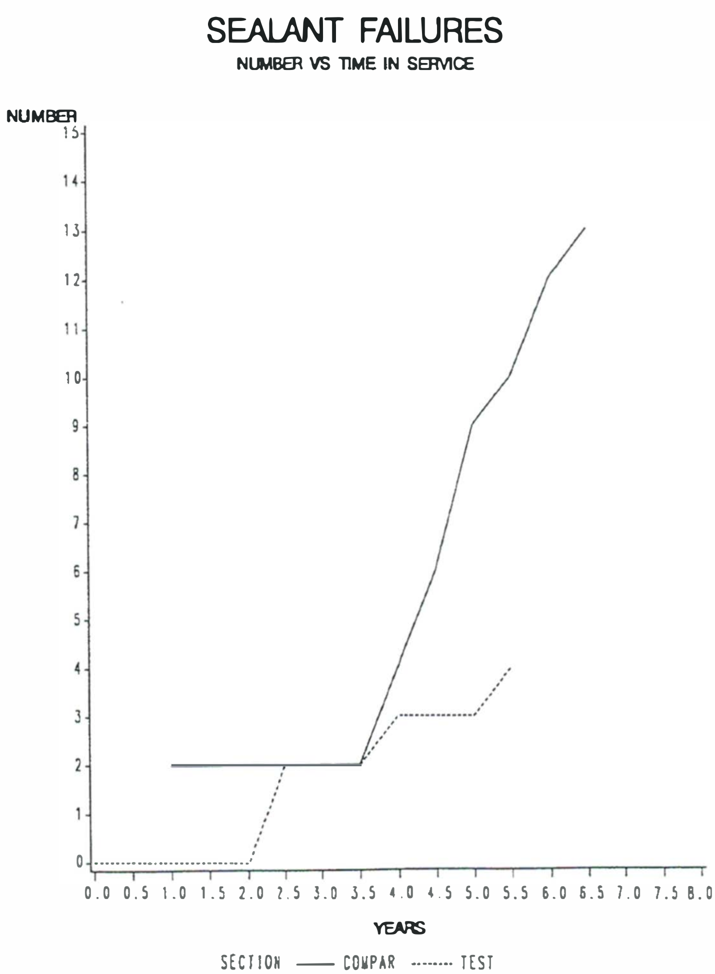


Figure 6. Failures vs. Time. Test Section and Comparison Section 2.

Test Section 3.

Four failures had occurred in this section by the date of the final survey (May 11, 1994). Three of these were adhesion failures of the sealant in the edge line joint. All were approximately two inches long. In one localized area, there were three holes (each approximately 1/4 inch diameter) within one foot of each other.

Comparison Section 3.

Only two cohesion failures were noted in this section by the time of the final survey (May 11, 1994). These had the appearance of holes (approximately 1/2 inch diameter) through the sealant, down to the backer rod. Both failures were located in intersections of edge line joints and transverse joints in shoulders.

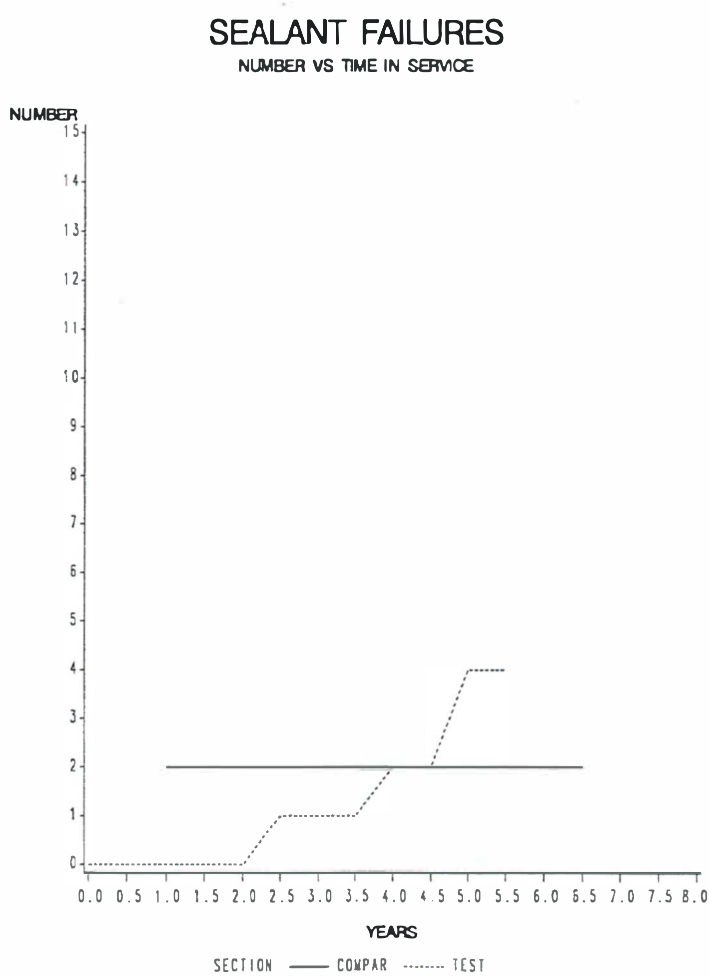


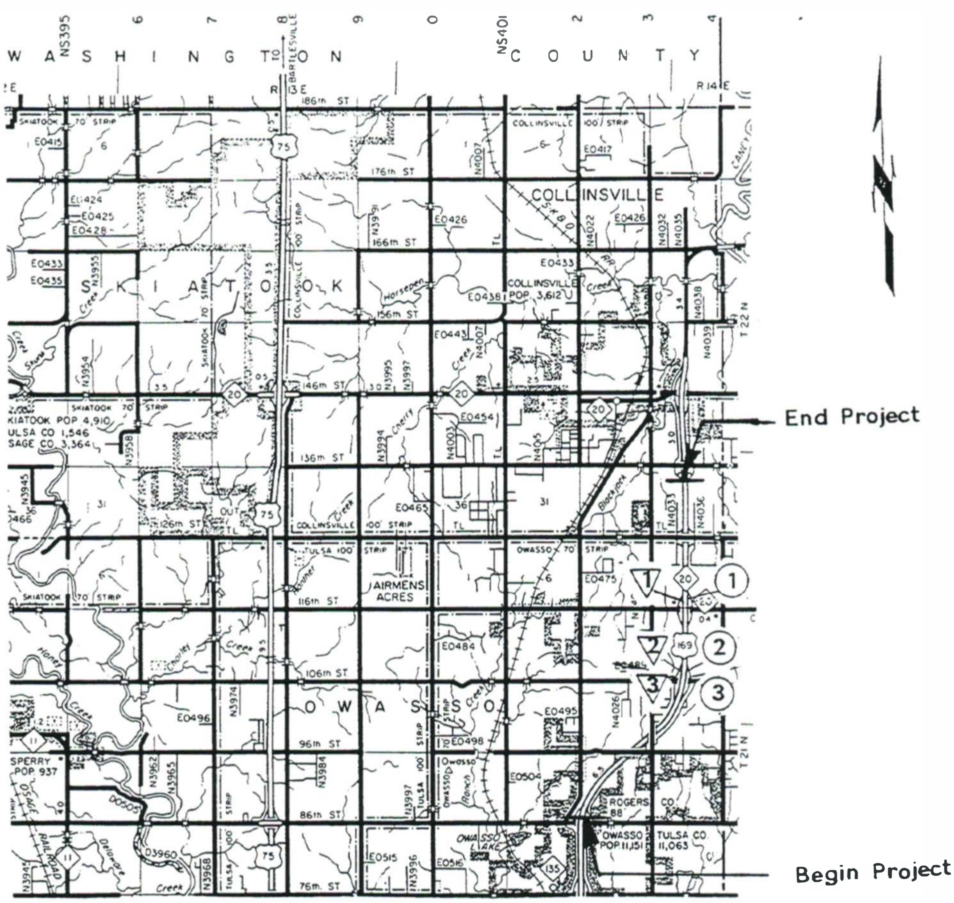
Figure 7. Failures vs. Time, Test and Comparison Sections 3.

Figure 8. Crack next to Joint, Leaving an Unsealed Joint with no Sealant Failure.

Project MAF-521(035)

The Northbound Expressway of U.S. 169, in the area shown in Figure 9, was built under this project. Project MAF-521(035) was completed in August, 1988. The Southbound Expressway was completed one year earlier, under another project. Joints in the Southbound Expressway were sealed with Dow Corning 888, a standard silicone sealant, which has been accepted for use on ODOT Projects for several years. Joints on the Northbound Expressway were sealed with 890-SL. Locations of Test and Control Sections are shown in Figure 9.

This project consists of a nine inch (22.86 cm) thick jointed PCC pavement with joints on 15 foot (4.572 m) centers. ADT in the Project area is 13,000.



◯ Test Section.

▽ Comparison Section.

Figure 9. Project MAF-521(035) Location Map.

Test Section 1.

At the time of the final survey on this project (June 3, 1994), this section had seven adhesion failures (no other types of failure observed). Lengths of failures ranged from one inch to six inches. Four of these had failed on both sides of the sealant. This allowed the sealant to drop down into the joint in the failed area (Figure 13). All of the failures in this section were in locations where thermoplastic striping crossed a sealed joint (Figure 14). The failures were first observed when the sealant had been in service three and one half years.

Comparison Section 1.

Eleven failures had occurred in this section by the time of the final survey. Five of these were cohesion failures, appearing as 3/8 inch (0.9525 cm) diameter holes through the sealant). All of the failures of this type occurred at the intersection of transverse joints and longitudinal edge line joint. One failure was a three-inch-long cohesion failure that had the appearance of a split in the sealant. The other three were adhesion failures occurring where thermoplastic striping crossed joints (Figure 15).

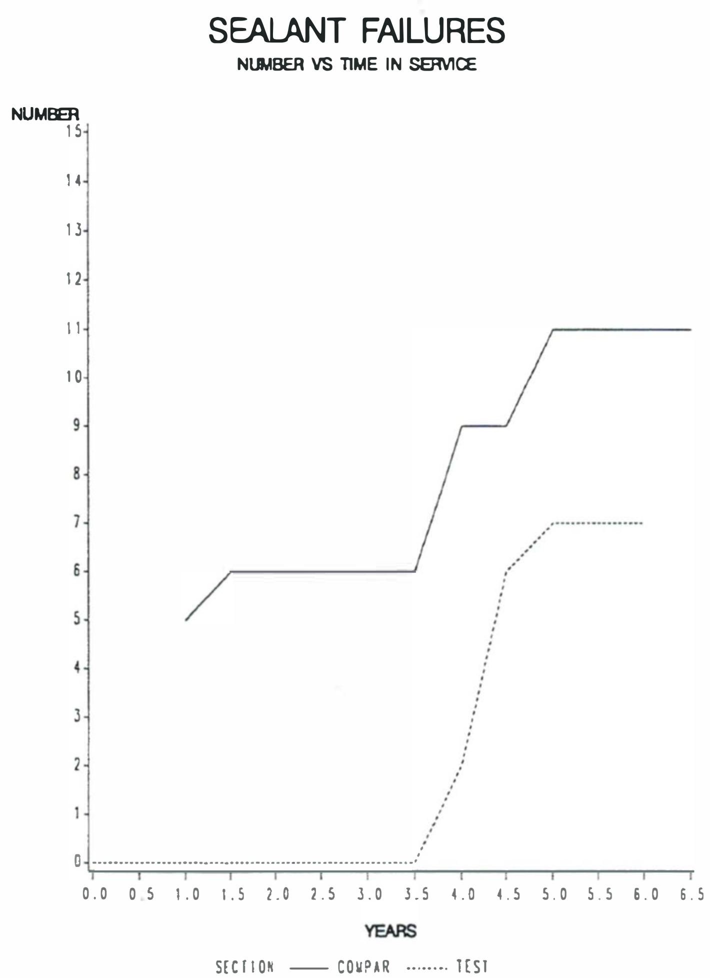


Figure 10. Failures vs. Time, Test Section and Comparison Section 1.

Test Section 2.

During the final survey (May 11, 1994), five failures were located in this section. Four of these were cohesion failures appearing as "holes" (approximately 1/2 inch diameter). The one adhesion failure was located where thermoplastic striping crossed a transverse joint.

Comparison Section 2.

The final survey noted twelve failures in this section. Nine of these were adhesion failures occurring where thermoplastic striping crossed transverse joints. The remaining failures were an adhesion failure (not located at a stripe) and two 1/2 inch diameter holes (cohesion failures) through the sealant.

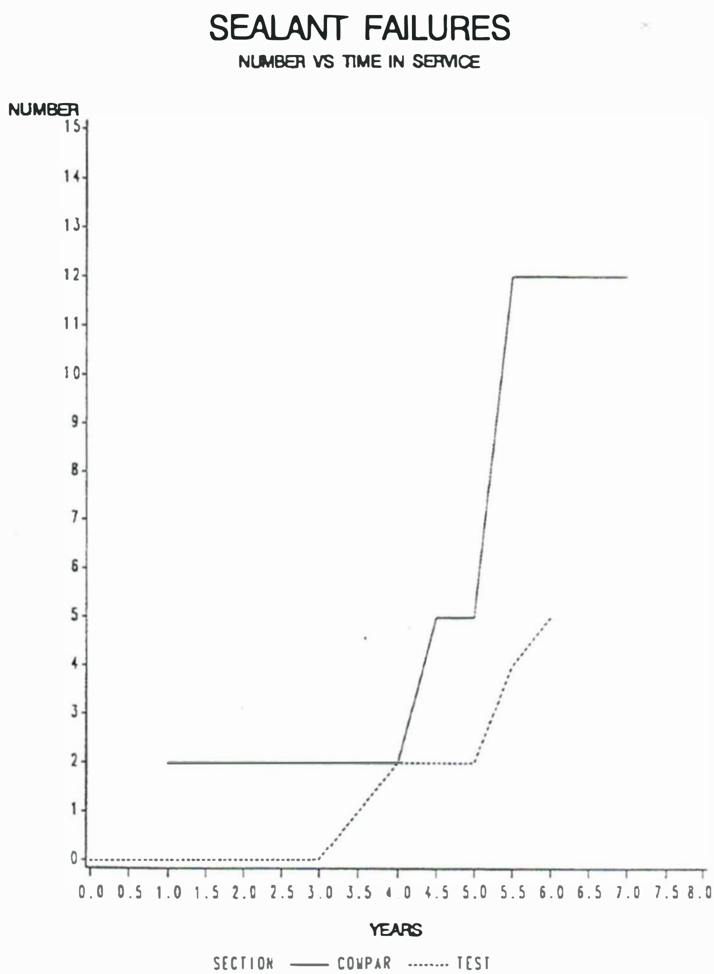


Figure 11. Failures vs. Time, Test Section and Comparison Section 2.

