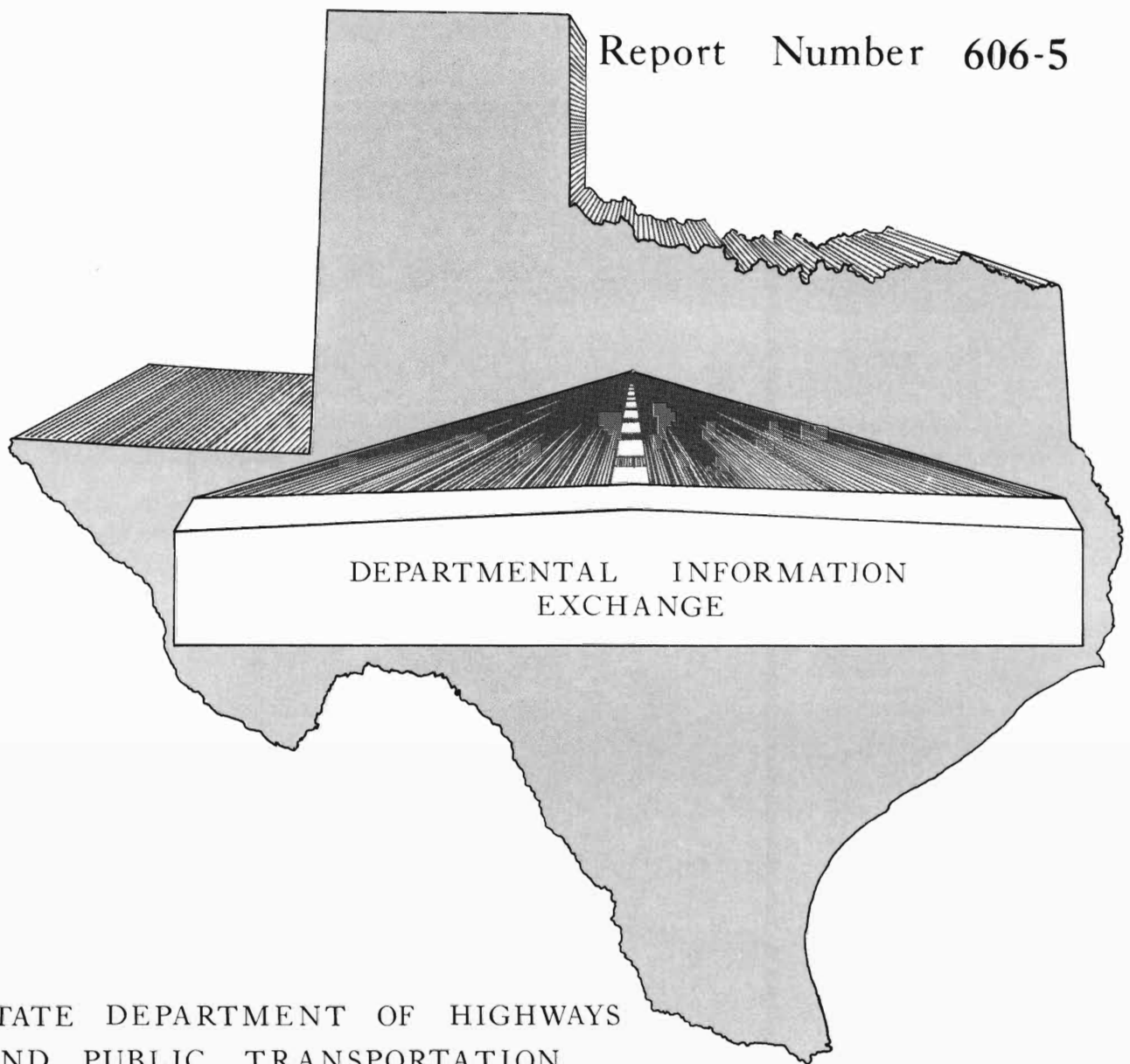


EXPERIMENTAL PROJECTS

FABRIC UNDERSEAL AND ASPHALTIC CONCRETE PAVEMENT OVERLAY

Report Number 606-5



STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

FABRIC UNDERSEAL AND
ASPHALTIC CONCRETE PAVEMENT OVERLAY

Experimental Construction Project No. TX 78-03

on

Alameda Avenue (S.H. 20)
El Paso County
Control 2-1-40 Project M X019 (1)
From Linden Street to Concepcion Street
In The City of El Paso

Report 606-5

February, 1980

DISCLAIMER STATEMENT

The material contained in this report is experimental in nature and is published for informational purposes only. Any discrepancies with official views or policies of the DHT should be discussed with the appropriate Austin Division prior to implementation of the procedures or results.

This report covers the installation and first year of service of a fabric underseal and asphaltic concrete pavement overlay on Alameda Avenue (SH-20) in the City of El Paso. The installation was done September 5th through 8th, 1978.

OBJECTIVE:

As stated in the "work plan," the objectives of the project were (1) to evaluate the performance of a fabric underseal to retard or eliminate reflective cracking on an asphaltic concrete overlay when placed over a badly distressed asphalt pavement, (2) to evaluate construction procedures, and (3) to develop cost data for this type of construction.

