

FINAL REPORT
FOR
EVALUATION OF EXPERIMENTAL
CONSTRUCTION PROJECT
ON
INTERSTATE HIGHWAY 40
POTTER COUNTY
TEXAS

CONTROL: 275-1-83
FROM: IH 27 IN AMARILLO
TO: EAST 8.0 MILES

PROJECT SUPERVISION
WILLIAM E. BRYAN, JR., RESIDENT ENGINEER

REPORT PREPARED BY
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DATES OF CONSTRUCTION:
JANUARY 6, 1983 TO DECEMBER 8, 1983

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OBJECTIVES

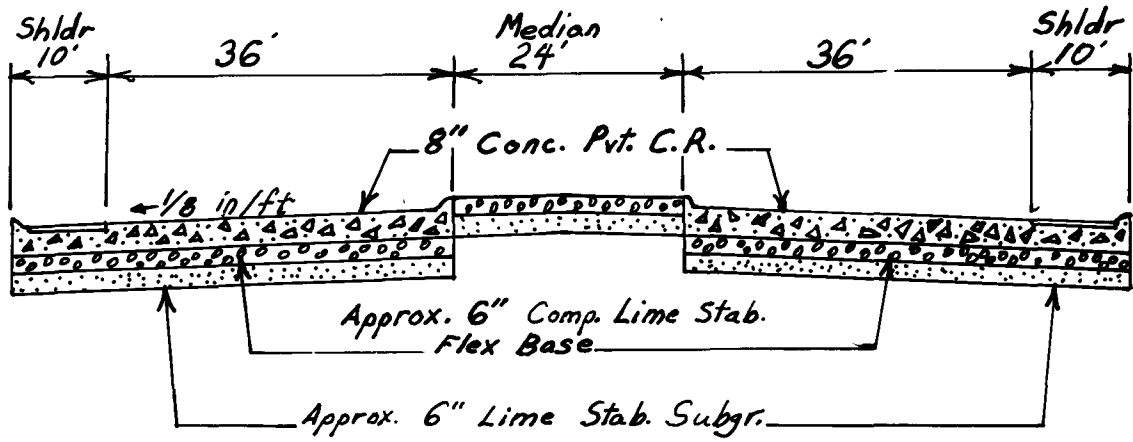
The objectives are to report observations made during the annual condition surveys of the experimental project constructed on IH 40 in Potter County, and to report the performance of the Hot Rubber Asphalt Underseal in retarding reflective cracking.

PROJECT BACKGROUND

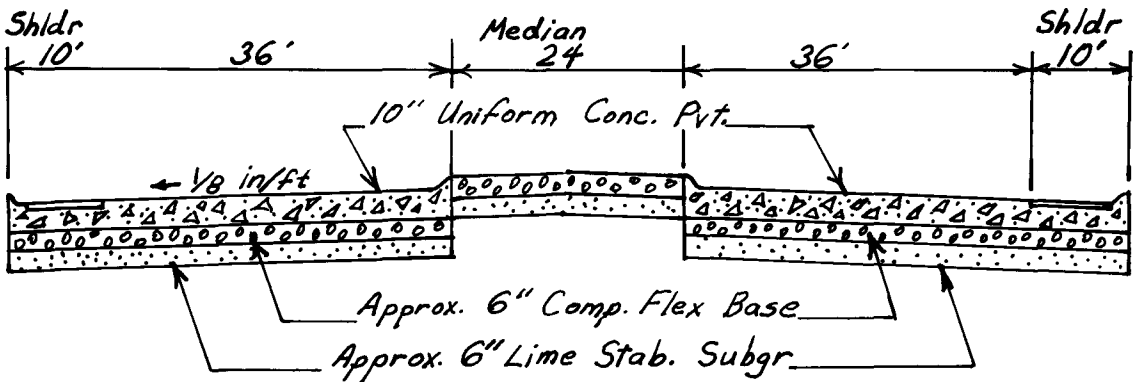
This project is located from IH 27 in Amarillo East 8.0 miles. The roadway surface is at an elevation of 3650 feet and is oriented from West to East. The soil is Pullman clay loam with a Plasticity Index (P.I.) between 21 and 27 and Triaxial Class of 4.3 to 5.0.

The average rainfall is 20.28 inches with an average snowfall of 15 inches. The mean annual temperature is 59 degrees Fahrenheit with a minimum of 21 degrees Fahrenheit and daily variations of 30 to 40 degrees are common.