Test Section 3

During the final survey (May 11, 1994), a total of six failures were noted in this section. Of these, four were cohesion failures appearing as 3/8 inch (0.9525 cm) diameter holes through the sealant. The holes extended down to the backer rod (Figure 16). The remaining two were adhesion failures. One was located where thermoplastic striping crossed a transverse joint. The other was located in the outside wheel path.

Comparison Section 3.

All four of the failures in this section were cohesion type, appearing as 3/8 inch (0.9525 cm) diameter holes. The holes extended down to the backer rod Three of the failures were located at intersections of transverse and longitudinal joints. The remaining failure was located where thermoplastic striping crossed a transverse joint.

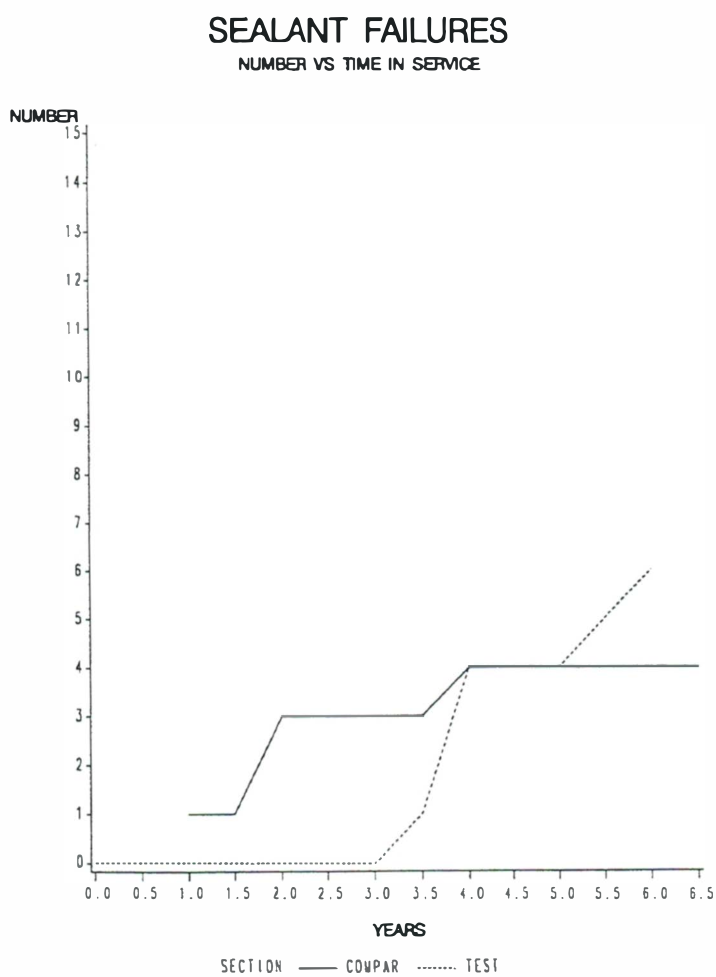


Figure 12. Failures vs. Time, Test Section and Comparison Section 3.

Figure 13. Sealant Dropped into Joint Due to Adhesion Failure on Both Sides.

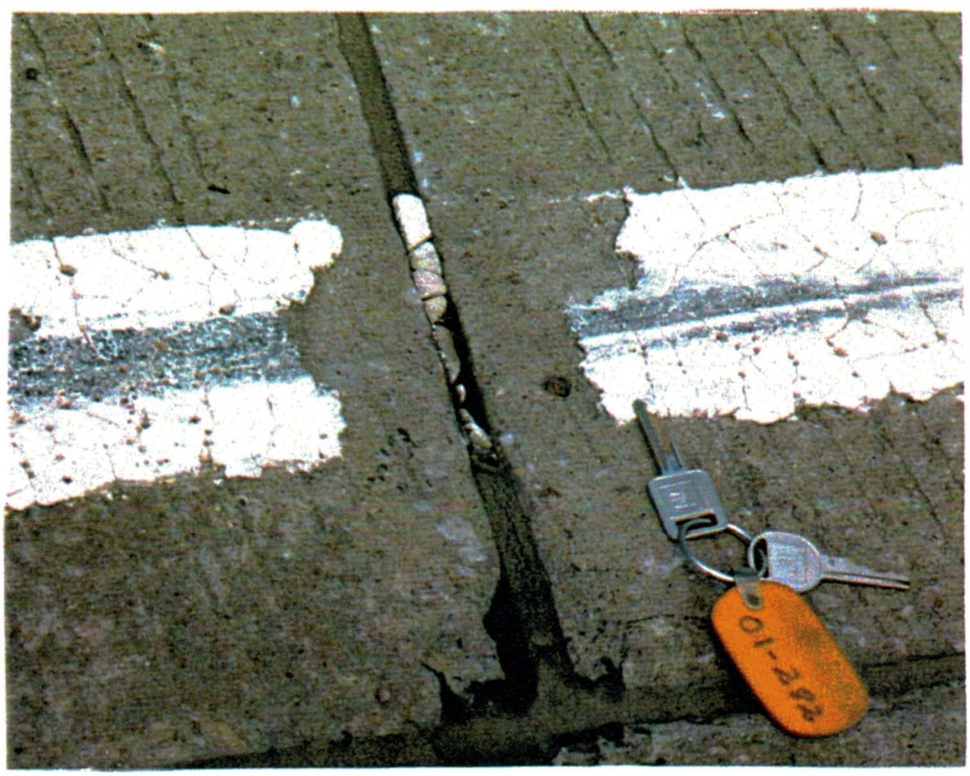


Figure 14. Adhesion Failure Where Thermoplastic Striping Crosses Joint Sealed with 890-SL.

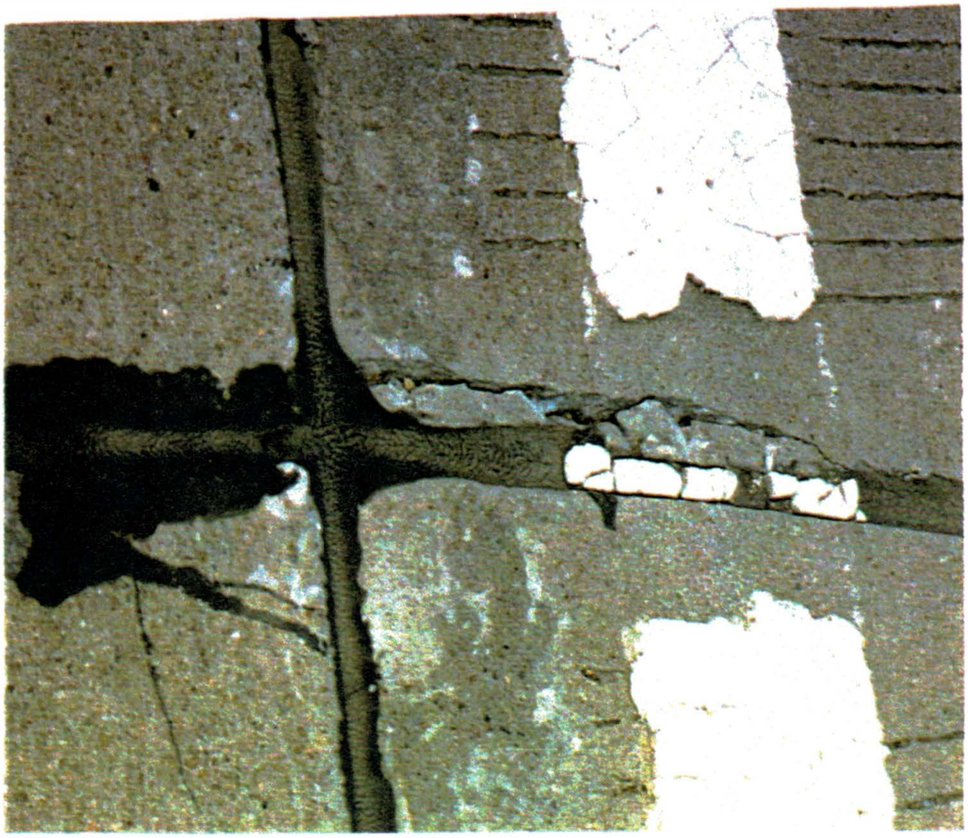


Figure 15. Adhesion Failure Where Thermoplastic Striping Crosses Joint Sealed with Accepted Sealant.

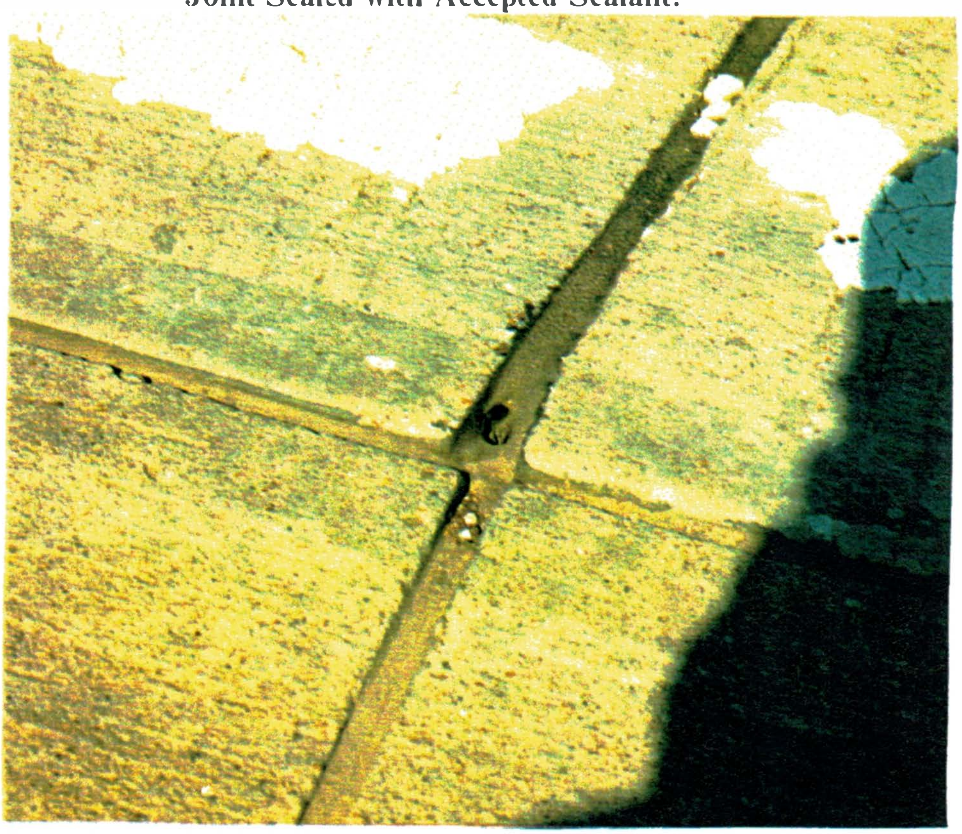


Figure 16. Cohesion Failure Appearing as "Hole" in Sealant.

Project MAF-521(075)

Both the Northbound and Southbound Expressways of U.S. 169, between 51st and 71st Streets South, Tulsa, were constructed under this project. The entire project was sealed with 888-SL. No comparison with similar sites using an accepted sealant was done.

The pavement was nine inch (22.86 cm) thick CRCP, with PCC shoulders. Outside shoulders were CRCP design, while inside shoulders were jointed PCC, with joints on 15 foot centers. ADT at this location is 39,000.