PROJECT BACKGROUND:

Alameda Avenue is a city street on the Urban System, and it carries the designation of SH-20. The street was rebuilt in 1959 to a 60-foot curb-to-curb section, and it consisted of four 10.2-foot lanes and two 8-foot parking lanes. The travel lanes were separated by a 2-foot asphalt blister. The pavement structure was composed of 10 inches of flexible base and 2 inches of HMAC with curbs and gutters. (Refer to Enclosure I for project geometrics.) The profile of the street was extremely flat, so storm water runoff was collected in curb and grate inlets along both curb lines. The street carried approximately 15,400 vehicles per day.

With almost 20 years of service, the pavement surface had become badly cracked and distressed with rutting in some locations. Numerous utility cuts and patches had also been made.

DESIGN PHASE:

It was determined during the design phase of the project that due to the severity of the deterioration of the pavement surface, a conventional overlay would not prevent the existing cracks from reflecting through the new mat within one to two years. Therefore, it was decided to specify a fabric underseal to be placed between a level-up course and a surface course. The typical section for the project plans required that a 110 lbs./s.y. level-up course of Type D asphaltic concrete be placed on the existing street with the fabric underseal placed on the level-up course using AC-10 asphalt as a tack coat. This was to be followed with a 165 lbs./s.y. Type D asphaltic concrete overlay. (Refer to Enclosure II for details.) AC-20 asphalt was used in all hot mix asphaltic concrete pavements.

CONSTRUCTION PHASE:

Special Specification, Item 3099, Fabric Underseal, was used for the project and the contractor, Vowell Construction Company of El Paso, opted to supply Mirafi 140 fabric, a Celanese Fibers Company product. This was supplied in 14'-9" and 17'-4" widths and each roll was 328 feet in length.

Upon completion of the adjusting of the curb and grate inlets and the laying of the level-up course, the contractor was ready to begin the fabric placement and subsequent overlay.

The placement of the Mirafi fabric began on the morning of September 5, 1978, by applying to the existing leveled-up surface 0.175 gal/s.y. of AC-10 asphalt at a temperature of 325° F as a binder course to secure the fabric to the pavement. The roll of fabric was fitted with a steel rod and tension handles for hand placing. This method proved unsatisfactory due to the roll weight, 175 pounds for 14'-9" roll width and 205 pounds for a 17'-4" roll, curb side obstructions and the lack of a suitable method to deter the fabric from wrinkling. All subsequent fabric placement was done by unrolling the fabric while the roll rested on the pavement. Billowing of the fabric in a light breeze was not a problem due to the roll resting on the pavement. However, as there was no method to apply tension to the roll, wrinkles were a problem as the fabric was placed.

The application rate of the AC-10 asphalt varied from .175 gal/s.y. to .222 gal/s.y. with the average being .202 gal/s.y. All transverse fabric joints were butt joints while the longitudinal joints were lapped approximately 6 inches to 12 inches. Asphalt shots were applied approximately 8 inches to 12 inches wider than the fabric to insure proper edge sealing.

All large and/or lengthy wrinkles were cut out of the fabric before the overlay was placed. These again were butt joints. The fabric was rolled numerous times with a medium pneumatic tire roller to iron out all wrinkles and seat the material in the asphalt binder.

Traffic was not allowed on the fabric except for occasional crossings and at one major street intersection. Construction traffic as well as other traffic appeared to have little effect on the Mirafi except at the intersection. There, when the AC-10 penetrated through fabric, it had a tendency to become tacky and cling to the wheels of heavier vehicles causing the fabric to separate in layers and disintegrate. Loaded asphalt trucks momentarily parking on the fabric and subsequently backing into the lay-down machine did cause some delamination of the fabric.

The 165 lbs./s.y. asphalt overlay was started as soon as practical and no apparent problems were encountered during this phase of the construction.

The asphalt overlay was placed at a temperature of 240° F to 265° F.

The 19,326 square yards of fabric were placed in four (4) working days under the following weather conditions:

Temperature Range

September 5	76° to 83°	Partly cloudy, variable wind
September 6	74° to 82°	Light and variable wind
September 7	71° to 78°	Light clouds, no wind
September 8	70° to 84°	Light clouds, no wind

COST DATA:

The following data was obtained from the contract documents as well as job records of the contractor:

Fabric Underseal Material, Item 3099 (19,326 s.y.), \$1.20/s.y.

Contractor's Cost of Fabric Material (20,541 s.y.), \$0.58/s.y.

Contractor's Cost for Equipment associated with Fabric Placement (Roller, Flatbed Truck and Pickup Truck), \$2,008.24

Contractor's Cost for Labor associated with Fabric Placement, \$1,761.49

Contractor's Total Cost for Fabric Placement based on 19,326 s.y., \$0.81/s.y.

Asphalt AC-10, Item 3099 (3,865 gal), \$0.75/gal.

Contractor's Cost of Asphalt (4,215 gal), \$0.34/gal.

Contractor's Cost for Equipment associated with AC-10 Asphalt (Distributor), \$220.00.

Contractor's Cost for Labor associated with AC-10 Asphalt, \$77.40

Contractor's Total Cost for AC-10 Asphalt, \$0.42/gal.