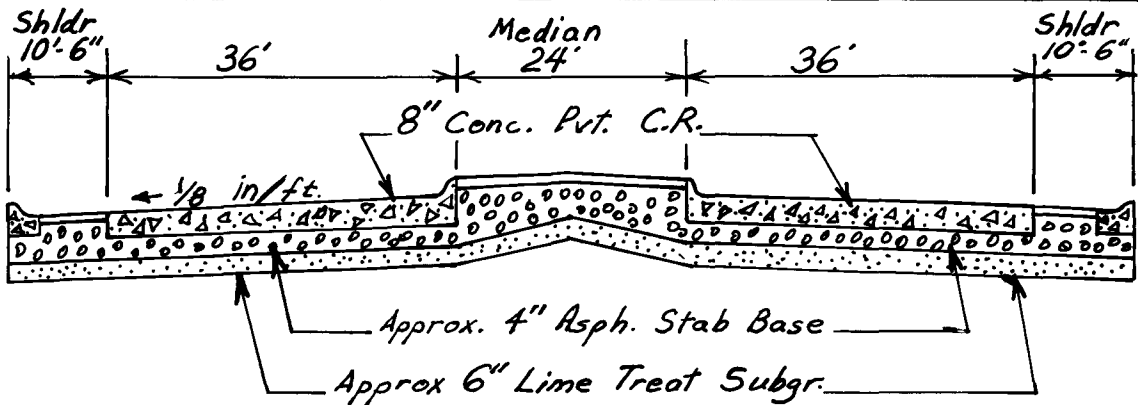
The portion of Interstate 40 covered in this project was originally constructed under three separate contracts beginning in 1962 and completed in December of 1966. Four typical cross sections of the roadway as originally constructed are shown on the following page.



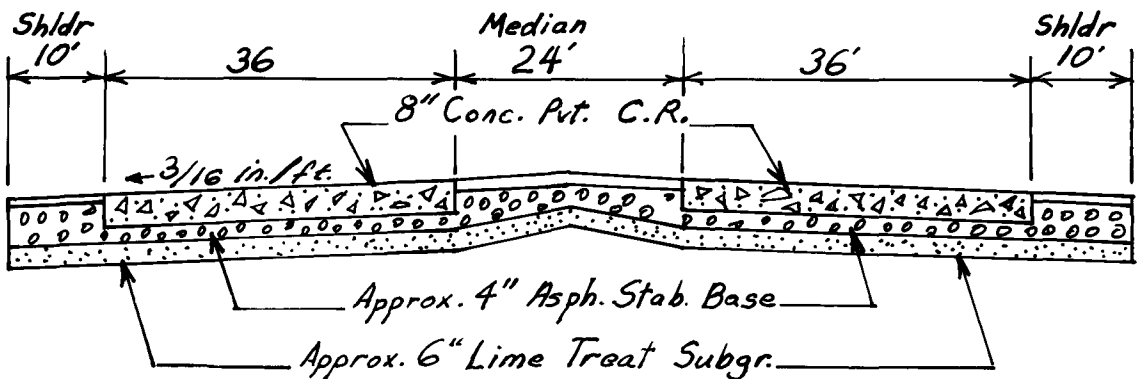
TYPICAL SECTION- STA 1008+43 TO STA 1079+35



TYPICAL SECTION- STA 1079+35 TO STA 1150+00



TYPICAL SECTION- STA 1150+00 TO STA 9+20



TYPICAL SECTION- STA 9+20 TO STA 235+00

REVIEW OF THE DESIGN

Repair of existing concrete pavement, a hot asphalt-rubber underseal with Ty PB Gr 3 Aggregate, and an asphaltic concrete overlay at approximately 275 LB/SY.

For evaluation purposes, two 400 foot long test sections were provided on which no underseal was used. One test section is in an area where the original surface is of continuous reinforced concrete pavement, the other is in an area where the original surface is jointed, non-reinforced concrete pavement.

CONSTRUCTION PHASE

Construction operations began on January 6, 1983 with repairing of existing concrete pavement. This operation involved removing and replacing sections of concrete where failures were obvious, and patching spalled areas around concrete paving joints.

Sahuaro Petroleum and Asphalt Company, subcontractor for Gilvin-Terrill, Inc., began the applications of Hot Asphalt-Rubber on June 22, 1983. The material, made up of 75% AC asphalt and 25% rubber, was heated to a temperature of 325 to 350 degrees Fahrenheit. It was applied over an emulsion tack coat at an average rate of 0.648 Gal/SY and covered with approximately 77 CY/SY of aggregate. The seal coat was rolled with a pneumatic roller at an average rate of 1 Hr: 1948 SY, swept and returned to traffic. Sahuaro completed its operations on July 1, 1983.

Paving operations began on July 25, 1983 after the ramps and outside shoulder had been treated with an asphalt latex underseal. A level up course was laid at an average rate of 125 LBS/SY. The depth of the level up course varied across the width to the roadway in order to increase the cross slope. The second course was laid at a rate of 150 LBS/SY with constant depth of $1\frac{1}{2}$ inches. Paving was completed on September 8, 1983.

Test sections were provided to use as controls in evaluating the performance of the Hot Asphalt-Rubber as an underseal. No surface sealing system was applied to the main lanes of these 400' long sections. The test sections are located near bridges so that overhead photographs can be made from the bridges. The test section located between stations 154+00 and 158+00 is in an area where the original pavement was constructed of continuous reinforced concrete. The test section located between stations 1106+00 and 1110+00 is in an area where the original pavement was constructed of jointed

non-reinforced concrete.

Traffic was carried on the main lanes during the construction. The average daily traffic count varied from 59,000 vehicles on the west end to 18,000 vehicles on the east end of the project, with approximately 35% trucks.