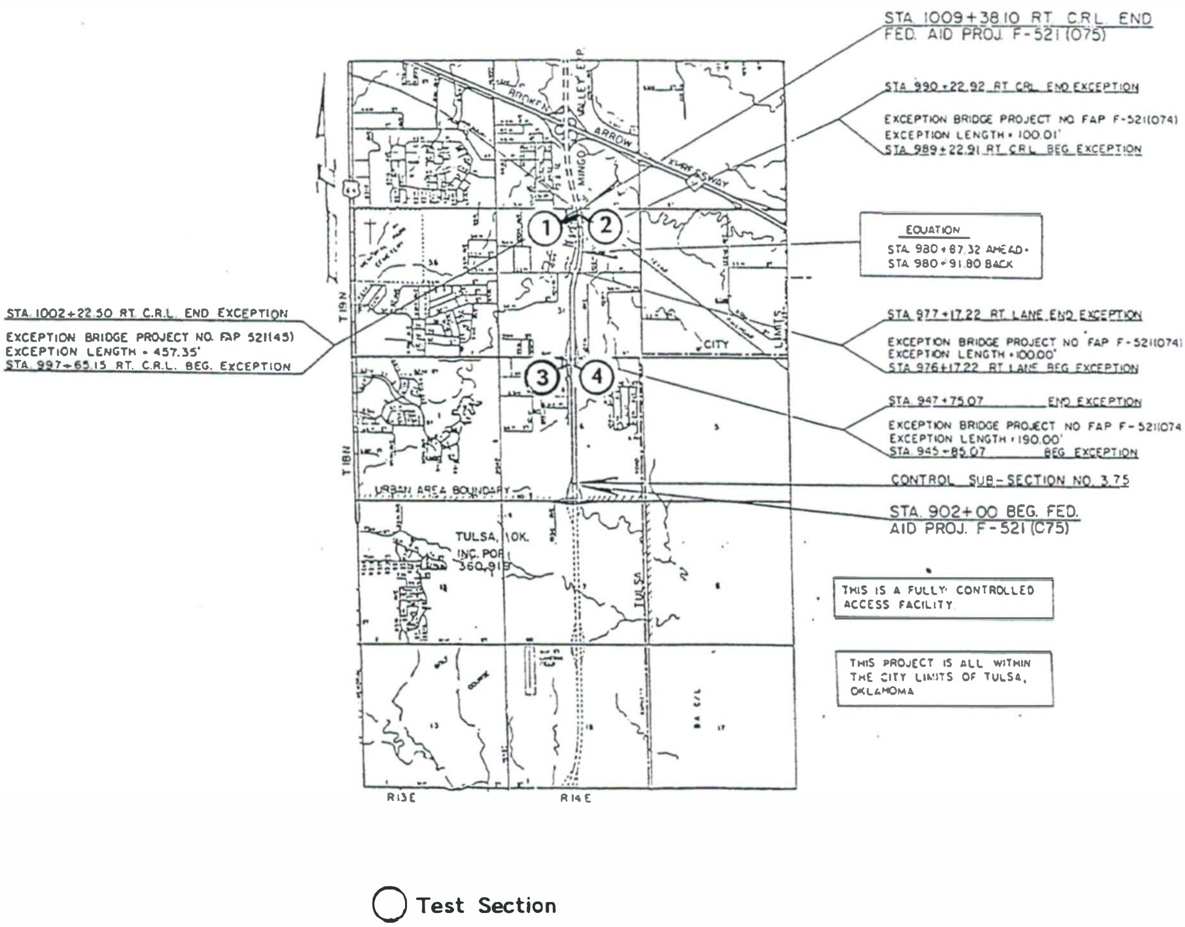


Figure 17. Project MAF-521(075) Location Map.

Test Section 1.

Test Section 1 begins at the south end of the South 51st Street Overpass Bridge and extends south in the Southbound Expressway. Two 30 foot long approach slabs are located at the end of the bridge. At each end of the approach slabs there are 1 1/2 inch wide expansion joints. The bridge, approach slabs, and expansion joints, were built under another project. The expansion joints were originally sealed with a hot pour sealant (brand name unknown). Approximately one year after this evaluation began, the hot pour sealant failed and was replaced with 890-SL. Information on the sealant in the approach slab expansion joints was included for information only. These joints were not included in the evaluation when it began. The Test Section consists of the two approach slabs and 300 feet of CRCP pavement with jointed, 10 foot wide shoulders on the outside of each expressway, and 4 foot CRCP inside shoulders.

The condition of the sealant, at the time the final survey of this site was done (June 3, 1994), is described below.

This test section had two failures in the sealed edge joint, and five in the two sealed terminal joints at the ends of the 51st Street overpass. The failures in the edge joint were cohesion failures consisting of series of connected "holes" (Figure 21). The sealant on both sides of these failures was intact and adhering to the pavement. The hot pour sealant originally used in the 1 1/2 inch joint between the bridge deck and the first slab had completely failed. Only small traces of it could be found in the joint (Figure 18). The next 1 1/2 inch wide joint was sealed with 890-SL. That seal was in good condition (Figure 19). South of this, there is another 30 foot long approach slab and another 1 1/2 inch wide joint, sealed with 890-SL. This joint has one six inch long adhesion failure at the outside edge line stripe.

Test Section 2.

Construction of this section similar to that described for Section 1.

This Test Section begins at the south end of the 51st Street Overpass and extends south in the Northbound Expressway. The 1 1/2 inch wide joint at the end of this bridge deck had also been sealed with a hot pour sealant. As in Section 1, only small traces of sealant could be found by the end of the evaluation. The 1 1/2 inch wide joint south of this was sealed with 890-SL. This joint had one adhesion failure, approximately one foot long, located in the outside wheel path, outside lane. The 1 1/2 inch wide joint between the CRCP and the approach slab was also sealed with 890-SL. This joint had adhesion failures in each wheel path (Figure 20). The CRCP making up the rest of this section had approximately 20 cohesion failures in one localized area, which had the the appearance of holes through the sealant (Figure 21). Each of these "holes" was approximately 3/8 inch in diameter. There were no failures in the remainder of this section.

Test Section 3.

Construction of Section is similar to that described for section 1.

The 1 1/2 inch wide joint between the bridge deck and the adjacent approach slab was sealed with hot pour sealant. There is a small amount of sealant still in the joint, but it is no longer attached to either the slab or the bridge. Approximately 75 percent of the joint has no sealant remaining in it. The other two expansion joints (at ends of the 30 foot approach slabs) are sealed with self-levelling sealant. The self-levelling sealant appears to have been applied too close to the roadway surface. When slab expansion occurs with hot weather, the sealant is being compressed in the joint such that the top of it is forced up higher than the roadway surface. Cars are hitting the portion extending above the roadway, giving it a black, "polished" appearance (Figure 23) and pulling it out of the joint. This has caused adhesion failures in the wheel paths of both joints sealed with 890-SL. No failures were observed in the 300 feet of CRCP pavement making up the rest of this section.

Test section 4.

Construction of this section is also similar to that of Section 1.

The joint between the bridge and the adjacent approach slab was sealed with hot pour sealant as in Sections 1, 2, and 3. The result was also similar. Only small traces of hot pour sealant remain in the joint. The other two-inch-wide joints, sealed with 890-SL, have adhesion failures in the wheel paths and show "polishing" where the sealant has been pushed up above the roadway surface when thermal expansion closes the joints (Figure 23). There were no failures in the 300-foot CRCP Section.

Figure 18. Expansion Joint Formerly Sealed With Hot Pour Sealant.

Figure 19. Expansion Joint Sealed with Self-Levelling Sealant.

Figure 20. Expansion Joint Sealed with 890-SL with Adhesion Failures in Wheel Paths.

Figure 21. Cohesion Failures in Edge Line Joint.

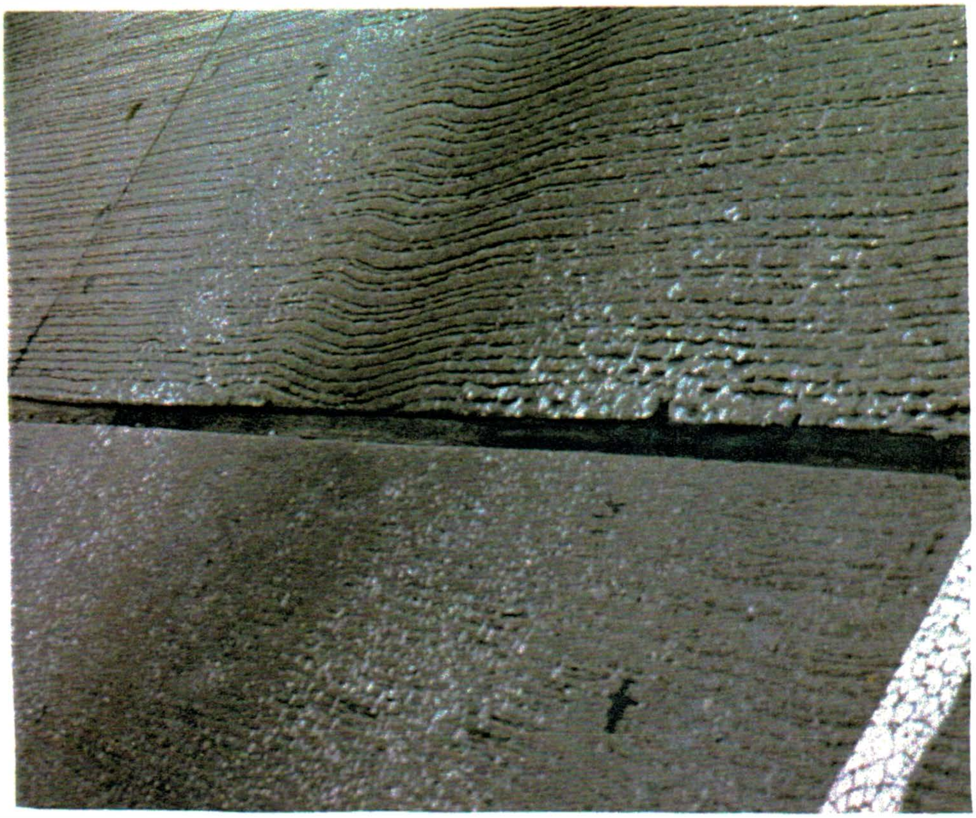


Figure 22. Adhesion Failures Occurring Where Wheels Contact Sealant.

Figure 23. "Polished" Sealant in Wheel Path.

U.S. 412 Demonstration Area.

This section is located as shown in Figure 24. This area was sealed in 1987 as a demonstration of two new (at that time) self-levelling silicone sealants. The first prototype sealant was intended for use in sealing joints in PCC pavements. The second prototype was designed for use in sealing joints between PCC pavements and AC shoulders. At the time of the demonstration, these sealants were a prototype products recently developed by Dow Corning. Neither product was available on the market, and neither had been named. The first product (for use on PCC pavements) was later named 888-SL. The second product (to be used between PCC roadways and AC shoulders) was named 890-SL. Transverse joints and the Centerline joint were sealed with the first product. The joint between the PCC roadway and the AC outside shoulder was sealed with the second product.

The demonstration area was an existing jointed PCC roadway, built in 1956. The original joint sealant had failed and been replaced several times before the demonstration. ADT at this location is 14,300.

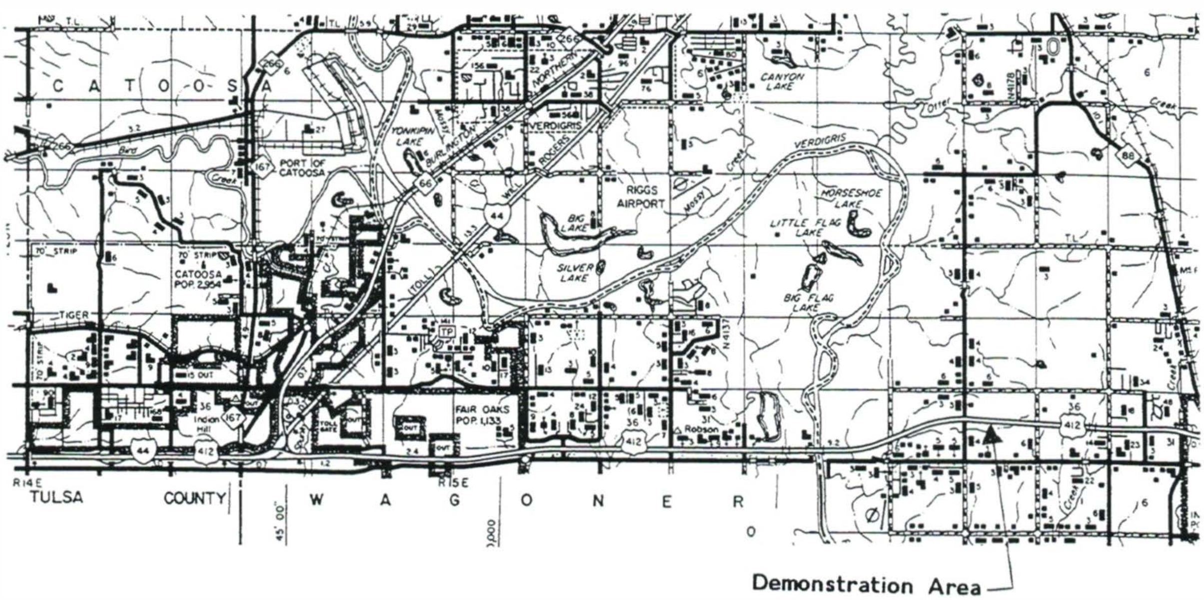


Figure 24. Location of U.S. 412 Demonstration Area.

Prior to the demonstration, ODOT Maintenance forces removed the existing hot pour type sealant remaining in the joints. They then cleaned the joints by sandblasting. This removed most of the old sealant, but there were numerous locations where small (less than 1 square inch) amounts of the old sealant remained in the joints. Also,, the AC shoulders were old and deteriorating. These conditions were related to many of the failures that occurred in the demonstration area.

The number of failures observed in each survey since sealant installation are listed in Table 1. By the time the last survey was done (April, 1994), 13 of a total of 23 failures were considered to be related to conditions described above. On eight of these locations the AC shoulder had deteriorated such that there was no stable surface for the sealant to adhere to where the failures occurred. The other five were adhesion failures located where the old sealant had not been completely removed.

Table 1.

Failures Since installation, U.S. 412 Sealant Demonstration Site.		
Survey Date	Time in Service (Years)	Failures (Number)
August, 1987	0.0	0
April, 1988	0.5	0
August, 1988	1.0	0
September, 1989	2.0	0
March 1990	2.5	2
September 1990	3.0	6
March, 1991	3.5	13
September, 1991	4.0	16
April, 1992	4.5	18
September, 1992	5.0	21
March, 1993	5.5	22
September, 1993	6.0	22
April, 1994	6.5	23

S.H. 3 SHRP Site, Ada

This section was sealed with 890-SL in February, 1991 as part of a SHRP study on the ffects of joint sealing. The Oklahoma Dow Corning Distributor furnished the sealant and sealed the joints as a demonstration of their product. Since this site had consisted of a PCC roadway with AC shoulders, it was included in this study in an attempt to get as much information as possible on the effectiveness of 890-SL as a sealant between these surfaces.