Total Cost of Fabric Underseal (Fabric and Asphalt), \$0.90/s.y. based on 19,326 square yards

PERFORMANCE EVALUATION:

Minor transverse cracks of the A.C. overlay were noticed during the first nine (9) months of this first year's service. However, it became apparent in August of this year that the overlay and fabric underseal had slipped on the roadway in two locations (refer to Enclosure I for locations). The exact date of the occurrence cannot be determined; however, it is speculated to have occurred during the latter part of July. The extent of the slippage is shown in several pictures in Enclosure III. The initial failures occurred on extremely sharp horizontal curves which are not super-elevated. Also, some slippage has been noted on tangent sections. See Enclosure IV for existing street cross slopes.

The weather for the months of June and July was extremely hot with the highest temperature ever recorded for El Paso coming on July 10 when 112° F was recorded. Enclosure V-1&2 are National Weather Service office monthly summaries of local climatological data.

Enclosure VI is a summary of the serviceability indices for the roadway. From this summary, it can be seen that the roadway surface has

deteriorated to a point below the minimum S.I. (2.5) for this type of facility and to near the point the roadway was before the required overlay. This can be attributed to longitudinal slippage of the fabric and overlay on the tangent sections.

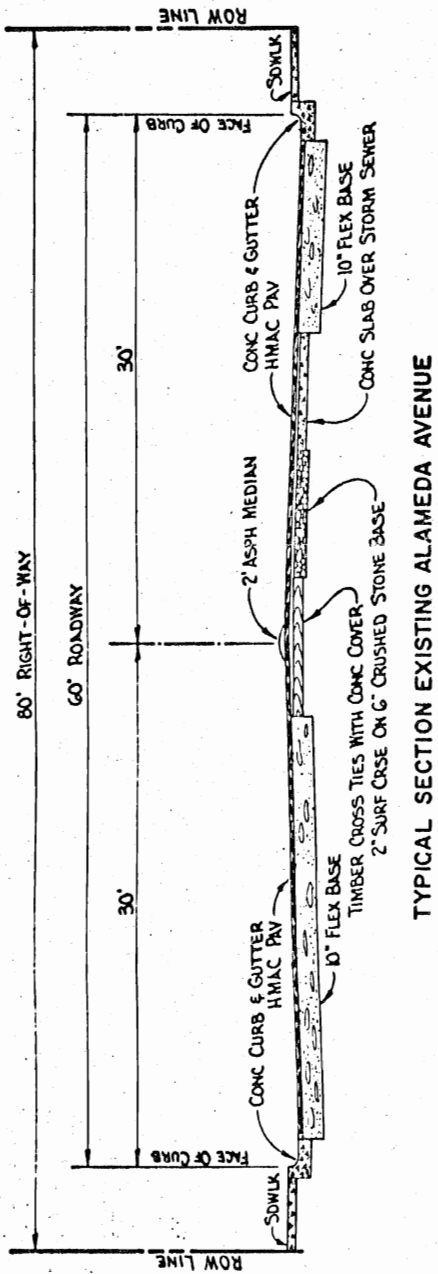
Three core samples were removed from slippage area No. 2. These revealed the failure occurred at the longitudinal fabric lap joint of the fabric and that the whole 15 foot wide mat slid toward the curb line. A core removed adjacent to the curb and gutter section confirmed that the fabric had indeed slid on the level-up course.

CONCLUSION:

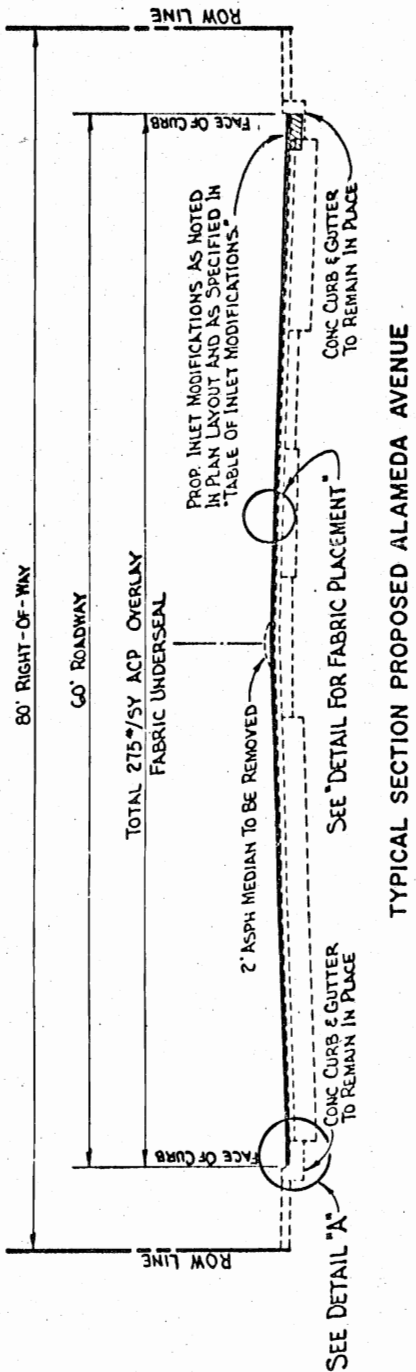
It is apparent that three factors contributed to the failure of this fabric underseal. These are (1) excessively high ambient air temperatures re-occurring over a prolonged period of time, (2) adverse roadway geometrics, and (3) the plane of weakness created by the fabric underseal was overstressed by the aforementioned factors and a traffic volume of approximately 15,400 vehicles per day performing numerous turning movements as well as starting and stopping maneuvers.

