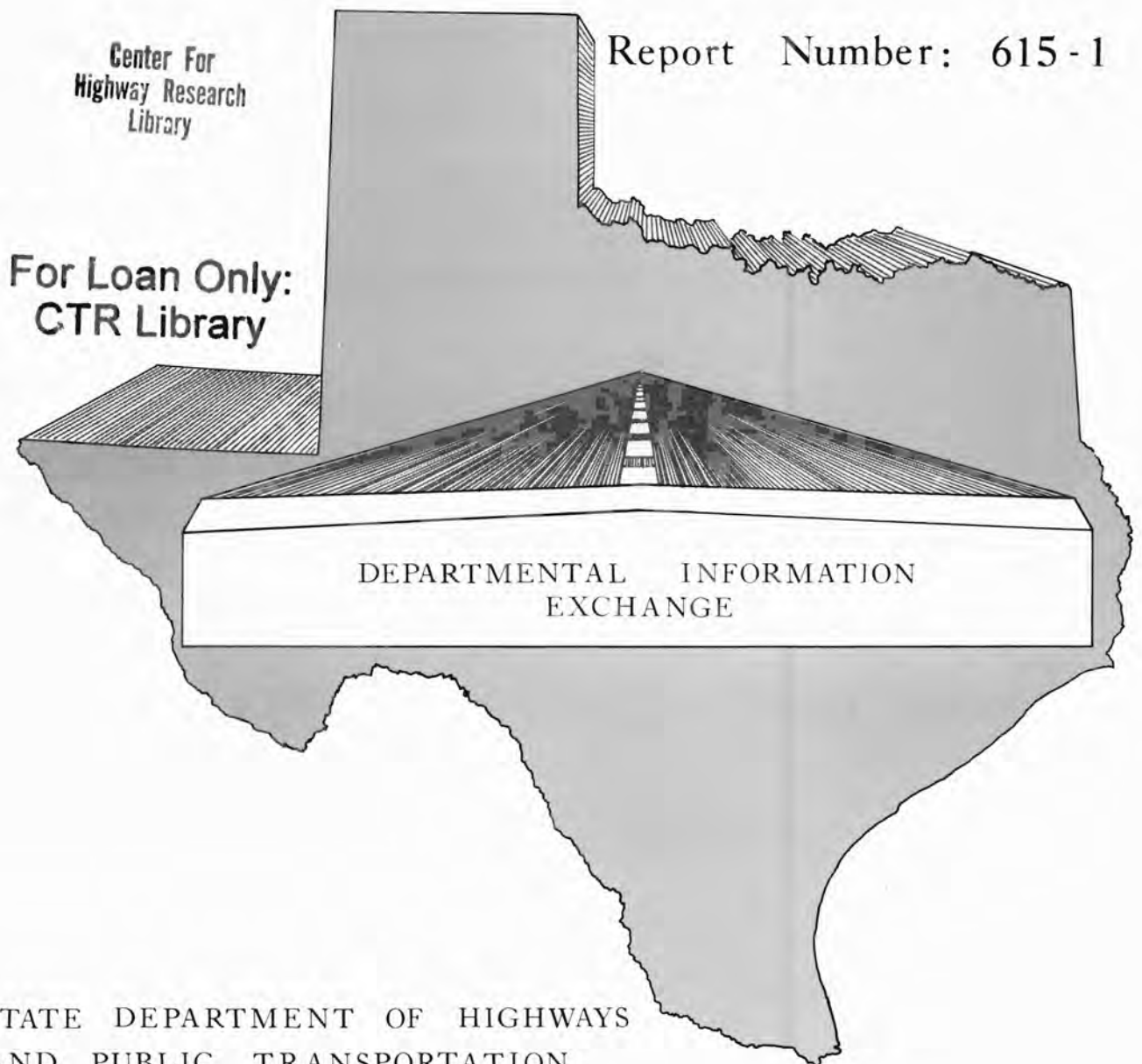


DEC 30 1975 REC'D

EXPERIMENTAL PROJECTS

TEST SECTIONS OF VARIOUS ASPHALTIC MIXTURES AND SPRINKLE TREATMENTS





L006238

TEST SECTIONS
OF
VARIOUS ASPHALTIC MIXTURES
AND
SPRINKLE TREATMENTS

FM 1604, Bexar County
Project C 73-5-38
Contr. 2452-2-8
Contr. 2452-3-19

A NARRATIVE REPORT

Report 615-1

Prepared By
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A NARRATIVE REPORT

The various asphaltic mixtures and sprinkle treatment test sections placed on FM 1604, Bexar County, between IH 10 North and 0.3 mile East of US 281 North evolved as the result of a permissive type field change, Field Change No. 1, which was described as follows: "Permit the use of dissimilar coarse aggregates, to be introduced separately in pre-determined proportions through the plant cold feed bins, in order to achieve a total coarse aggregate which will have a "Polish Value" of not less than 33." We requested this field change to obtain a satisfactory coarse aggregate by the utilization of mixtures of local limestone and other materials and, through a study of the resultant pavement characteristics, provide the design criteria basis for the construction of additional and more economical level-up and safety overlay projects.