The SHRP Site is located on a divided four lane roadway. Construction is jointed PCC with AC shoulders. The roadway has been in service since 1979. AADT at this location is 3,600.

Prior to the demonstration, the the original joint sealant was removed by sawing it out of the joints. The joints were then cleaned by sandblasting. Removal of the old sealant and joint cleaning was done by ODOT Maintenance Forces. It is difficult to completely remove old sealant in this manner. In numerous locations, small amounts of the old sealant remained on the joints. The saw cut between the roadway and the shoulder varied in width from 1/2 inch (1.27 cm) to 2 inches (5.08 cm) (Figure 26). Also, the elevation of the shoulder varied from being flush with the roadway to as much as 1 inch (2.54 cm) below it. (Figure 27). Most of the failures at this location were related to these conditions.

The majority of the failures (17 out of a total of 19) were considered to be related to site conditions described above. The number of failures observed in each survey since installation is summarized in Table 2.

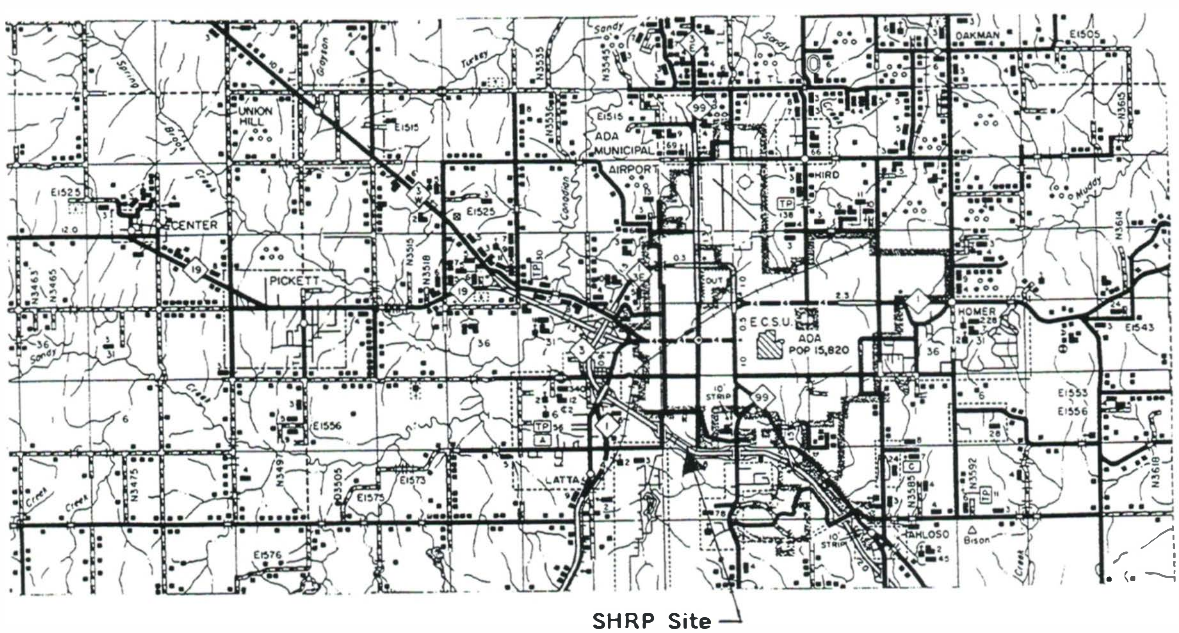


Figure 25. S.H. 3 SHRP Site.

Table 2.

Failures Since installation, S.H. 3 SHRP Site.		
Survey Date	Time in Service (Years)	Failures (Number)
March, 1991	0.0	6
August, 1991	0.5	16
March, 1992	1.0	18
August, 1992	1.5	18
March 1993	2.0	19
August 1993	2.5	19
March, 1994	3.0	19
August, 1994	3.5	19

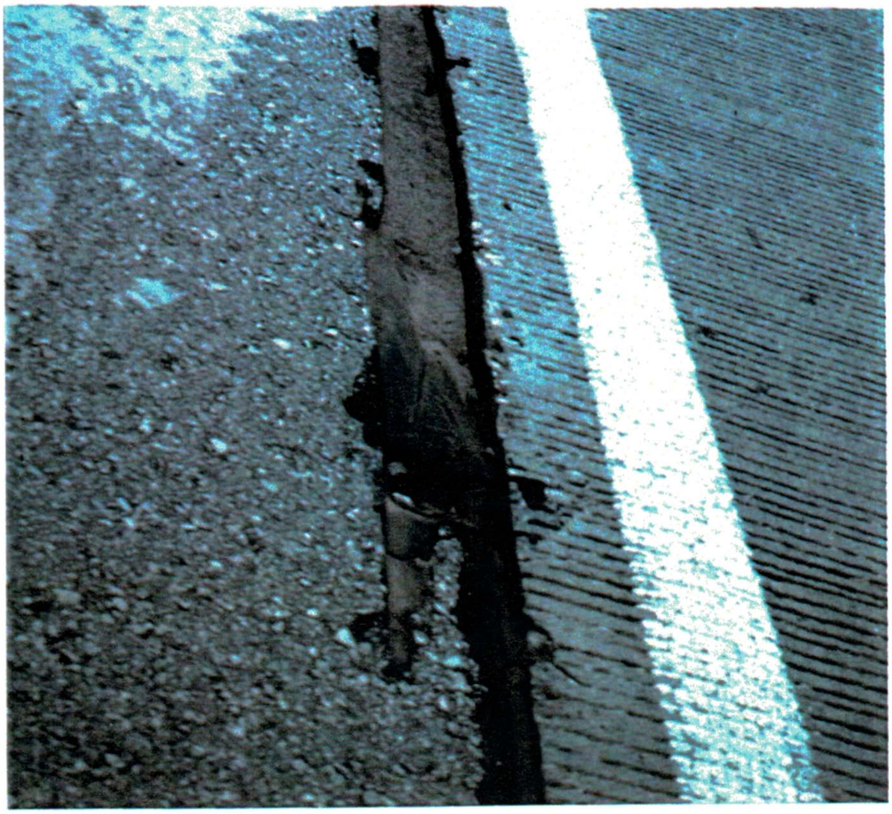


Figure 26. Sawed Joint Between PCC Roadway and AC Shoulder.

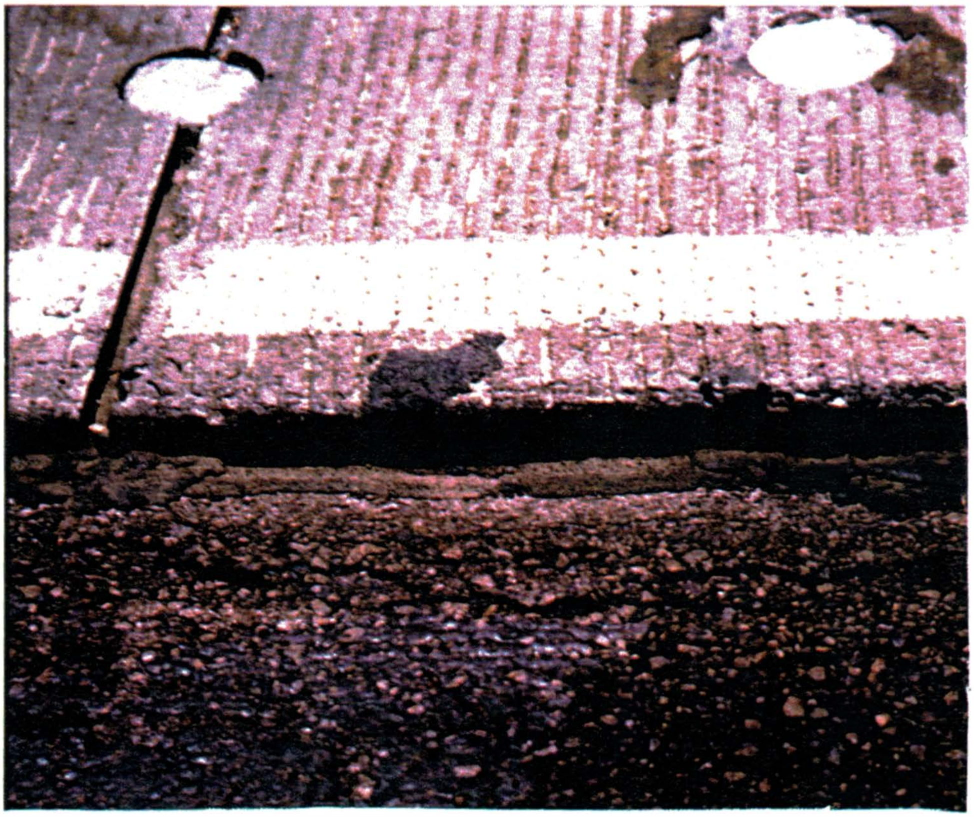


Figure 27. Difference in Elevation Between PCC Roadway and AC Shoulder.

Discussion

Failures in the self-levelling sealants began to appear when the sealant had been in place approximately three years. This was true for both adhesion and cohesion failures.

Project MAF-521(035) had jointed PCC design. Projects MAF-15(209) and MAF-521(075) both had CRCP design. Numerous failures were observed in locations where traffic striping crossed sealed joints, with the largest number on Project MAF-521(035). Jointed PCC pavements have relatively more places where striping crosses joints. Hot applied thermoplastic traffic striping is installed in a melted state at 400 to 450 degrees F (204.4 to 232.2 degrees C). The number of adhesion failures located where striping crosses sealed joints indicates that the striping is damaging the sealant. This is likely due to striping application temperatures. Failures at intersections of striping and sealed joints were noted in both test and comparison sections. However, there were proportionately more failures of this type in the test sections. Damage to sealant, where striping crossed it, has shown up over the entire Project MAF-521(035) area. Some areas of the project have more of this type of damage than the Test and Comparison Sections.

Failures at intersections of striping and sealed joints were rare on Projects MAF-521(075) and MAF-15(209). Thes pavement design on these projects was CRCP, and there were relatively few places where striping crossed joints. The U.S. 412 Demonstration and S.H. 3 SHRP Sites both had jointed PCC design, but neither was restriped after sealing.

It may be possible to reduce the number of failures of the type involving thermoplastic striping This could possibly be done by temporarily covering the part of the joint that will be crossed during striping with some type of fabric cover material. Another possibility would be scheduling striping to be done before joint sealing. Further research would be required to determine the effectiveness of actions of this type, and what effect they might have on construction operations.

The majority of failures on all locations were located in the outside edge joint. This may be due to larger percentages of the total traffic using the outside lane.

Where self-levelling sealants were used to seal 1 1/2 inch (3.81 cm) wide expansion joints on Project MAF-521(075), they were considerably more successful than the hot pour sealant that they replaced.

On Projects MAF-15(209) and MAF-521(035), the number of failures in the Comparison Sections was generally higher than that in the Test Sections. This appears to be due to differing traffic conditions since sealant application, rather than differences in performance. Both types of sealant were effective on all projects monitored in the study.

Conclusions

1. On Project MAF-521(035), numerous failures occurred where Thermoplastic traffic striping crossed joints sealed with 890-SL. This was most common, and the effects most severe, where the outside edge stripe crossed transverse joints.

2. Further research may be indicated on possible methods of preventing or minimizing damage to sealant at intersections with thermoplastic striping.

3. Project with CRCP design have few intersections of joints and striping, and few sealant failures associated with striping.

4. Self-levelling sealant failures observed during the evaluation generally began three years after sealant application.

5. 890-SL, used as a sealant between PCC pavement and AC shoulders, should be evaluated on a new construction project or a project with new AC shoulders, so that deterioration of the AC does not affect sealant.

6. Most of the sealant failures on the U.S. 412 Demonstration site and the S.H. 3 SHRP Site occurred where the old sealant was not completely removed.

7. A large proportion of the sealant failures (44 percent of all failures in Test and Demonstration Sections) occurred in the outside edge joint.

8. All projects in the study had numerous areas where small cracks formed parellel to joints or where small amounts of concrete spalled off of the edge of the saw cut. Where these conditions occurred, their effect was the same as that of sealant failure.

9. Where self-levelling sealants were used to reseal the 1 1/2 inch (3.81 cm) wide expansion joints on Project MAF-521(075), their performance was considerably better than the hot pour sealants they replaced.

10. The self-levelling sealants used to reseal the 1 1/2 inch (3.81 cm) expansion joints on Project MAF-521(075) were installed so that the top of the sealant was 1/2 inch below the roadway surface. This recess distance appears to be inadequate, since sealant "polishing" in the wheel paths indicates that the sealant is being forced above the roadway surface during joint closure from thermal expansion of the deck. Installing sealant during hot weather, when joints are in a relatively closed position, would be another possibility for of preventing this.

11. Results of this Field Performance Evaluation indicate that both 888-SL and 890-SL should be accepted for use on ODOT Projects.

Recommendations

1. Both self-levelling sealants (888-SL and 890-SL) should be accepted for use on ODOT projects.

2. Where joints are to be resealed with self-levelling sealants the old sealant should be completely removed and joints thoroughly cleaned.

3. Further research should be done on protecting self-levelling sealants from damage where thermoplastic traffic striping is applied over the sealant.

4. Where self-levelling sealants are used to seal 1 1/2 inch (3.81 cm) wide expansion joints, the distance the sealant is recessed below the roadway surface should be increased (beyond the 1/2 inch (1.27 cm) distance now used).

Appendix A, ODOT Specifications, Low Modulus Silicone Joint Sealants

701.08. JOINT FILLERS AND SEALERS. This Subsection establishes the requirements for joint fillers and sealers for portland cement concrete.