From the above factors, it should be recommended that if high ambient air temperatures may be encountered and roadway geometrics are below standard, a fabric underseal should not be used.

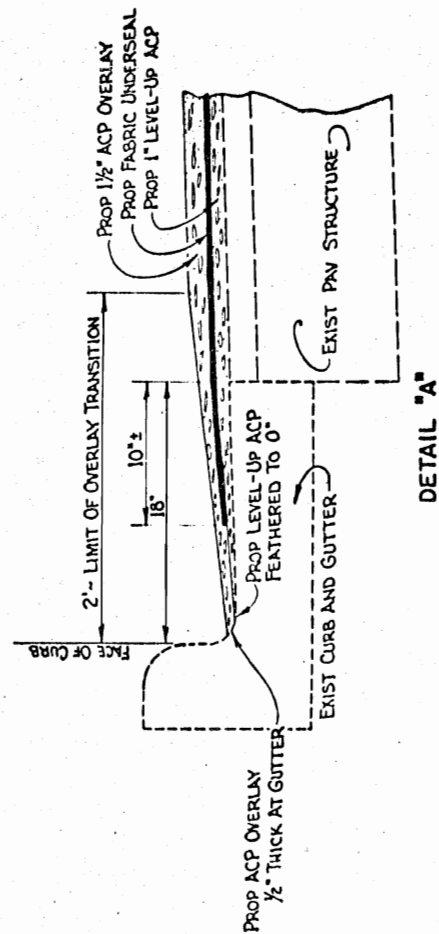
If it is valid to assume that the above factors did in fact contribute to the failure of the underseal, then future slippage should occur during the summer of 1980 if the daily temperatures for the months of June and July equal this past summer. Following reports will address this assumption.



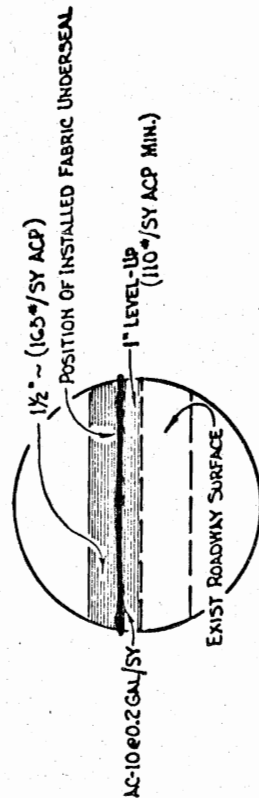
TYPICAL SECTION EXISTING ALAMEDA AVENUE



TYPICAL SECTION PROPOSED ALAMEDA AVENUE

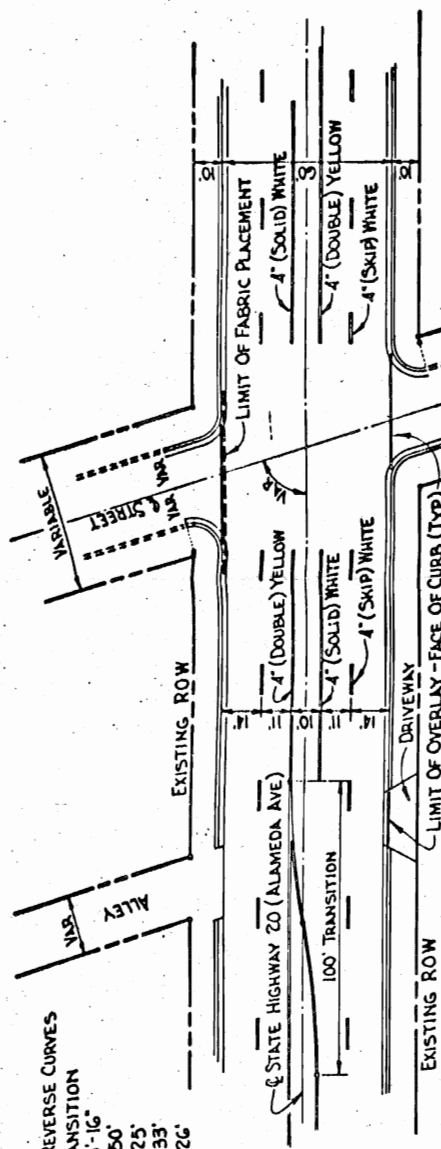


DETAIL "A"



DETAIL FOR FABRIC PLACEMENT

CURVE DATA - REVERSE CURVES
FOR 100' TRANSITION
Δ - 11° 25' 16"
R - 252.50'
T - 25.25'
L - 50.33'
E - 1.26'



DETAIL SHOWING LIMIT OF PAVEMENT OVERLAY
LIMIT OF FABRIC PLACEMENT AND STRIPING TRANSITION

ITEM DESCRIPTION	340				479				3099							
	REMOV ASPH MED	ASPH (AC)	AGGR (TYD)	ASPH (AC) (LEVEL-UP)	AGGR (TYD)	ASPH (AC) (LEVEL-UP)	MANH	ADJ INLET	ADJ MONUMENT FRAME	FABRIC UNDERSEAL (AC-10)	SY	EA	EA	EA	SY	GAL
TOTAL	2008	86	1514	56	1003	5	18	8	19,326	3865						