This field change had been based upon the availability of a locally produced Lightweight Aggregate from the Featherlite Corp. at Converse, Texas. However, after receiving approval and just prior to sending samples to D-9, the Featherlite Corp. shut down their operations at the Converse plant. We were then left with a very small amount of Lightweight Aggregate at the McDonough Bros. plant. This material, being left over from their portion of lightweight pavement on a Safety Overlay project, had all been hot deck screened and sized and was enough for only a portion of the FM 1604 work. Additional conferences were held with the Austin office and it was decided to proceed with testing, designing and then placing various mixtures with different percentages of Lightweight Aggregates as a portion of the total aggregate.

It was also agreed that Sprinkle Treatment would be applied to some of the pavement surface.

Work began on FM 1604 with the placement of regular Hot Mix, Ty 'D' using coarse aggregate with an acceptable Polish Value of 33. Beginning at IH 10, this mix was placed on the Westbound Lane from Sta 0+00 to Sta 119+00 and on the Eastbound Lane from Sta 0+00 to Sta 220+00. We reserved some of this aggregate to be used in conjunction with Sprinkle Treatment at a later date.

During these placements the testing and designing work was underway at D-9 Laboratory in Austin. From these tests it was determined that an existing stockpile of aggregate having a Polish Value of 32 would be used with test sections of varying percentages of lightweight aggregate, as follows:

Zero % Lightweight, 15% Lightweight, 30% Lightweight, 40% Lightweight and then run the remainder of the available lightweight aggregate on a 20%

Lightweight mix, which blend would yield a Polish Value of 33. A small amount would be reserved for Sprinkle Treatment to be done at a later date.

These various mixtures were placed on the Westbound Lane, from Sta 119+00 to Sta 203+00. The remainder of the Polish Value 32 Stockpile was run with 20% Lightweight aggregate and placed on the Westbound Lane from Sta 203+00 to Sta 287+00, and on the Eastbound Lane from Sta 220+00 to Sta 287+00.

We then proceeded to place mix made from available aggregates whose Polish Value was unknown. These mixes contained 20% Lightweight aggregate and samples of the limestone aggregate were obtained during plant operations and submitted to D-9 for Polish Value determination. These were placed

on Westbound Lane from Sta 287+00 to Sta 397+00 with a Polish Value of 32 and on the Eastbound Lane from Sta 287+00 to Sta 360+00 with a Polish Value of 35.

While these paving operations were going on, Extra Work Order No. 1 was being processed for "Furnishing and placing pre-coated Lightweight Aggregates on top of Item 340, HMAC, 'Ty D', as a portion of research project to develop non-skid pavement data". Various mixtures were made in the Residency Laboratory and it appeared that the optimum amount of No. 6 Pre-Coat Oil would be about 3.2% or 3.5% (by weight). Approximately 20 Tons of each precoated aggregate (3.2% & 3.5%) were made and hauled to the job site. Very cold and rainy weather set in and it was about two weeks before we could begin the Sprinkle Treatment Test Sections.

A Sprinkle Treatment Test Section was placed on the Eastbound Lane from Sta 360+00 to Sta 382+00 using the 3.5% No. 6 Pre-coat Oil Mix. This was applied with the Flaherty Aggregate Spreader (Self Propelled) at the rate of 1:515. The rolling was done with a Vibrating Roller, Vibrating Forward, Static Reverse; then followed by the Pneumatic Roller. It was noted that the pneumatic roller was causing the pre-coated aggregate to come loose from the mat surface.

With regard to the Vibratory Roller: The Contractor, at his written request, had been given permission to use a Vibratory Roller in lieu of the 3 wheel roller and tandem roller, as required by Item 340. The roller used was the Tampo Vibratory Double Drum Asphalt Roller, Model RS-166A. He had already used this roller on other Ty 'D' overlay and Lightweight Safety

Overlay Projects with satisfactory results. This same roller was used on all the mix placed on this project.