(e) **Low Modulus Silicone Joint Sealant.**

1. *Description.* These Specifications cover low modulus silicone joint sealant and expanded polyethylene bond breaker rod for use in sealing portland cement concrete pavement joints. The silicone sealant shall be furnished in a one part silicone formulation. Acetic acid cure sealants are not acceptable.
2. *Materials.*

2.1. **Silicone Sealant.** The silicone sealant shall meet the current Federal Specification TT-S-001543 for class A sealants except as modified by the following test requirements:

Test	Limit	Test Method
Flow	0.3 in. maximum	MIL S 8802
Extrusion Rate	75-250 gms/min.	MIL S 8802
Tack Free Time at 77°F and 45-55% R.H.	20-75 minutes	MIL S 8802
Specific Gravity	1.01 - 1.515	ASTM D 792 Method A*
Durometer, Shore A	10-27 max. @ 0°F	ASTM D 2240*
Tensile Stress at 100% Elong	75 psi maximum	ASTM D 412 Die C*
Elongation, %	500 minimum	ASTM D 412 Die C*

Concrete primer may be used if specified by the sealant manufacturer.
Note: *Cured 7 days at 77 ± 4°F and 50 ± 5 percent R. H.

2.1.1. **Acceptance.** The sealant shall be accepted on the basis of manufacturer's certification and approval by the Materials Engineer in accordance with Subsection 106.12.

A type A certification shall be furnished for the above listed test requirements.

A type D certification shall be required for compliance with current Federal Specification TT-S-001543 in accordance with Subsection 2.1 of these Specifications.

Samples of the joint sealant shall be submitted by the manufacturer to the Materials Division for tests and approval prior to use.

2.1.2. **Storage and Shelf Life.** Storage and use of the joint sealant shall be in accordance with the manufacturer's recommended practices.

2.2. **Bond Breaker Rod.** The bond breaker rod shall be of the size and dimensions shown on the Plans. The bond breaker rod shall be compatible with the joint sealant and no bond or reaction shall occur between the rod and sealant.

The bond breaker rod shall be an approved product listed for use by the Materials Division.

(Amend the following Subsection to read as follows.)

70L08. JOINT FILLERS AND SEALERS.

(e) **Low Modulus Silicone Joint Sealant.**

1. *DESCRIPTION.* These Specifications cover self-leveling, low modulus silicone joint sealants and polyethylene bond breaker rod for use in sealing Portland cement concrete pavement joints. The self-leveling silicone sealant shall be furnished in a one part silicone formulation. Acetic acid cure sealants are not acceptable.
2. *MATERIALS.* The silicone sealant shall meet the current Federal Specification TT-S-001543 for Class A sealants except as modified by the following test requirements.

TEST	LIMIT	TEST METHOD
Appearance	Smooth, non-grainy Homogeneous mixture	MIL S 8802
Extrusion Rate (gram/min)	275-550	MIL S 8802
Tack Free Time at 77 deg. F and 45-55% R.H.	3 Hrs.	MIL S 8802
Specific Gravity	1.26-1.34	ASTM D 792, Method A
Elongation, %	600 Minimum	ASTM D 3583 Section 14, Modified*
Modulus @ 50%, psi	7 Maximum	ASTM D 3583 Section 14, Modified*
Modulus @ 100%	8 Maximum	ASTM D 3583 Section 14, Modified*
Modulus @ 150%	9 Maximum	ASTM D 3583 Section 14, Modified*

2.1.1. *Acceptance.* The sealant shall be accepted on the basis of the manufacturer's certification and approval by the Materials Engineer in accordance with Subsection 106.12.

A Type "A" Certification shall be furnished for the above listed test requirements.

A Type "D" Certification shall be required for compliance with current Federal Specification TT-S-001543 in accordance with Subsection 2 of these Specifications.

Samples of the joint sealant shall be submitted by the manufacturer to the Materials Division for tests and approval prior to use.

2.1.2. *Storage and Shelf Life.* Storage and use of the joint sealant shall be in accordance with the manufacturer's recommended practices.

2.2. *Bond Breaker Rod.* The bond breaker rod shall be of the size and dimensions shown on the Plans. The bond breaker rod shall be compatible with the joint sealant and no bond or reaction shall occur between the rod and the sealant.

The bond breaker rod shall be an approved product listed for use by the Materials Division.

*Clean two 1" x 1" x 3" concrete test blocks, hold under running tap water and scrub with a brush for approximately 30 seconds. Allow blocks to dry for 24 hours at room temperature. Assemble blocks (with 1" x 3" surfaces facing) with 1/2" x 1/2" clamp. Insert backer rod (closed) cell 1/2" dia. x 1"), do not touch surface with fingers. Inject sealant to fill the cavity with no air entrapment. Allow the sealant to flow to a smooth surface-do not strike off. Allow to cure at 77 degrees F and 45-55% R.H. After 21 days, remove clamp and Teflon spacers and pull Instron tester at 2" per minute.

Appendix B, Final Survey Reports

ODOT RESEARCH AND DEVELOPMENT DIVISION

JOINT SURVEY FORM, CRCP PAVEMENT

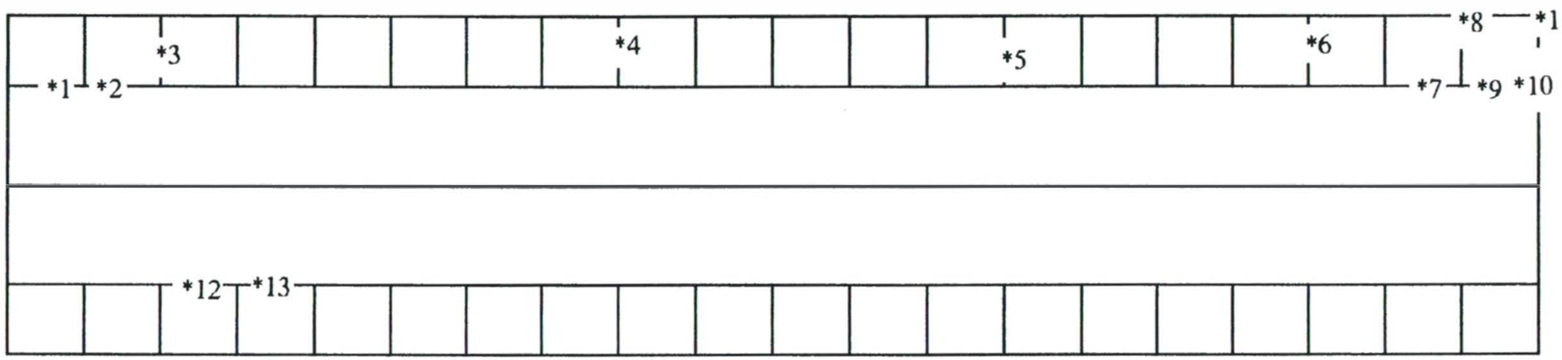
PROJECT OR LOCATION: Project MAF-15(209).

Begins at "Road 36", Extends 20 slabs North.

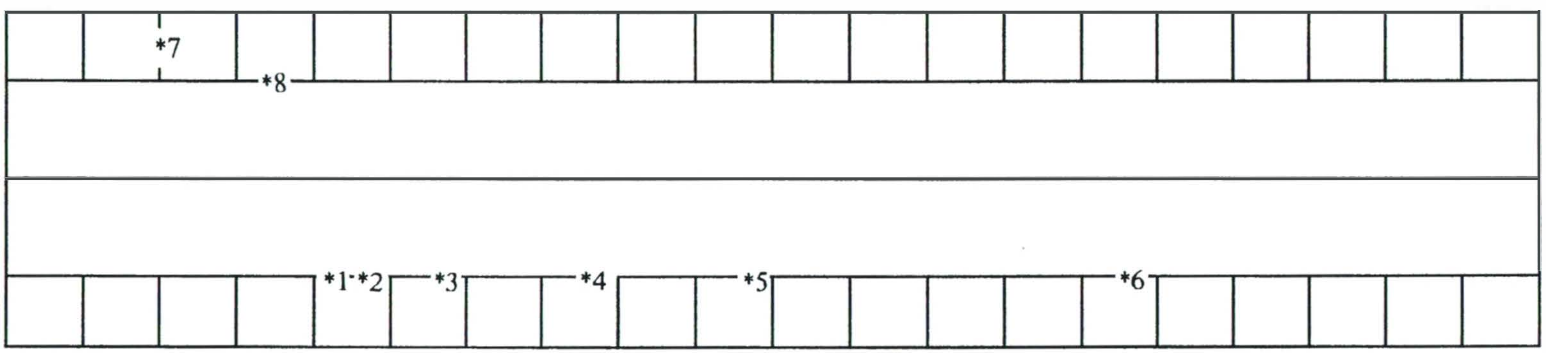
Surveyed by: G. Williams

COMPARISON SECTION 1. Southbound Expressway

Date: May 11, 1994.



TEST SECTION 1. Northbound Expressway



* Location of Failure

ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: MAF-15(209), Test Section No. 1 and Comparison Section No. 1.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: May 11, 1994.

SEALANT FAILURES

TEST SECTION NO. 1.

NUMBER	DESCRIPTION
1.	Two inch long adhesion failure.
2.	Two inch long adhesion failure.
3.	One inch long adhesion failure.
4.	One inch long adhesion failure.
5.	Cohesion failure.1/4 inch Dia. "hole" extending down to backer rod.
6.	Two inch long adhesion failure.
7.	Cohesion failure. 3/8 inch Dia. "hole' extending down to backer rod. approx. one inch below the roadway grade).
8.	Two inch long adhesion failure.

COMPARISON SECTION NO. 1.

NUMBER	DESCRIPTION
1.	One inch long adhesion failure.
2.	Cohesion failure. 3/8 inch Dia. "hole" extending down to backer rod.
3.	Cohesion failure. 1/4 inch Dia. "hole" extending down to backer rod.
4.	Two inch long adhesion failure.
5.	Cohesion failure. 1/4 inch wide X 1 inch long "split" in sealant.
6.	One inch long adhesion failure.
7.	One inch long adhesion failure.
8.	One inch long adhesion failure.
9.	Two inch long adhesion failure.
10.	One inch long adhesion failure.
11.	Cohesion failure. 1/4 inch Dia. "hole" extending down to backer rod.
12.	Two inch long adhesion failure.
13.	One inch long adhesion failure.

ODOT RESEARCH AND DEVELOPMENT DIVISION

JOINT SURVEY FORM, CRCP PAVEMENT

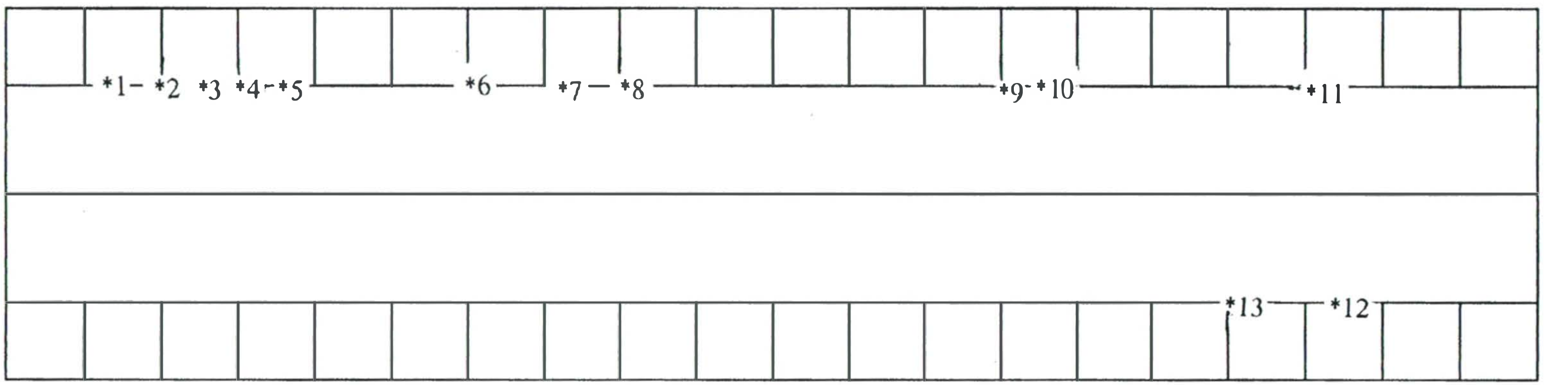
PROJECT OR LOCATION: Project MAF-15(209).

Begins at "Road 37", Extends 20 slabs North.

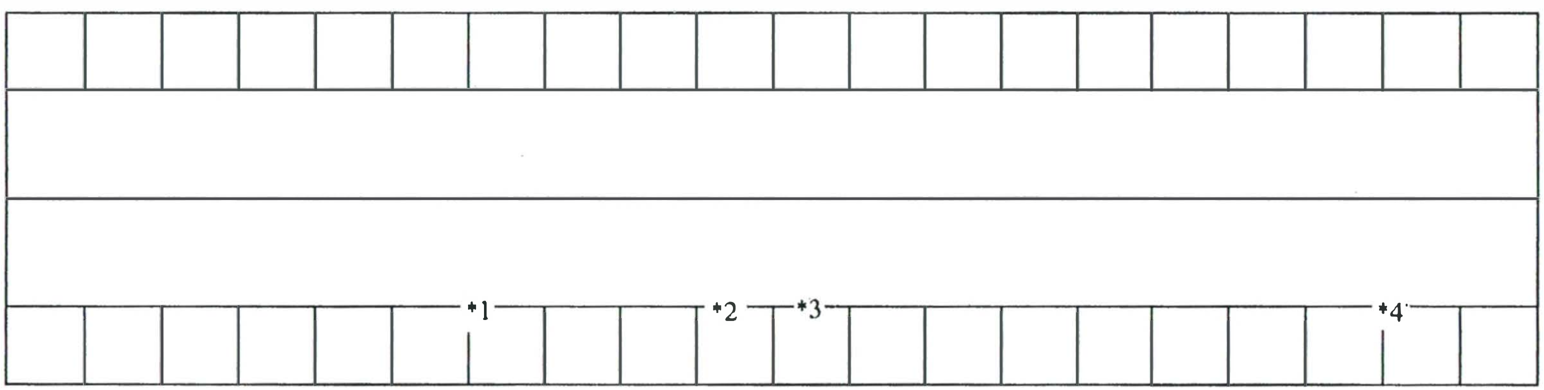
Surveyed by: G. Williams

COMPARISON SECTION 2. Southbound Expressway

Date: May 11, 1994.