ENCLOSURE II
STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
TYPICAL SECTIONS
MISCELLANEOUS DETAILS
ROADWAY SUMMARY

STATE	TEXAS	FEDERAL AID PROJECT NO.	5
COUNTY	EL PASO	SECTION	21
DISTRICT	2	DATE	1/23/20
PROJECT NO.	M X019(1)	SCALE	AS SHOWN



-PHOTO 38-79-
SLIPPAGE AREA NO. 1 - STATION 164 + 60 ±



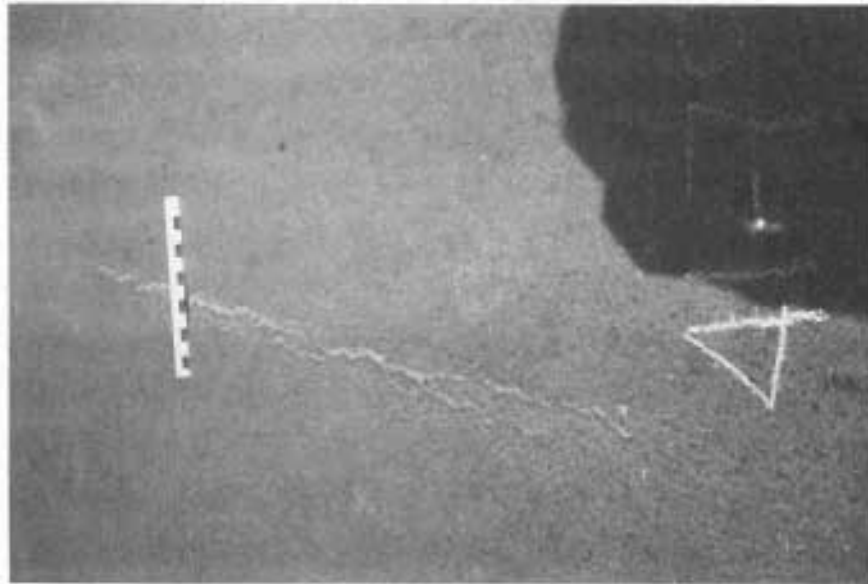
- TRANSVERSE CRACK-
AT EASTERN END OF LONGITUDINAL CRACK OF SLIPPAGE AREA
NO. 1.



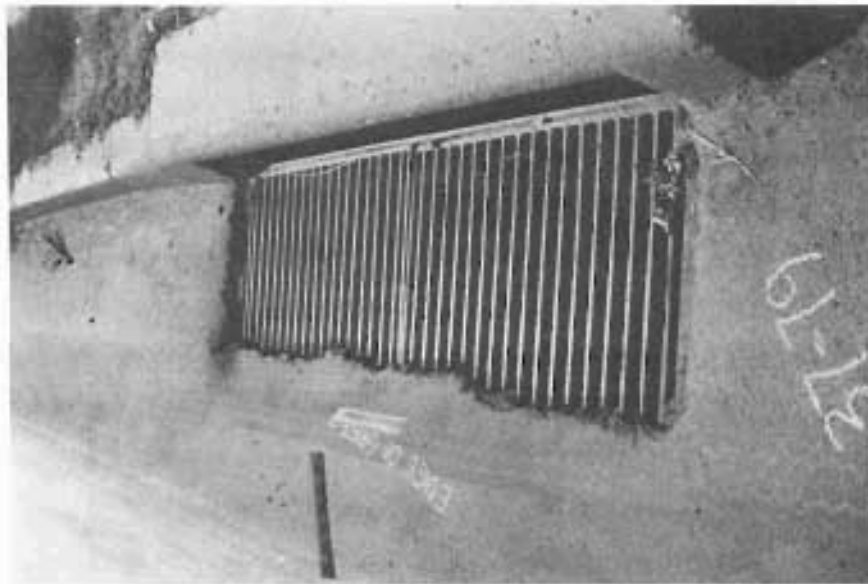
-PHOTO 34-79A-
LONGITUDINAL SHOT EASTBOUND LANES AT
BEGINNING OF PROJECT. VICINITY OF
SLIPPAGE AREA NO. 1.