CONDITION AFTER INITIAL INSPECTION

As of October 1983, only small hairline cracks have been observed and only in areas where the original concrete pavement was constructed of jointed, non-reinforced concrete. A visual inspection of the test section in this area found 16 transverse cracks in the eastbound lanes and 12 transverse cracks in the westbound lanes. The 400' long section to the west and adjacent to this test section has 12 transverse cracks in the eastbound lanes and 7 transverse cracks in the westbound lanes.

Visual inspection of the overlay on continuous reinforce concrete pavement, which includes a test section where no Hot Asphalt-Rubber was used, found no transverse cracks.

CONDITION AFTER ONE YEAR

A visual inspection of the pavement was made in October 1984. Specific attention was paid to the 400 foot test sections and the 400 foot long areas adjacent and to the west of the test sections.

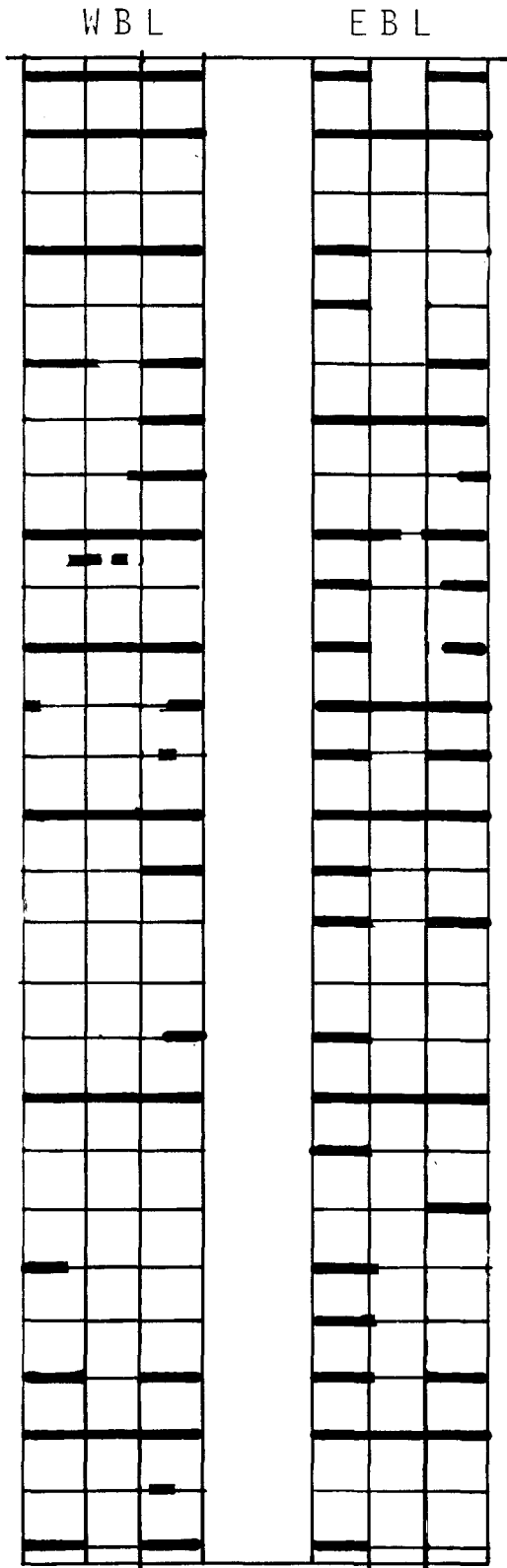
No transverse cracks were found in the areas where the overlay is on continuous reinforced concrete pavement (CRCP). Continuous longitudinal cracking was noted at the joints between the main lanes and shoulders. Occasional longitudinal cracking was noted at the joints between the travel lanes.

In the area where the non-reinforced, jointed concrete was overlaid, approximately 40% of the transverse joints had reflected through the overlay. The crack diagram shows transverse cracks in the test section and in the adjacent section. Eighty-seven percent of the joints had reflected through the overlay in the test section.