TEST SECTION 2. Northbound Expressway



ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: MAF-15(209), Test Section No. 2 and Comparison Section No. 2.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: May 11, 1994.

SEALANT FAILURES

TEST SECTION NO. 2.

NUMBER DESCRIPTION

1. Cohesion failure. 1/4 inch Dia. "hole" extending to backer rod. Located at intersection of edge and transverse shoulder joints.
2. Two inch long adhesion failure.
3. One inch long adhesion failure.
4. Cohesion failure. 1/4 inch Dia. "hole" extending to backer rod. Located at intersection of edge and transverse shoulder joints.

COMPARISON SECTION NO. 2.

NUMBER DESCRIPTION

1. One inch long adhesion failure.
2. Cohesion failure. 1/4 inch Dia. "hole" extending down to backer rod.
3. Two inch long adhesion failure.
4. Two inch long adhesion failure. Located at intersection of joints.
5. One inch long adhesion failure. Located at intersection of joints.
6. One inch long adhesion failure.
7. Cohesion failure. 3/8 inch Dia. "hole" extending down to backer rod. Located at intersection of joints.
8. Two inch long adhesion failure.
9. Cohesion failure. 1/4 inch Dia. "hole" extending down to backer rod. Located at intersection of joints.
10. Two inch long adhesion failure.
11. Three inch long adhesion failure. Located at intersection of joints.
12. Two inch long adhesion failure. Located at intersection of joints.
13. Cohesion failure. 1/4 inch Dia. "hole" extending down to backer rod.

ODOT RESEARCH AND DEVELOPMENT DIVISION

JOINT SURVEY FORM, CRCP PAVEMENT

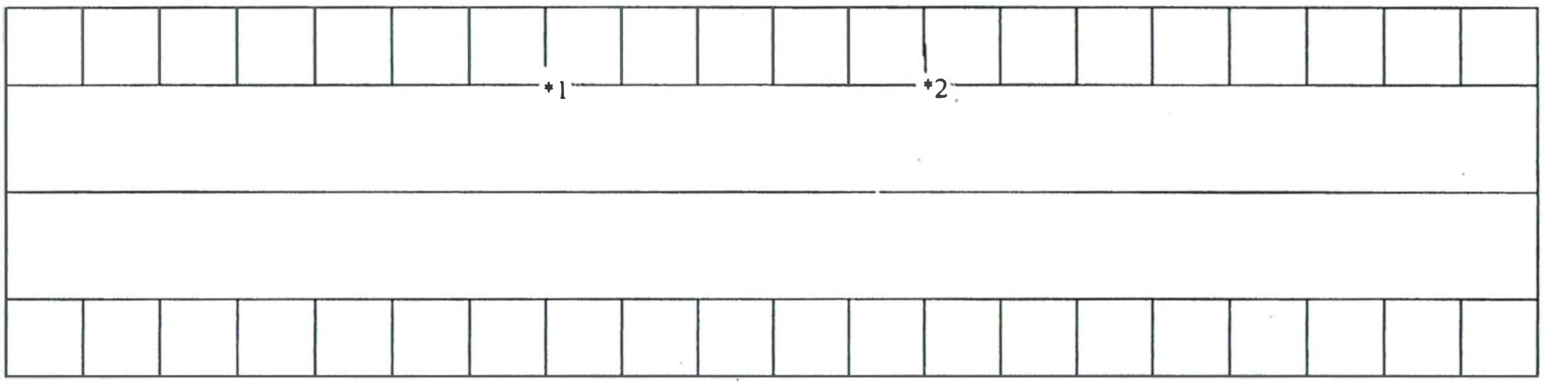
PROJECT OR LOCATION: Project MAF-15(209).

Begins at "Road 40", Extends 20 slabs North.

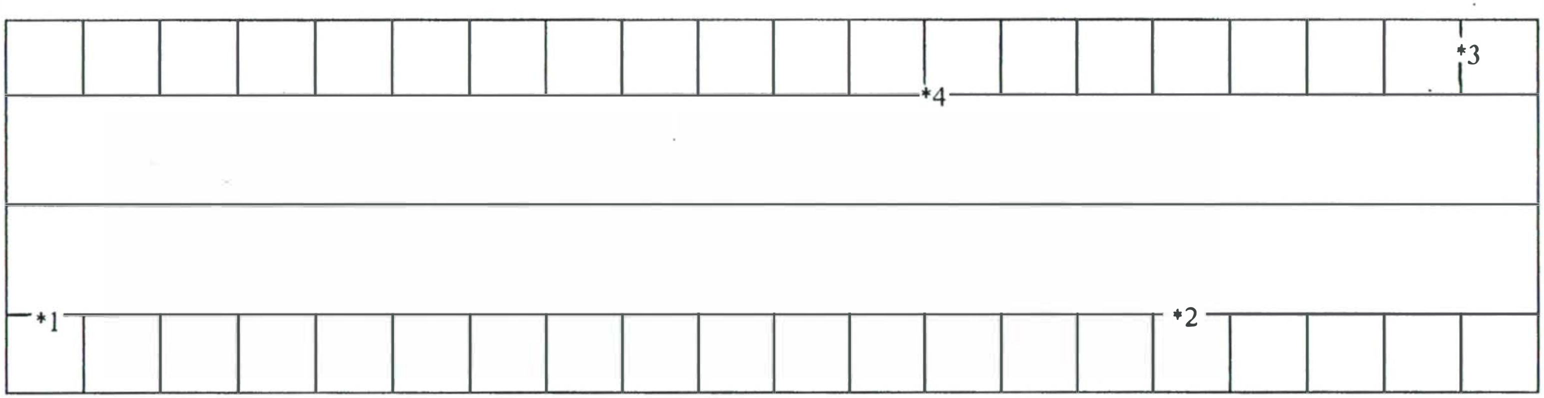
Surveyed by: G. Williams

COMPARISON SECTION 3. Southbound Expressway

Date: May 11, 1994.



TEST SECTION 3. Northbound Expressway



ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: MAF-15(209), Test Section No. 3 and Comparison Section No. 3.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: May 11, 1994.

SEALANT FAILURES

TEST SECTION NO. 3.

NUMBER	DESCRIPTION
1.	One inch long adhesion failure.
2.	Two inch long adhesion failure.
3.	Cohesion failure. Three (connected) "holes", each is almost as wide as the joint (1/2 inch).
4.	Two inch long adhesion failure.

COMPARISON SECTION NO. 3.

NUMBER	DESCRIPTION
1.	Cohesion failure. 1/4 - 3/8 inch Dia. "hole" extending down to the sender rod.
2.	Cohesion failure. 1/4 inch Dia. "hole" extending down to backer rod.

ODOT RESEARCH AND DEVELOPMENT DIVISION

JOINT SURVEY FORM, JOINTED PCC PAVEMENT

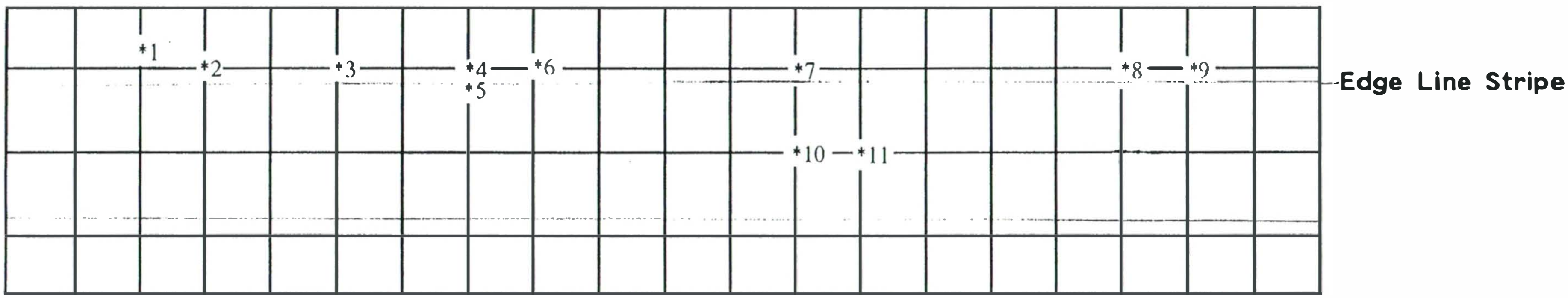
PROJECT OR LOCATION: MAF-521(035)

Comparison Section 1.
Begins at north end of approach slab, 116th St. Overpass bridge, extends 20 slabs north.

Surveyed by: G. Williams

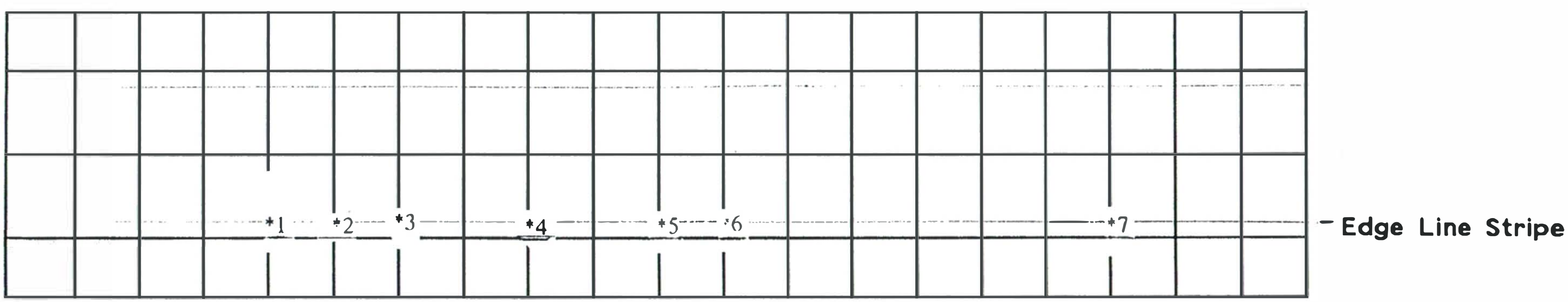
Southbound Expressway

Date: June 3, 1994



Test Section 1.
Begins at north end of approach slab, 116th St. Overpass Bridge, extends 20 slabs north.

Northbound Expressway



* Location of Failure.

ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: MAF-521(035), Test Section No. 1 and Comparison Section No. 1.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: May 11, 1994.

SEALANT FAILURES

TEST SECTION NO. 1.

NUMBER DESCRIPTION

1. Four inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
2. Three inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
3. Three inch long adhesion failure.Located where thermoplastic edge line striping crosses transverse joint.
   the joint (1/2 inch).
4. Five inch long adhesion failure.Located where thermoplastic edge line striping crosses transverse joint.Sealant is not attached to the joint on either side and has dropped (sagged) one inch below the surface.
5. Four inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
6. Five inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint. Sealant has sagged1 inch below the surface as described in No. 4.
7. Five inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.

COMPARISON SECTION NO. 1.

NUMBER DESCRIPTION

1. One inch long adhesion failure.
2. Cohesion failure. 3/8 inch Dia. "hole" extending down to backer rod.
3. Cohesion failure. Three inch long "split" in the middle of the sealant.
4. Cohesion failure. 1/4 inch Dia. "hole" extending down to backer rod.
5. Four inch long adhesion failure.Located where thermoplastic edge line striping crosses transverse joint.
6. Cohesion failure. 1/4 inch Dia. "hole".
7. Cohesion failure. 1/4 inch Dia. "hole".
8. Cohesion failure. 3/8 inch Dia. "hole".
9. Cohesion failure. 1/4 inch Dia. "hole".
10. Two inch long adhesion failure. Located where thermoplastic centerline striping crosses transverse joint.
11. Three inch long adhesion failure. Locatedwhere thermoplastic center-line striping crosses transverse joint.

ODOT RESEARCH AND DEVELOPMENT DIVISION

JOINT SURVEY FORM, JOINTED PCC PAVEMENT

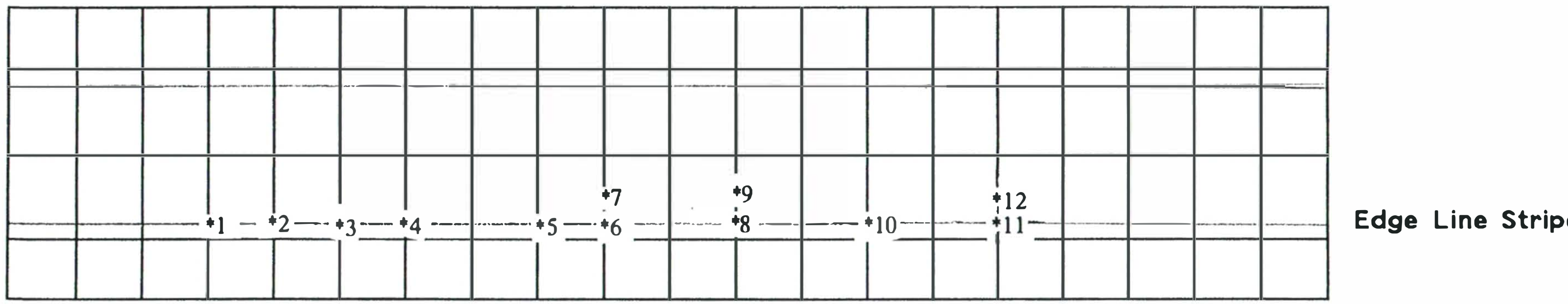
PROJECT OR LOCATION: MAF-521(035)

Comparison Section 2.
Consists of 20 slabs adjacent to main line. On entrance ramp from 106th St.