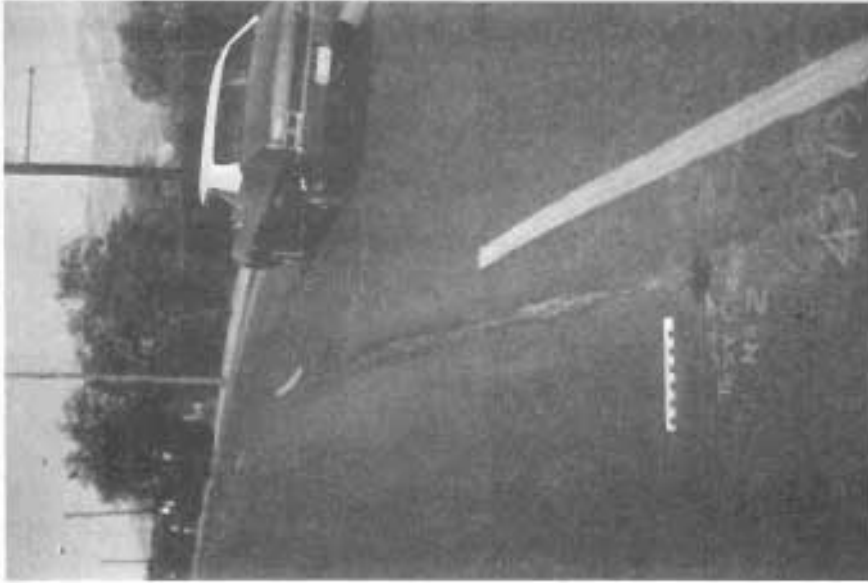
CLOSE-UP OF PAVEMENT SLIPPAGE AT MANHOLE... EASTBOUND
LANES AT BEGINNING OF PROJECT. VICINITY OF SLIPPAGE
AREA NO. 1.



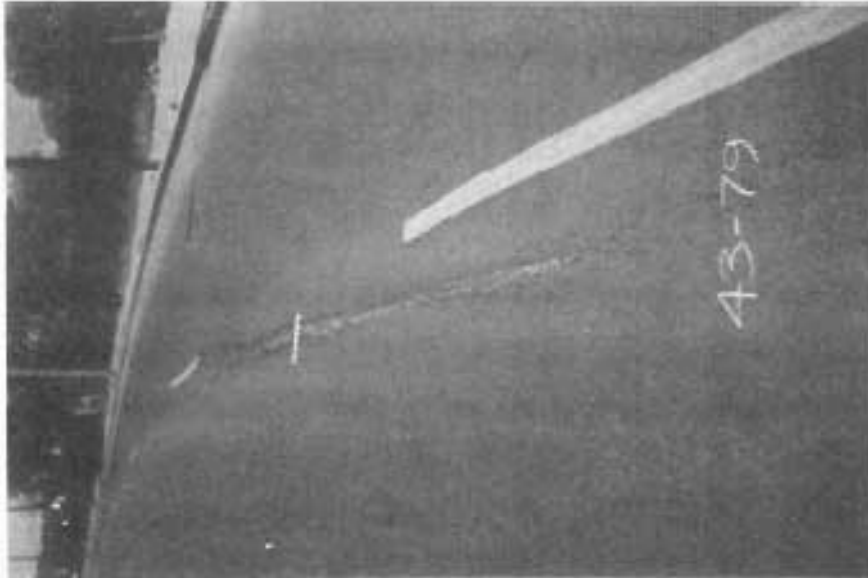
LONGITUDINAL CRACKING EASTBOUND LANES
AT STATION 169 + 35 ± APPROXIMATELY
14' FROM SOUTH CURB LINE.



PAVEMENT SLIPPAGE AT INLET... SOUTH
CURB OF EASTBOUND LANES NEAR BEGINNING
OF PROJECT. NOTE LOCATION OF EDGE OF
GRATE. VICINITY OF SLIPPAGE AREA NO. 1.