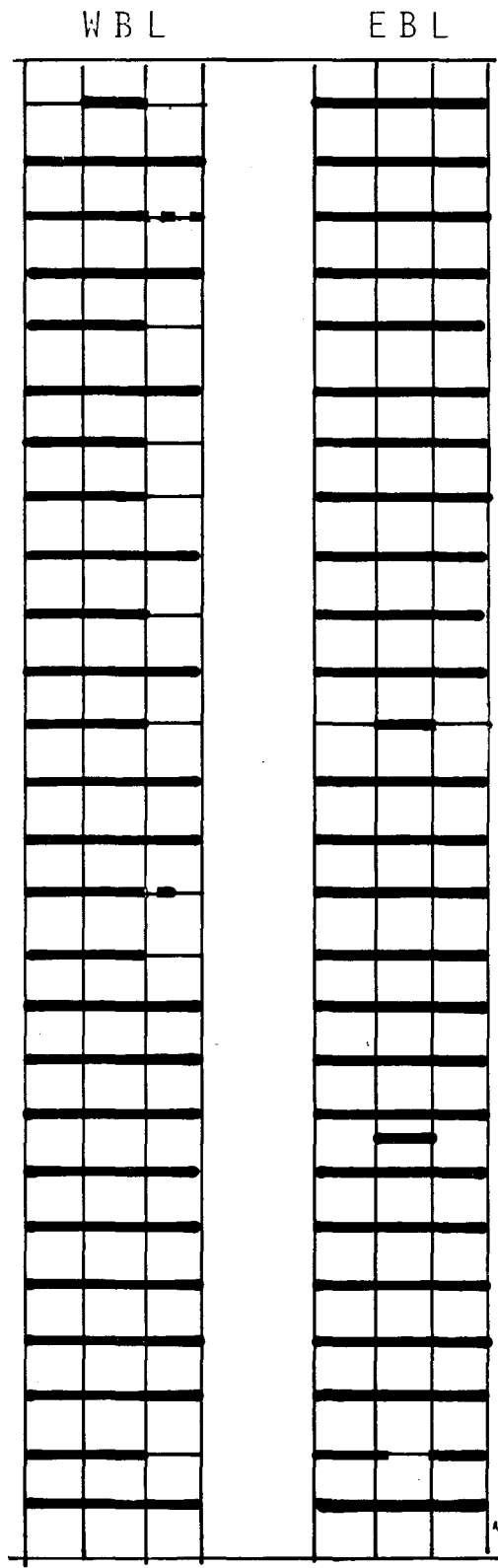
CRACK DIAGRAM - OVERLAY ON JOINTED, NON-REINFORCED CONCRETE
OCTOBER, 1984

Thin Line - Joint in concrete pavement
Broad Line - Crack in ACP

TYPICAL SECTION
WITH HOT RUBBER ASPHALT



TEST SECTION
NO UNDERSEAL



CONDITION AFTER TWO YEARS

A visual inspection of the pavement was made in November 1985. Very little change was noted in the number of transverse cracks from the previous year. A few cracks were beginning to appear in the areas overlaid on CRCP. The test section in the CRCP area still had no transverse cracks.

Where the overlay was on jointed concrete pavement, approximately 49% of the transverse joints had reflected through the overlay. In the test section where no underseal was used, 94% of the joints had reflected through the overlay. (See the crack diagram on the following page.)

At this time, the overlay was providing a good ride with little maintenance required. Maintenance forces did seal the longitudinal joints where needed and patched some spalled areas during the year. The spalling was the result of a segregation problem which occurred during the lay down operation.