Surveyed by: G. Williams

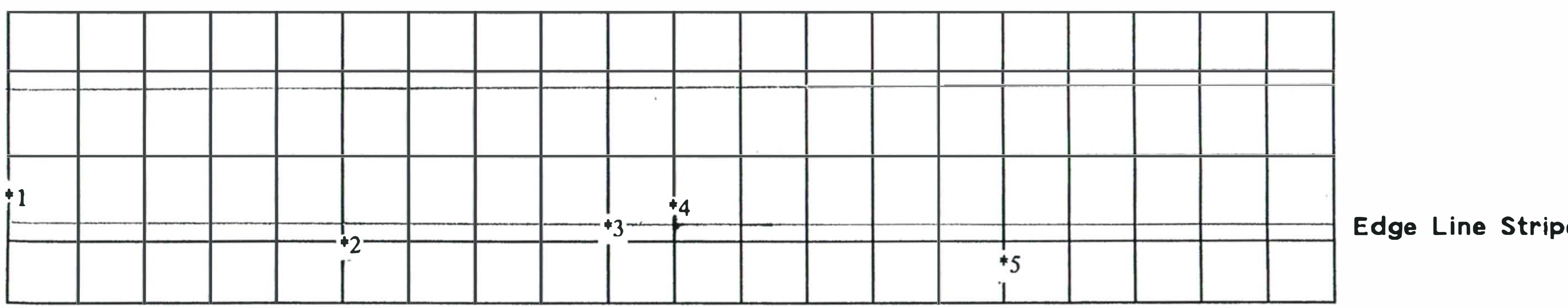
Southbound Expressway

Date: June 3, 1994



Test Section 2.
Consists of 20 slabs adjacent to main line. On exit ramp to 106th St.

Northbound Expressway



* Location of Failure.

ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: MAF-521(035), Test Section No. 2 and Comparison Section No. 2.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: May 11, 1994.

SEALANT FAILURES

TEST SECTION NO. 2.

NUMBER	DESCRIPTION
1.	Cohesion failure. Diameter of "hole", which extends to the backer rod, is almost full joint width (1/2 inch) with a small amount of sealant remaining on each side.
2.	Cohesion failure. As in No. 1 (above), dia. of "hole" is approx. 1/2 inch.
3.	Cohesion failure. Approx. 1/2 inch dia. "hole".
4.	Cohesion failure. Approx. 1/2 inch dia. "hole".

COMPARISON SECTION NO. 2.

NUMBER	DESCRIPTION
1.	Four inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
2.	Three inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
3.	Three inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
4.	Four inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
5.	Two inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
6.	Three inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
7.	One inch long adhesion failure.
8.	Three inch long adhesion failure. Located where thermoplastic center-line striping crosses transverse joint.
9.	Cohesion failure. "Hole" approx. 1/2 inch Dia. (almost full joint width).
10.	Four inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
11.	Three inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
12.	Cohesion failure. "Hole" approx. 1/2 inch Dia.

ODOT RESEARCH AND DEVELOPMENT DIVISION

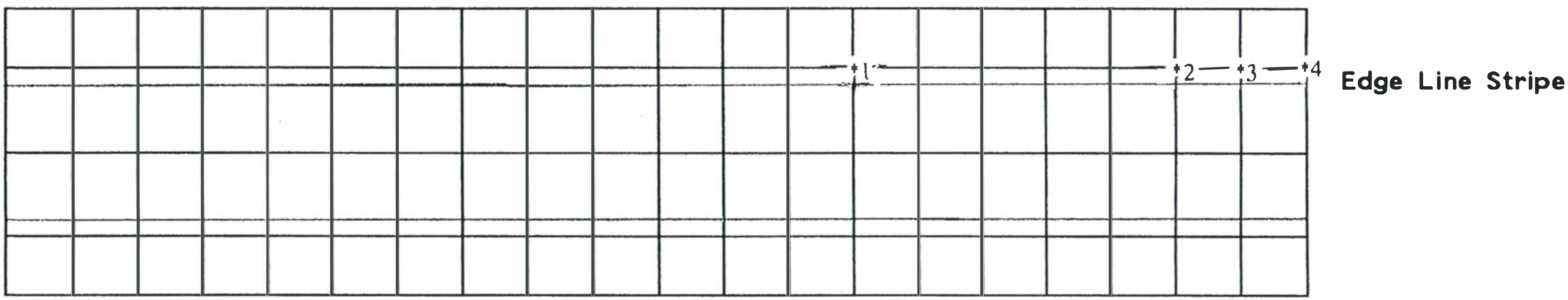
JOINT SURVEY FORM, JOINTED PCC PAVEMENT

PROJECT OR LOCATION: MAF-521(035)

Comparison Section 3.
Located in 106th St. Exit Ramp. Begins at first slab adjacent to main line, extends 20 slabs south (into ramp).

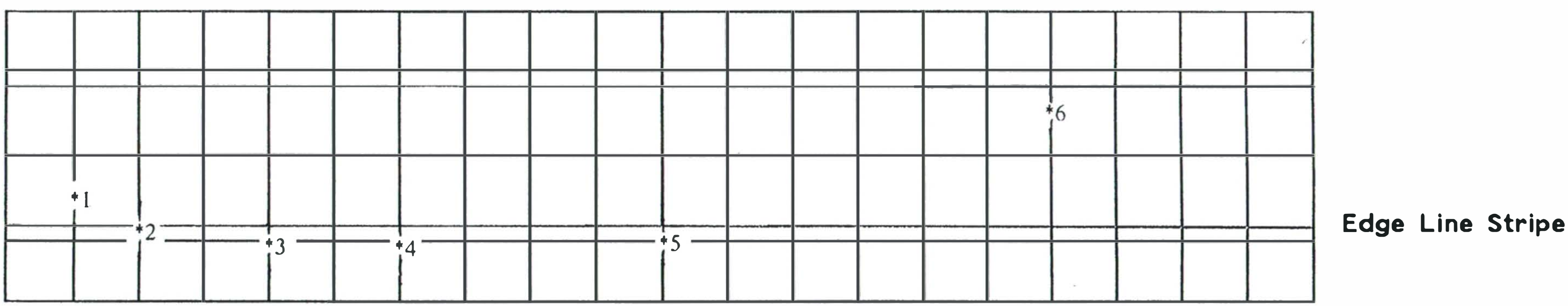
Surveyed by: G. Williams
Date: June 3, 1994

Southbound Expressway



Test Section 3.
Located in 106th St. Entrance Ramp. Begins at first slab adjacent to main line, extends 20 slabs south (into ramp).

Northbound Expressway



* Location of Failure.

ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: MAF-521(035), Test Section No. 3 and Comparison Section No. 3.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: May 11, 1994.

SEALANT FAILURES

TEST SECTION NO. 3.

NUMBER DESCRIPTION

1. Cohesion failure. Diameter of "hole", which extends to the backer rod, is approx. 3/8 inch.
2. Three inch long adhesion failure. Located where thermoplastic edge line striping crosses transverse joint.
3. Cohesion failure. 3/8 inch Dia. "hole" extending down to backer rod.
4. Cohesion failure. 3/8 inch Dia. "hole" extending down to backer rod.
5. Cohesion failure. 3/8 inch Dia. "hole" extending down to backer rod.
6. Cohesion failure. 3/8 inch Dia. "hole" extending down to backer rod.

COMPARISON SECTION NO. 3.

NUMBER DESCRIPTION

1. Cohesion failure. 3/8 inch "hole" extending down to backer rod.
2. Cohesion failure. 3/8 inch "hole" extending down to backer rod.
3 Cohesion failure. 3/8 inch "hole" extending down to backer rod.
4. Cohesion failure. 3/8 inch "hole" extending down to backer rod.

ODOT RESEARCH AND DEVELOPMENT DIVISION

JOINT SURVEY FORM, CRCP PAVEMENT

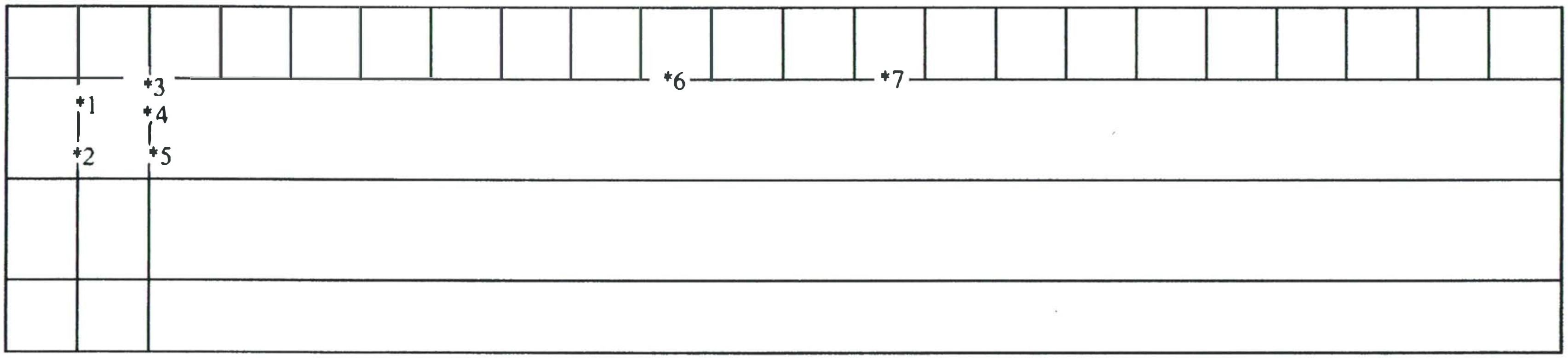
PROJECT OR LOCATION: MAF-521(075), U.S. 169, in Tulsa, between 51st and 71st Streets South, Tulsa.

Begins at 51st Street Overpass. Extends 20 slabs South.

Surveyed by: G. Williams

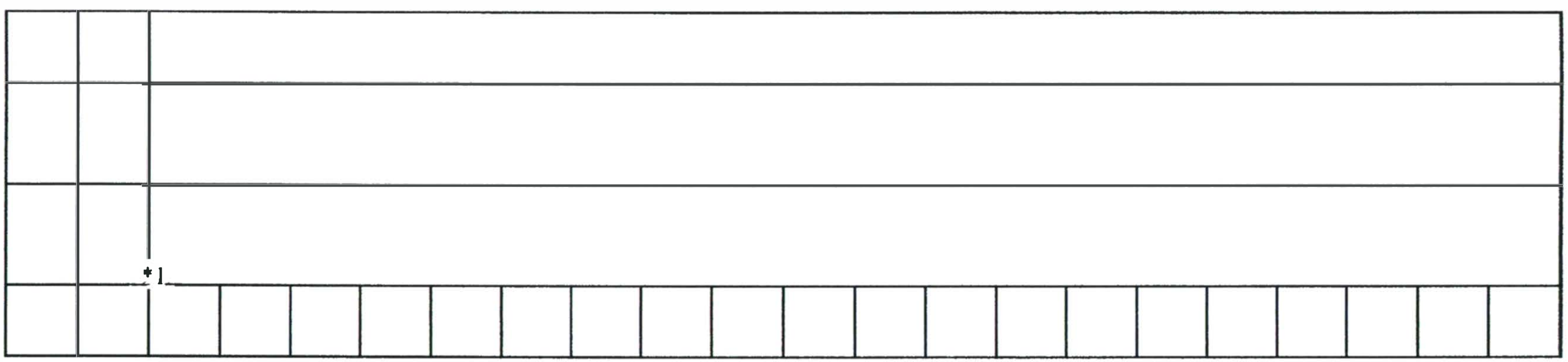
TEST SECTION 1. Northbound Expressway,

Date: June 3, 1994.



Failures shown are in terminal joints at bridge approach slabs. No failures in pavement joints.

TEST SECTION 2. Southbound Expressway



No sealant failures.

ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: MAF-521(075), Test Sections No. 1 and 2.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: June 3, 1994.

SEALANT FAILURES

TEST SECTION NO. 1.

NUMBER	DESCRIPTION
1.	Four inch long adhesion failure. Located in wheel path.
2.	Five inch long adhesion failure. Located in wheel path.
3.	Two inch long adhesion failure Located where outside edge line striping crosses terminal joint.
4.	Three inch long adhesion failure. Located in wheel path.
5.	Five inch long adhesion failure. Located in wheel path.
6.	Cohesion failure. Consists of a series of connected "holes" which extend down to the backer rod. Individual holes are approx. 1/4 inch Dia.
7.	Cohesion failure. Series of connected "holes" as described in No. 6.

Note that all of the failures are in the terminal joint at the end of an overpass bridge. The joint is approximately two inches wide, when in the "open" position. Except for the one where the thermoplastic striping crosses the sealed joint, all failures appear to be caused by the sealant being compressed when thermal expansion of the roadway closes the joint. When this occurs, the sealant is compressed, such that the top edge of it extends above the road surface, exposing it to contact from tires. The action of the tires on the sealant then pulls it away from the joint, causing the failures noted.

TEST SECTION NO. 2.

NUMBER	DESCRIPTION
1.	One inch long adhesion failure. Located where thermoplastic striping (edge line stripe) crosses the terminal joint.