-TEST CORE NO. 2-
AT SLIPPAGE AREA NO. 2



-PHOTO 43-79-
SLIPPAGE AREA NO. 2
STATION 175 + 40 ±

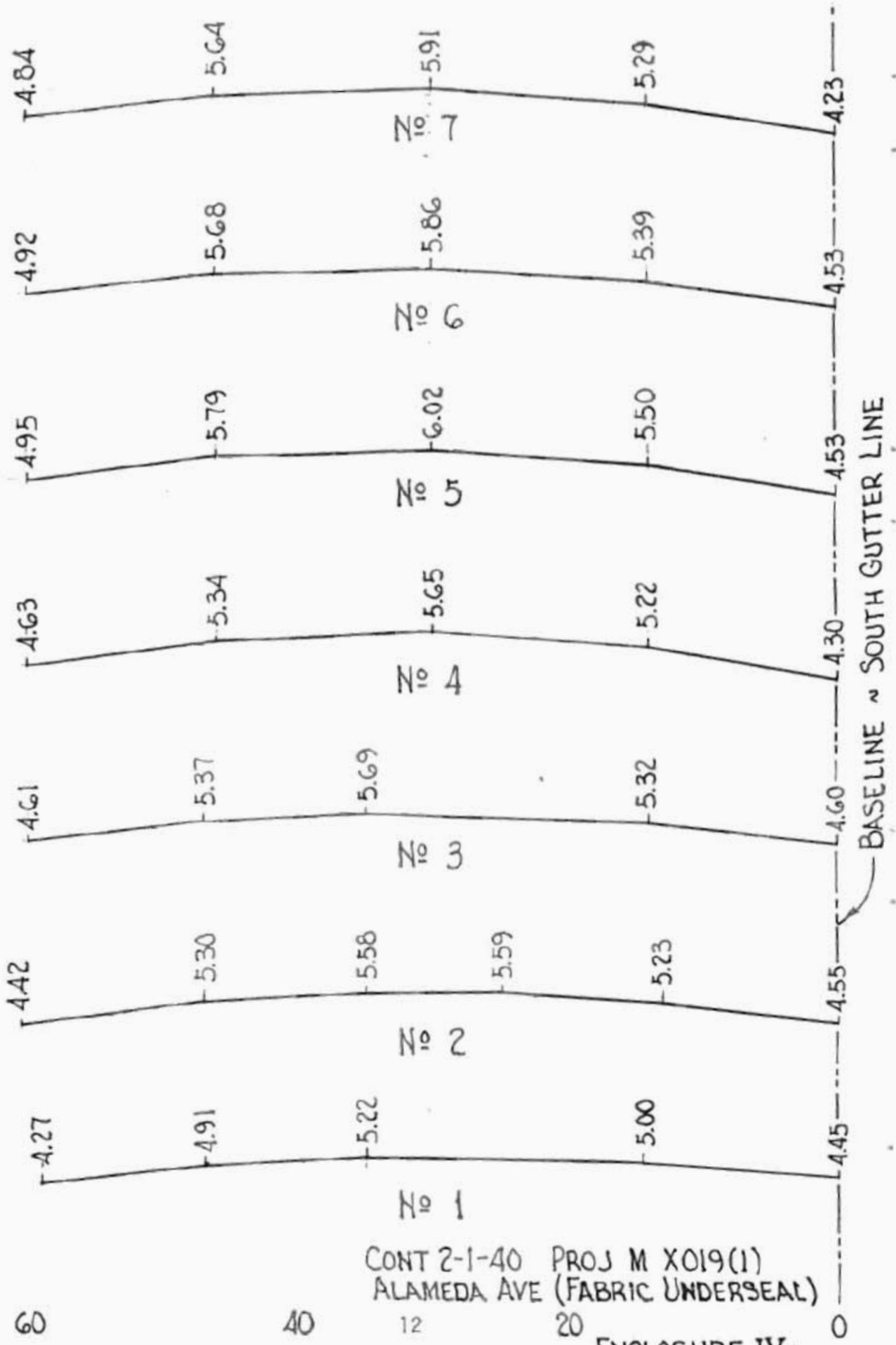


- TEST CORE NO. 3-
AT SLIPPAGE AREA NO. 2



- TEST CORE NO. 1-
AT SLIPPAGE AREA NO. 2

REF: PLAN LAYOUT SHEET SHOWING X-SLOPE ELEV LOCATIONS.
 LEVEL BK ~ PG 32



CONT 2-1-40 PROJ M X019(1)
 ALAMEDA AVE (FABRIC UNDERSEAL)

60

40

12

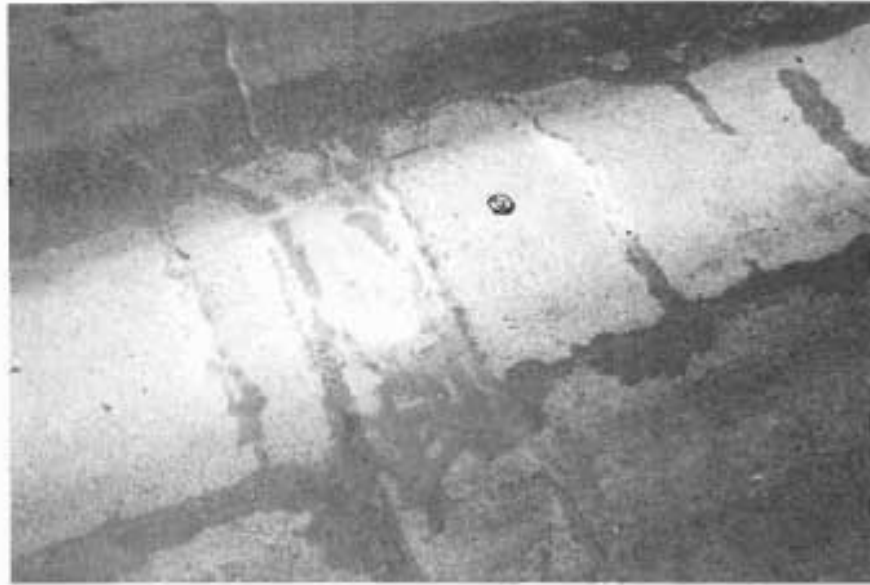
20

0

ENCLOSURE IV.

SUMMARY OF SERVICEABILITY INDEX

<u>Date S.I. Taken</u>	<u>Eastbound Curb Lane</u>	<u>Eastbound Inside Lane</u>	<u>Westbound Curb Lane</u>	<u>Westbound Inside Lane</u>
March 29, 1978	1.1	1.9	0.9	1.5
August 18, 1978	1.0	1.5	1.1	1.5
Street Overlaid Sept. 5, 6, 7 & 8, 1978	-	-	-	-
August 22, 1979	1.6	1.2	1.7	2.4



GREATLY DISTRESSED PAVEMENT CONDITION IS EVIDENT. THIS PHOTO SHOWS A TYPICAL AREA AT THE CENTERLINE OF ALAMEDA AVENUE.



THIS PHOTO DEPICTS ONE OF SEVERAL UTILITY CUTS THAT EXISTED WITHIN THE LIMITS OF THIS PROJECT.