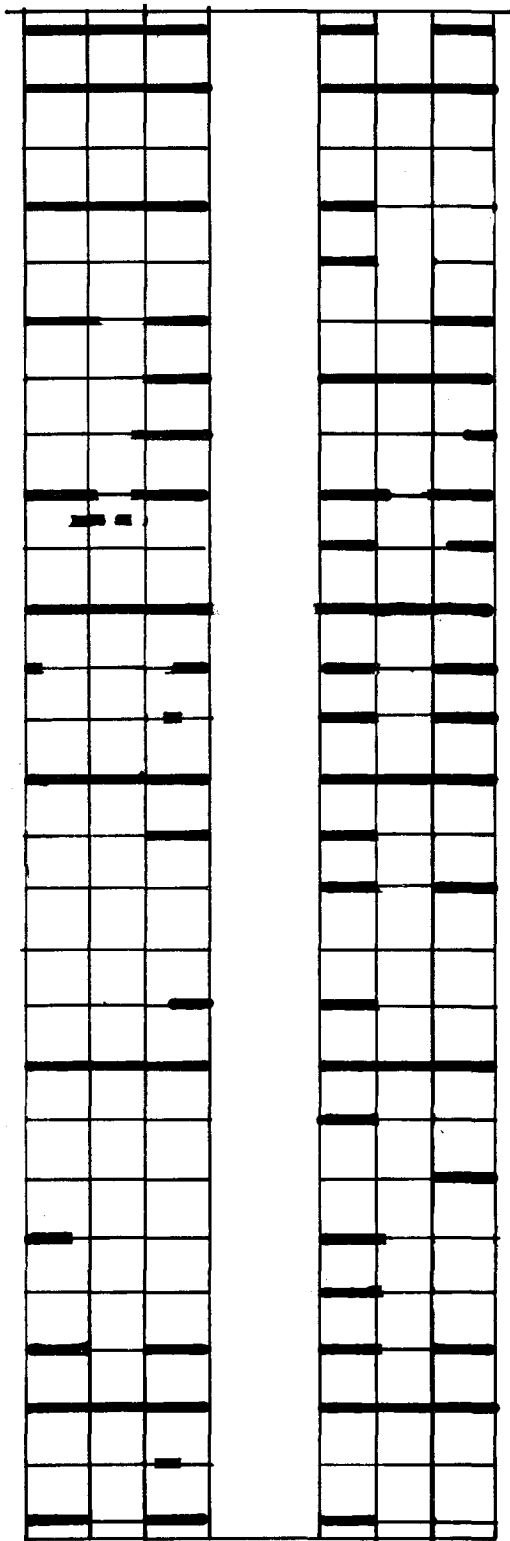
**CRACK DIAGRAM - OVERLAY ON JOINTED, NON-REINFORCED CONCRETE
NOVEMBER, 1985**

Thin Line - Joint in concrete pavement
Broad Line - Crack in ACP

**TYPICAL SECTION
WITH HOT RUBBER ASPHALT**

W B L

E B L



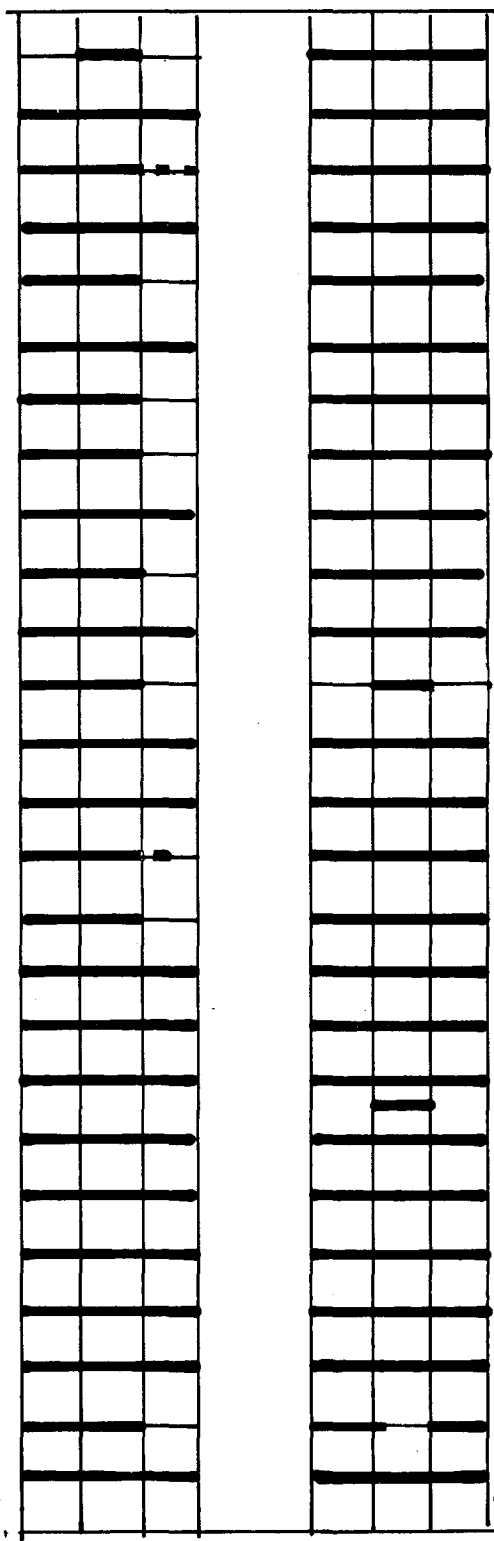
STA
1106

STA
1111

**TEST SECTION
NO UNDERSEAL**

W B L

E B L



STA
1102

STA
1106

CONDITION AFTER THREE YEARS

A visual inspection of the pavement was made in December 1986. As in the previous two years, transverse cracks were counted in the test sections and in sections adjacent to the test sections.

Very few transverse cracks were found in the area where the overlay is on CRCP. No transverse cracks were noticed in the test section of the CRCP area either.

Where the overlay is on jointed concrete pavement, including the test section, there was no change in the number of transverse cracks from the previous year. (See the crack diagram on the following page.)