Note; as in Test Section 3, all failures in this area were in the sealed terminal joints. Also as in Section 3, the damage appears to be caused when the joint closes in hot weather, compressing the sealant. The sealant is enclosed on both sides and on the bottom, when compressed, it tends to force the top of the sealant up. This causes the top of the sealant to be above the surface of the roadway, exposing it to contact with tires.

ODOT RESEARCH AND DEVELOPMENT DIVISION

JOINT SURVEY FORM, CRCP PAVEMENT

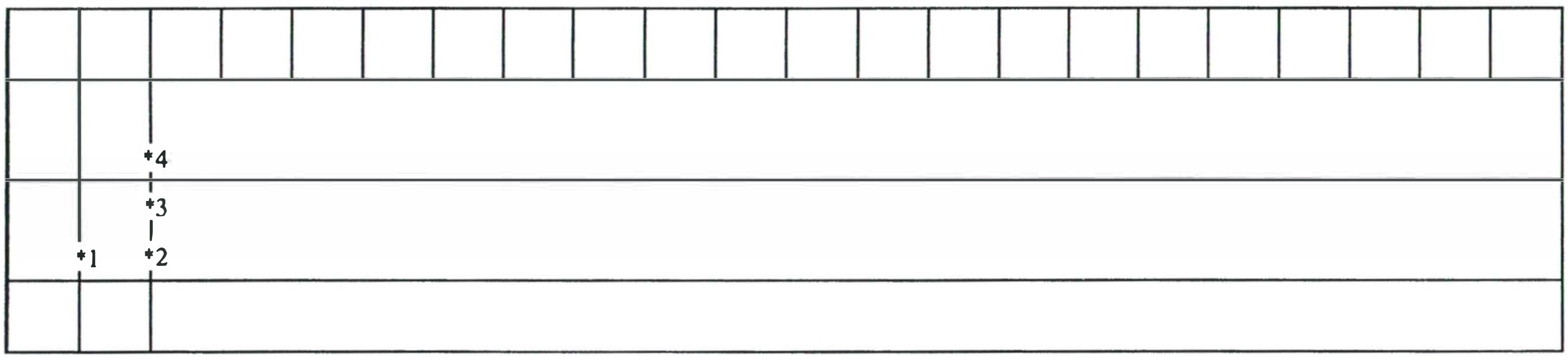
PROJECT OR LOCATION: MAF-521(075), U.S. 169, in Tulsa, between 51st and 71st Streets South, Tulsa.

Begins at 61st Street Overpass. Extends 20 slabs South.

Surveyed by: G. Williams

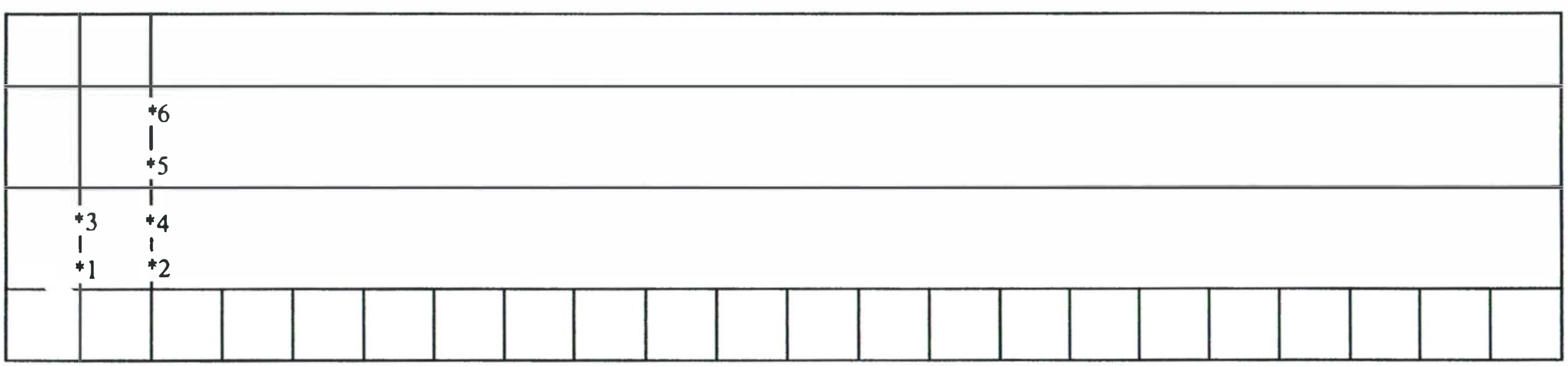
TEST SECTION 3. Northbound Expressway,

Date: June 3, 1994.



Failures shown are in terminal joints at bridge approach slabs. No failures in pavement joints.

TEST SECTION 4. Southbound Expressway



No sealant failures.

ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: MAF-521(075), Test Sections No. 3 and 4.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: June 3, 1994.

SEALANT FAILURES

TEST SECTION NO. 3.

NUMBER	DESCRIPTION
1.	Three inch long adhesion failure. Located in wheel path.
2.	Four inch long adhesion failure. Located in wheel path.
3.	Four inch long adhesion failure. Located in wheel path.
4.	Two inch long adhesion failure. Located in wheel path.

Note that all of the failures are in the terminal joint at the end of an overpass bridge. The joint is approximately two inches wide, when in the "open" position. All failures appear to be caused by the sealant being compressed when thermal expansion of the roadway closes the joint. When this occurs, the sealant is compressed, such that the top edge of it extends above the road surface, exposing it to contact from tires. The action of the tires on the sealant then pulls it away from the joint, causing the failures noted.

TEST SECTION NO. 4.

NUMBER	DESCRIPTION
1.	Four inch long adhesion failure. Located in wheel path.
2.	Four inch long adhesion failure. Located in wheel path.
3.	Five inch long adhesion failure. Located in wheel path.
4.	Six inch long adhesion failure. Locatedin wheel path.
5.	Four inch long adhesion failure. Located in wheel path.
6.	Three inch long adhesion failure. Located in wheel path.

Note; as in Test Section 3, all failures in this area were in the sealed terminal joints. Also as in Section 3, the damage appears to be caused when the joint closes in hot weather, compressing the sealant. The sealant is enclosed on both sides and on the bottom, when compressed, it tends to force the top of the sealant up. This causes the top of the sealant to be above the surface of the roadway, exposing it to contact with tires.

JOINT SURVEY FORM, JOINTED PCC PAVEMENT

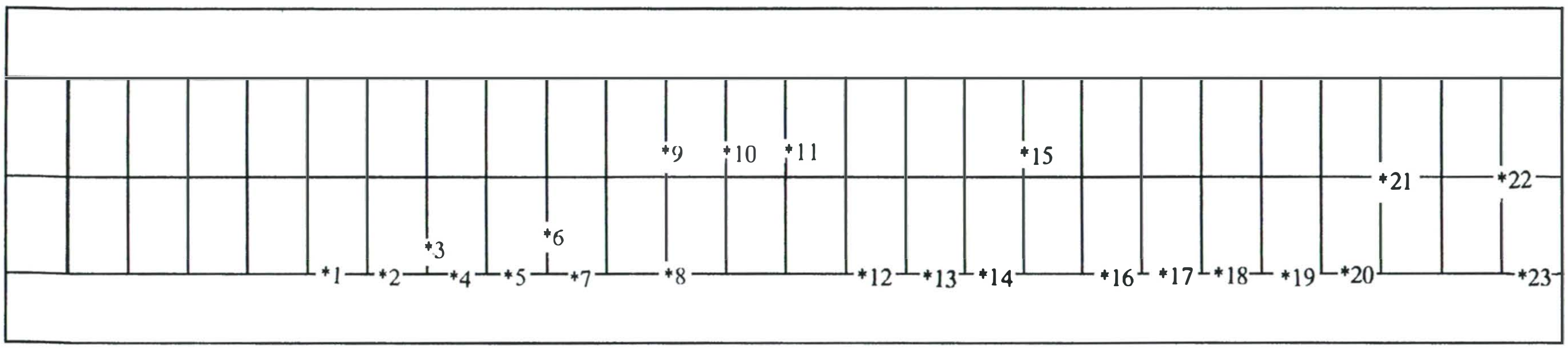
PROJECT OR LOCATION: Demonstration Section, U.S. 412

Location marked on shoulder.

Surveyed by: G. Williams

Eastbound Expressway

Date: April 3, 1994



* Location of Failure.

ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: Demonstration Section, US 412. Mayes County.
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: April 3, 1994.

SEALANT FAILURES

NUMBER	DESCRIPTION
1.	One inch long adhesion failure (not adhering to PCC).
2.	Two inchlong adhesion failure(not adhering to PCC). longer attached to the side of the joint.
3.	One inch long adhesion failure (not adhering to PCC).
4.	One inch long adhesion failure (not adhering to PCC).
5.	Two inch long adhesion failure (not adhering to PCC).
6.	Two inch long adhsion failure located in transverse joint 4 feet from edge line.
7.	Two inch long adhesion failure not adhering to AC shoulder).
8.	"Hole" (cohesion failure) located at edge and transverse joints.
9.	Cohesion failure (1/4 inch dia. hole) located in wheel path.
10.	Cohesion failure (1/4 inch dia. hole) located in wheel path.
11.	Two inch long adhesion failure in wheel path.
12.	One inch long adhesion failure (not adhering to AC shoulder).
13.	One inch long adhesion failure (not adhering to AC shoulder).
14.	Two inch long adhesion failure (not adhering to AC shoulder).
15.	Two inch long adhesion failure located in inside wheel path.
16.	One inch long adhesion failure (not adhering to PCC).
17.	One inch long adhesion failure (not adhering to PCC).
18.	One inch long adhesion failure (not adhering to AC shoulder).
19.	One inch long adhesion failure (not adhering to AC shoulder.
20.	One inch long adhesion failure (not adhering to AC shoulder).
21.	"Hole" (cohesion failure) at intersection of transverse and centerline joints. Dia. = 1/4 inch.
22.	"Hole" (cohesion failure) at intersection of transverse and centerline\ joints. Dia. = 1/4 inch.
23.	Two inch long adhesion failure (not adhering to PCC).

ODOT RESEARCH AND DEVELOPMENT DIVISION JOINT SURVEY

Project: Demonstration Section, SH 3, Ada, Oklahoma..
Surveyed by: G.Williams, ODOT R. & D. Div.
Date: March 22, 1994.

SEALANT FAILURES

NUMBER	DESCRIPTION
1.	Two inch long adhesion failure. Not adhering to deteriorated AC shldr.
2.	Two inchlong adhesion failure. Not adhering to PCC).
3.	One inch long adhesion failure (not adhering to deteriorated AC shldr.).
4.	One inch long adhesion failure (not adhering to deteriorated AC shldr.).
5.	Two inch long adhesion failure (not adhering to PCC.
6.	Two inch long adhsion failure located inwheel path.
7.	Two inch long adhesion failure (not adhering to AC shldr.which is approx. one inch below the roadway grade).
8.	"Hole" (cohesion failure) located at intersection of edge and transverse joints.
9.	Adhesion failure located in wheel path.
10.	Adhesion failure (not adhering to AC shldr.).
11.	Cohesion failure (1/4 inch dia. "hole") at intersection of transverse and centerline joints.
12.	One inch long adhesion failure (not adhering to deteriorated AC shldr.).
13.	Two inch long adhesion failure (not adhering to PCC).
14.	Two inch long adhesion failure (not adhering to deteriorated AC shldr.).
15.	One inch long adhesionfailure in wheel path.
16.	One inch long adhesion failure(not adhering to PCC).
17.	One inch long adhesion failure (not adhering todeteriorated AC shldr.).
18.	Two inch long adhesion failure (not adhering to deteriorated AC shldr.).
19.	One inch long adhesion failure (not adhering to deteriorated AC shldr.).

NOTE: Failures 12 - 14 are located in an area where the sawed edge joint is approx. two wide.

Failures 16 - 19 are located where the AC shldr. is approx. one inch lower than the edge of the roadway.

ODOT RESEARCH AND DEVELOPMENT DIVISION

JOINT SURVEY FORM, JOINTED PCC PAVEMENT

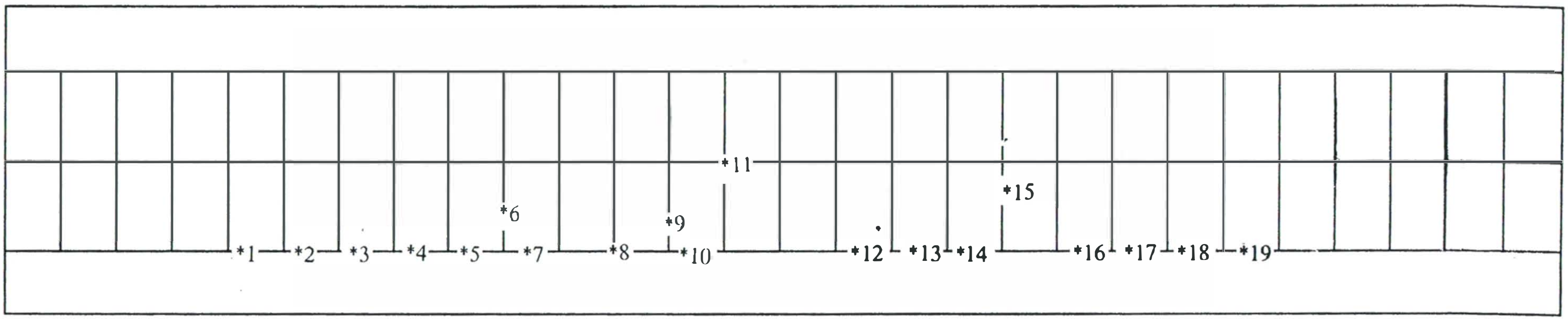
PROJECT OR LOCATION: Demonstration Section, SH3

Location marked on shoulder.

Surveyed by: G. Williams

Westbound Expressway

Date: **March 22, 1994.**



Westbound Expressway (continued)