The next Sprinkle Treatment Test Section was placed on the Eastbound Lane from Sta 382+00 to Sta 392+50 using the 3.2% No. 6 Pre-coat Oil Mix. Applied in the same manner at the rate of 1:288 and roller in the same manner, it was again noted that some of the pre-coated aggregate was being torn loose by the pneumatic roller.

On the next Sprinkle Treatment Test Section, placed on the Eastbound Lane from Sta 392+50 to Sta 403+00, we used the 3.5% No. 6 Pre-coat Oil Mix and applied that aggregate with the T.H.D. Chat Spreader, or "whirley bird" at the rate of 1:400. We reversed the rolling procedure, i.e., Pneumatic first and Vibratory Roller second.

It should be noted that all of this work was done "under traffic". Traffic was placed on the completed mats almost as quickly as the rolling was completed and removed a large percentage of the Sprinkle Treatment Aggregate.

We then placed another Sprinkle Treatment Test Section on the Eastbound Lane from Sta 403+00 to Sta 433+00, using 5% No. 6 Pre-Coat Oil Mix. We had increased the amount of Pre-Coat Oil in an attempt to get a "tacky" coating in the hopes that the aggregate would hold to the mat. We also changed the rolling procedure. We did not use the Pneumatic Roller. We "double drummed" with the Vibratory Roller, i.e. in rolling forward the lead wheel was vibrating and the rear wheel was static and in rolling backward the lead wheel was vibrating and the rear wheel was static. The aggregate was again applied with the Flaherty Self Propelled Spreader at the rate of

1:511. The aggregate was not "tacky" but was "greasy" instead.

Still seeking a "tacky" aggregate, we next placed a Sprinkle Treatment Test Section on the Eastbound Lane from Sta 433+00 to end of project at Sta 442+50. We used AC-10 as the pre-coating oil, 4% in this instance. The aggregate was again placed with the Flaherty Self Propelled Spreader at the rate of 1:400. Rolling was accomplished with the Vibratory Roller only and was done by "double drumming". The aggregate did have a "tacky" feeling and appeared to adhere to the mat.

We still had a small amount of the Westbound Lane pavement to place and this was Sprinkle Treated with the remainder of the 5% No. 6 Pre-coat Oil Mix. The pre-coated aggregate was placed with the Flaherty Self Propelled Spreader on two test sections; Sta 397+00 to Sta 411+00 at the rate of 1:337 and Sta 411+00 to end of project at Sta 422+50 at the rate of 1:415. Rolling was done with the Vibratory Roller, "double drum" method.

The mainlane pavement of FM 1604 was now completed and we lacked only the ramps at US 281 and FM 2696. We had not yet placed any "raw" Sprinkle Treatment Aggregate and decided to do so on those ramps. This raw aggregate was applied at the rate of 1:400 by the Flaherty Spreader and "double drum" rolled with the Vibratory Roller. The "raw" aggregate used was a little larger than all of the other used in the Sprinkle Treatments. It was about Gr. 4 grading. We obtained a little better retention on it, perhaps about 60% of that placed. Unfortunately, due to the horizontal and vertical alinement of the two ramps, we were not able to obtain Skid Resistance Values on these ramps.

On January 14, 1975, approximately one week after the completion of the placement of all paving and sprinkle treatment, Skid Resistance tests were run on every test section of the entire project. By this time the traffic had removed some of the Sprinkle Treatment Aggregate and left the Sprinkle Treatment test sections with a "pocked" surface, somewhat resembling that of a concrete pavement - almost set - and showered on. Regardless of the amount of pre-coated aggregate originally placed, it appeared that the ultimate aggregate retention was about the same on all the Sprinkle Treatment test sections with perhaps a little better retention on the 4% AC-10 Pre-coat Mix.

All of the test sections are plotted on a strip map, attached hereto, and are also shown below, as follows:

Westbound Test Section No. 1
Sta. 411+00 to Sta. 442+50 P.V. = 33
Sprinkle Treatment Pre-ct. Lt. Wt.
5% No. 6 Pre-ct. Oil
Applied 1:415
Initial Skid Value = 80

Westbound Test Section No. 2
Sta. 397+00 to Sta. 411+00 P.V. = 33
Sprinkle Treatment Pre-ct. Lt. Wt.
5% No. 6 Pre-ct. Oil
Applied 1:337
Initial Skid Value = 79