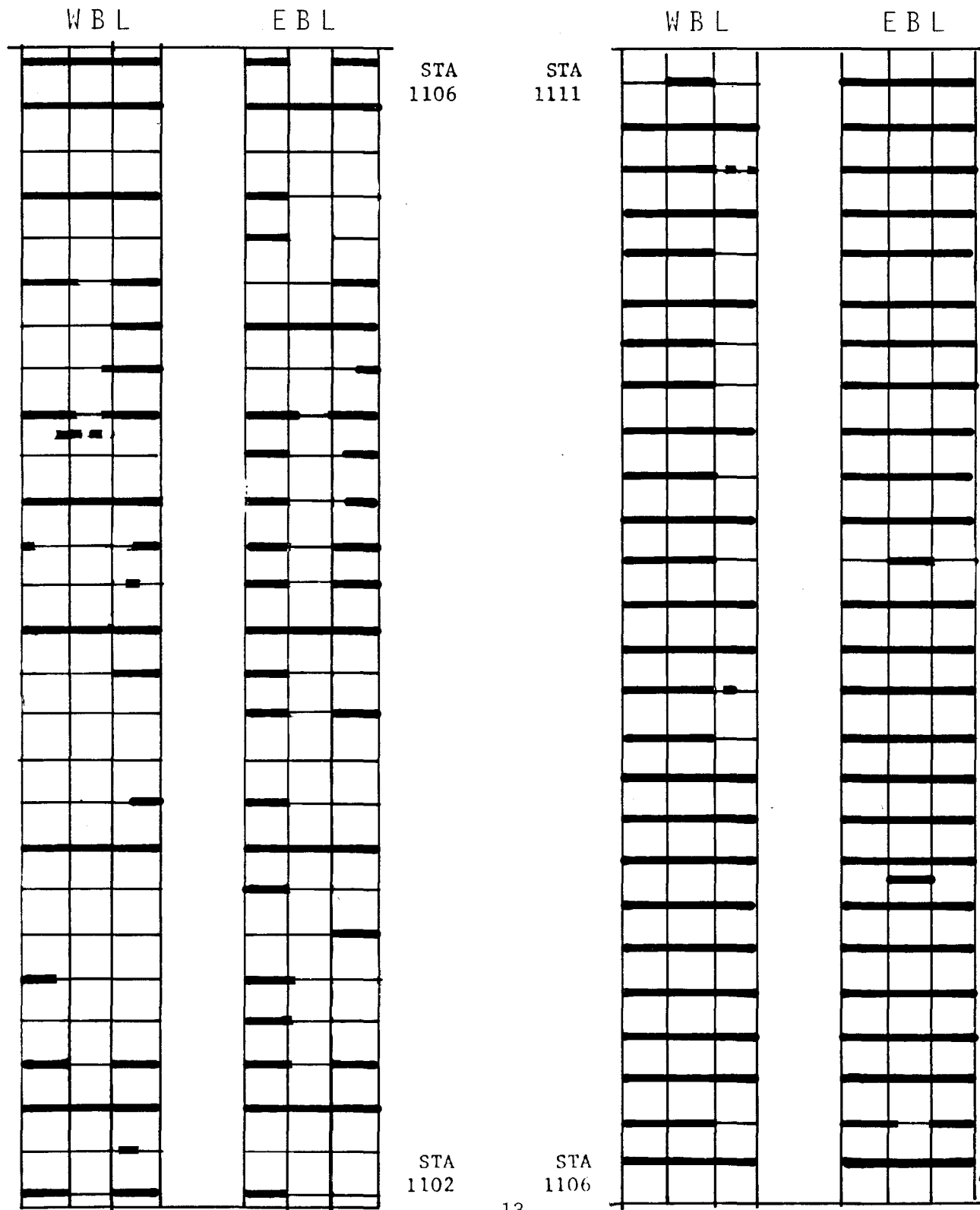
After three years, the overlay was still providing a good ride. As in the previous year, maintenance forces, on occasion, sealed longitudinal cracks and patched spalled areas. It was noticed that in some of these spalled areas, chunks the overlay turned loose from the concrete. This has caused some concern as to whether or not there is adequate bond between the Hot Rubber-Asphalt and the concrete surface.

**CRACK DIAGRAM - OVERLAY ON JOINTED, NON-REINFORCED CONCRETE
DECEMBER, 1986**

Thin Line - Joint in concrete pavement
Broad Line - Crack in ACP

**TYPICAL SECTION
WITH HOT RUBBER ASPHALT**

**TEST SECTION
NO UNDERSEAL**



CONDITION AFTER FOUR YEARS

A visual inspection of the pavement was made in December 1987. In the areas where the overlay is on CRCP, no significant change was noticed in the number of cracks appearing since the previous year. The test section in the CRCP area still had no transverse cracks. Longitudinal cracks were continuous at the joints between the shoulders and main lanes and occasional at the joints between the driving lanes.

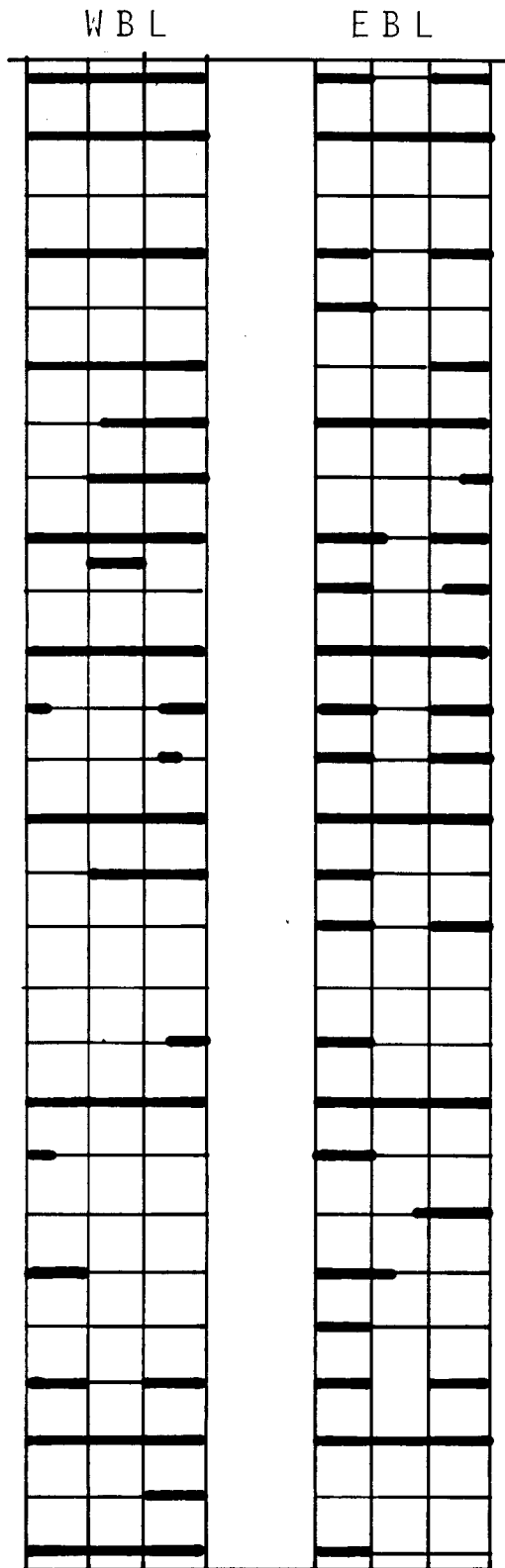
In the area where the overlay is on jointed concrete pavement, approximately 55% of the transverse joints had reflected through the overlay. In the test section 94% of the transverse joints had reflected through the overlay. (See the crack diagram on the following page.)