PHOTO DEPICTING CRAZED PATTERN OF CRACKS;
EVIDENCE OF BEING SEALED; AND RECRACKING.



PHOTO SHOWING TYPICAL POTHOLES WHICH EXISTED
MOSTLY ALONG CURB.



PHOTO DEPICTING BOTH LONGITUDINAL AND TRANSVERSE
CRACKING. THIS LOCATION WAS APPROXIMATELY IN THE
CENTER OF OUTSIDE WESTBOUND LANE.



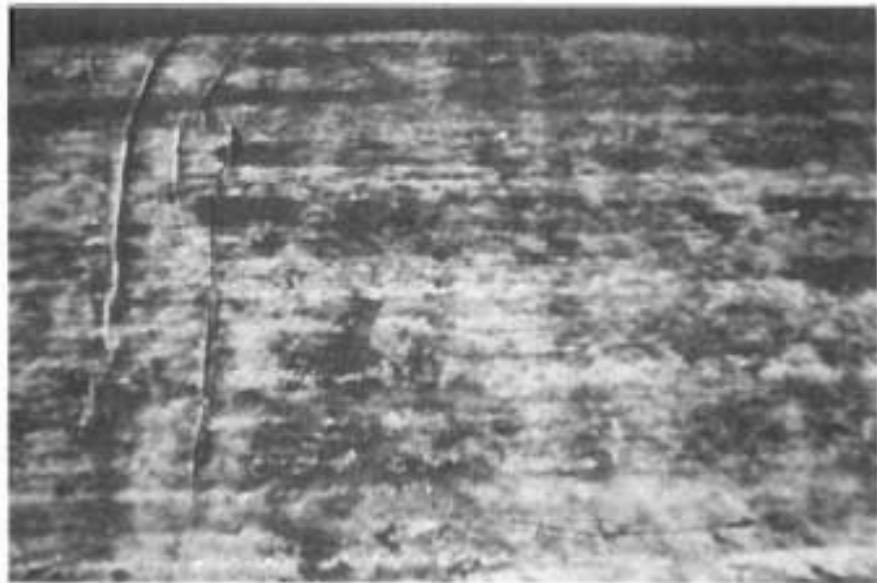
THE MORE SEVERE WRINKLES WERE CUT OUT WITH A
POCKET KNIFE ALLOWING FABRIC TO LAY FLAT.



FABRIC UNDERSEAL IMMEDIATELY AFTER PLACEMENT
SHOWING TYPICAL WRINKLING.



APPEARANCE OF FABRIC UNDERSEAL AFTER COMPLETION OF TWO PASSES OF A MEDIUM WEIGHT PNEUMATIC TIRE ROLLER, BUT WITH NOTICEABLY MORE ABSORPTION OF AC-10 THAN IN SOME OTHER PLACES.



APPEARANCE OF FABRIC UNDERSEAL AFTER COMPLETION OF TWO PASSES OF A MEDIUM WEIGHT PNEUMATIC TIRE ROLLER.



FABRIC UNDERSEAL PLACEMENT PROCEDURES INCLUDED TWO PASSES OF A MEDIUM WEIGHT PNEUMATIC TIRE ROLLER.



PORTIONS OF FABRIC OVER INLETS, MANHOLES AND VALVES WAS EASILY CUT WITH POCKET KNIVES AND REMOVED.



CLOSE-UP FABRIC UNDERSEAL PLACEMENT AT
TYPICAL MANHOLE LOCATION.



PLACEMENT OF THE FINISH A.C. PAVEMENT OVERLAY
WAS IN PROGRESS SHORTLY AFTER FABRIC WAS PUT DOWN.



PLACEMENT PROCEDURES INCLUDED MAINTAINING APPROXIMATELY 3" BETWEEN FACE OF CURB AND EDGE OF FABRIC.



FABRIC UNDERSEAL BEING PLACED ON FRESHLY LAID AC-10 ASPHALTIC MATERIAL.



ANOTHER VIEW OF THE SECTION IN THE PHOTO BELOW
BUT REVEALING MORE PRONOUNCEDLY THE TYPICAL
WRINKLING.



APPEARANCE OF FABRIC UNDERSEAL ON A CURVE AFTER
COMPLETION OF TWO PASSES OF A MEDIUM WEIGHT
PNEUMATIC TIRE ROLLER AND AWAITING THE A.C.
PAVEMENT OVERLAY.



ANOTHER VIEW OF THE SECTION IN THE PHOTO BELOW.



APPEARANCE OF FABRIC UNDERSEAL WITH NOTICEABLY MORE ABSORPTION OF AC-10 AND WRINKLING THAN IN MOST OTHER PLACES.

SUMMARY OF AMBIENT AIR TEMPERATURE VS. SURFACE AND BELOW SURFACE TEMPERATURE

Date	Weather Service Temperature	Project Site Temperature	Pavement Surface Temperature	A.C. Pavement Temperature	1" Deep in Pavement Temperature	Time	Remarks
8/30/79	94°	97°	141°	122°		2:30 p.m.	Partly Cloudy
8/31/79	94°	96°	149°	134°		2:40 p.m.	Clear
9/4/79	94°	96°	148°	131°		2:00 p.m.	Clear
9/5/79	97°	100°	150°	138°		2:40 p.m.	Partly Cloudy