At this time, rutting and shoving was beginning to appear in the outside wheel path of the outside lanes. In some isolated areas the shoving was bad enough to require repair. The repair was done by filling the low areas with hot mix.

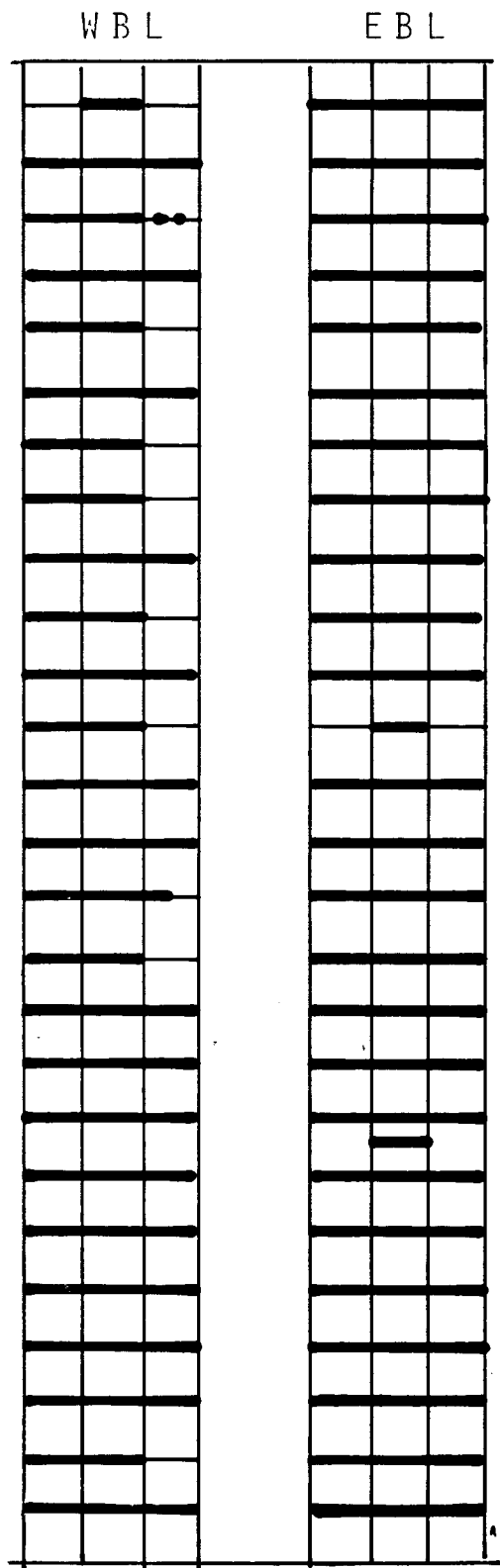
CRACK DIAGRAM - OVERLAY ON JOINTED, NON-REINFORCED CONCRETE
DECEMBER, 1987

Thin Line - Joint in concrete pavement
Broad Line - Crack in ACP

TYPICAL SECTION
WITH HOT RUBBER ASPHALT



TEST SECTION
NO UNDERSEAL



CONDITION AFTER SIX YEARS

A visual inspection of the pavement was made in May 1990. In the area where the overlay is on CRCP, very few transverse cracks have appeared on the surface. Most of the longitudinal joints have reflected through the overlay.

In the area where the overlay is on jointed concrete pavement, approximately 65% of the transverse joints have reflected through the overlay. In the test section, 96% of joints have reflected through the overlay. (See the crack diagram on the following page.)

During the past two years rutting and shoving has occurred. This resulted in a depression in the outside wheel path of the outside lanes and a buildup of paving material at the outside lane line.

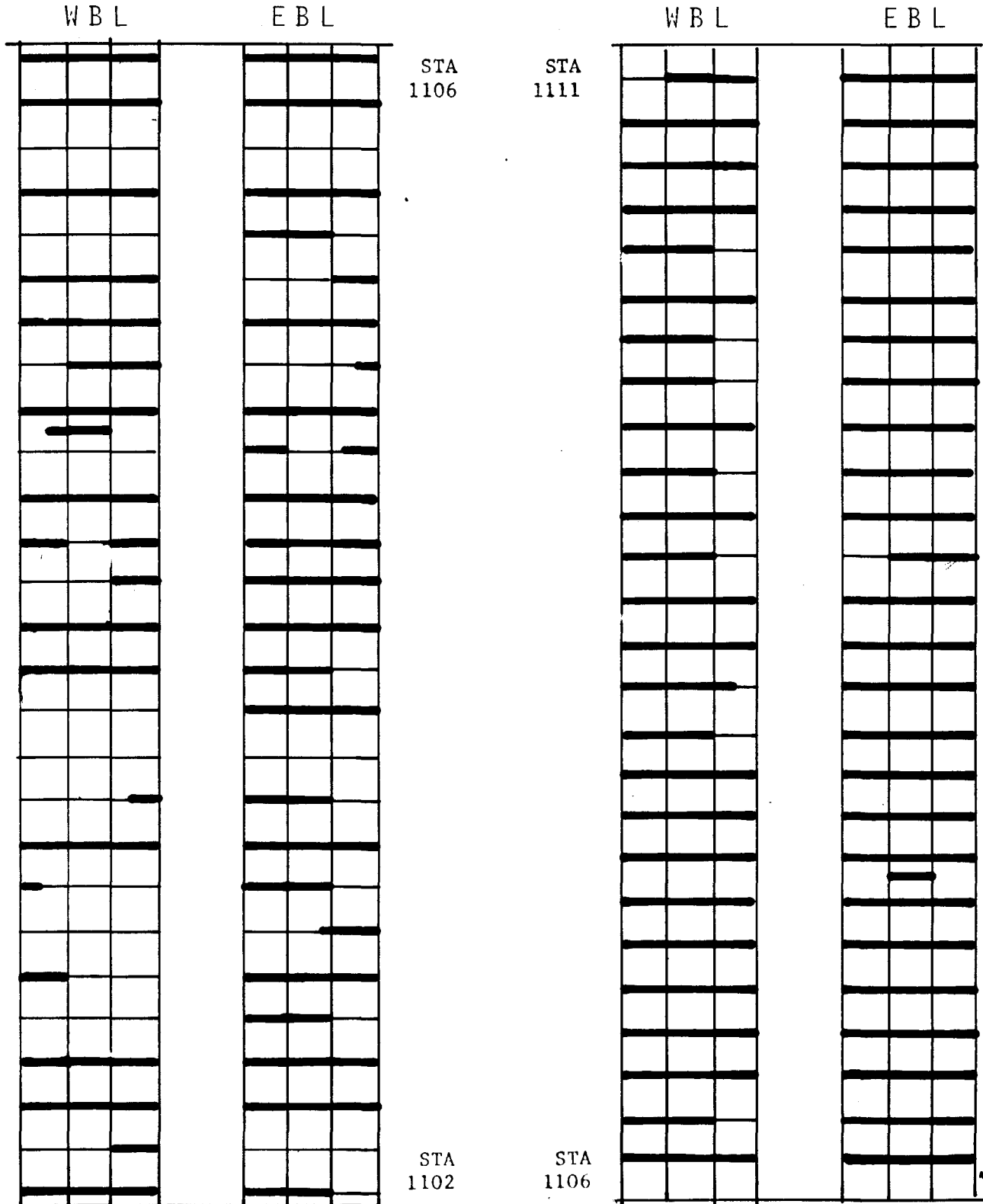
Maintenance forces corrected the rutting problem by removing the buildup with a rotomilling machine. The maintenance foreman reported that there were some problems with the pavement turning loose from the concrete surface during the rotomilling operation, and that the concrete surface was wet.

CRACK DIAGRAM - OVERLAY ON JOINTED, NON-REINFORCED CONCRETE
MAY, 1990

Thin Line - Joint in concrete pavement
Broad Line - Crack in ACP

TYPICAL SECTION
WITH HOT RUBBER ASPHALT

TEST SECTION
NO UNDERSEAL



SUMMARY

After monitoring the project for six years, it appears that the Hot-Rubber Asphalt has been effective in retarding reflective cracking. After six years only 65% of the transverse joints of jointed non-reinforced concrete pavement have reflected onto the riding surface. In the test section where no Hot-Asphalt Rubber was used, almost 90% of the transverse joints had reflected through the overlay within one year. In the area overlaid on CRCP, there are very few transverse cracks on the surface. Longitudinal cracking over the concrete paving joints appears to have been progressive from year to year. Approximately 50% of longitudinal joints have reflected onto the asphalt surface.

DISTRICT EVALUATION

After conferring with district design, construction and maintenance engineers, the general consensus is that the project is good. After six years of heavy traffic, the overlay is still providing a suitable ride without excessive maintenance. A hot asphalt rubber inner layer on ACP overlays on concrete pavement has been the standard design in this district during the past 7 years. It is believed that sealing the cracks in old concrete is necessary and that by using hot asphalt rubber, there is the added benefit of retarding reflective cracking.

Because of concerns of slippage between the concrete surface and hot asphalt-rubber, this district recommends cleaning and texturing the old concrete surface. This has been done recently on two other projects on IH 40 by rotomilling approximately one-quarter inch from the concrete surface. Also recommended is that the HMACP overlay be a minimum of two inches and that failures and spalls in concrete pavement be repaired prior to the overlay.