Westbound Test Section No. 3
Sta. 287+00 to Sta. 397+00 P.V. = 32
W/20% Lt. Wt. Aggr. Additive
Initial Skid Value = 54

Westbound Test Section No. 4
Sta. 203+00 to Sta. 287+00 P.V. = 32
W/20% Lt. Wt. Aggr. Additive
Initial Skid Value = 54

Westbound Test Section No. 5
Sta. 181+00 to Sta. 203+00 P.V. = 32
Est. 20% Lt. Wt. Aggr.
Actual 10.8% Lt. Wt. Aggr.
Initial Skid Value = 50

Westbound Test Section No. 6
Sta. 168+00 to Sta. 181+00 P.V. = 32
Est. 40% Lt. Wt. Aggr.
Actual 30.2% Lt. Wt. Aggr.
Initial Skid Value = 44

Westbound Test Section No. 7
Sta. 154+00 to Sta. 168+00 P.V. = 32
Est. 30% Lt. Wt. Aggr.
Actual 25.2% Lt. Wt. Aggr.
Initial Skid Value = 50

Westbound Test Section No. 8
Sta. 140+00 to Sta. 154+00 P.V. = 32
Est. 15% Lt. Wt. Aggr.
Actual 8.1% Lt. Wt. Aggr.
Initial Skid Value = 47

Westbound Test Section No. 9
Sta. 119+00 to Sta. 140+00 P.V. = 32
Zero Lt. Wt. Aggr.
Initial Skid Value = 52

Westbound Test Section No. 10
Sta. 0+00 to Sta. 119+00 P.V. = 33
No Admixture
Initial Skid Value = 52

Eastbound Test Section No. 1
Sta. 0+00 to Sta. 220+00 P.V. = 33
No Admixture
Initial Skid Value = 46

Eastbound Test Section No. 2
Sta. 220+00 to Sta. 287+00 P.V. = 32
W/20% Lt. Wt. Aggr. Added
Initial Skid Value = 52

Eastbound Test Section No. 3
Sta. 287+00 to Sta. 360+00 P.V. = 35
W/20% Lt. Wt. Aggr. Added
Initial Skid Value = 50

Eastbound Test Section No. 4
Sta. 360+00 to Sta. 382+00 P.V. = 33
Sprinkle Treatment Pre-ct. Lt. Wt.
3.5% No. 6 Pre-ct. Oil
Applied 1:515
Initial Skid Value = 77

Eastbound Test Section No. 5
Sta. 382+00 to Sta. 392+50 P.V. = 33
Sprinkle Treatment Pre-ct. Lt. Wt.
3.2% No. 6 Pre-ct. Oil
Applied 1:288
Initial Skid Value = 71

Eastbound Test Section No. 6
Sta. 392+50 to Sta. 403+00 P.V. = 33
Sprinkle Treatment Pre-ct. Lt. Wt.
3.5% No. 6 Pre-ct. Oil
Applied 1:400 "Whirlybird"
Initial Skid Value = 76

Eastbound Test Section No. 7
Sta. 403+00 to Sta. 433+00 P.V. = 33
Sprinkle Treatment Pre-ct. Lt. Wt.
5% No. 6 Pre-ct. Oil
Applied 1:511
Initial Skid Value = 75

Eastbound Test Section No. 8
Sta. 433+00 to Sta. 442+50 P.V. = 33
Sprinkle Treatment Pre-ct. Lt. Wt.
4% AC-10
Applied 1:400
Initial Skid Value = 85

With respect to the test sections with Lightweight Aggregate added to the mix: the initial skid values range from 44 to 54 as compared to values of 46 and 52 for mixes with no admixtures. With the very limited quantity of lightweight aggregate available, it was necessary to avoid any

loss of this material, and, with the exception of the 20% lightweight blend, it was necessary to estimate the cold feed settings of the batch plant, and run the blended material without plant adjustment. This resulted in some variance between actual amounts of blended lightweight, and intended amounts- eg Estimated = 40%, Actual = 30.2%. For the 20% blend, however, the plant was adjusted during the run, and the desired 20% (by volume) blend obtained. The initial skid values of this material (50-54) compare favorably with initial skid values of mixes of 100% lightweight coarse aggregate (50-60), and future skid testing of these blended mixes should show significant information as to the effect of traffic on skid values, and the value of the blending of aggregates approach to improving skid properties of pavement. It is possible that under the abrading action of traffic, the test sections with Lightweight Aggregate will reflect continuing increases in skid resistance values and those with no admixed Lightweight Aggregate will peak out early and show decreasing skid resistance values. For this reason, it is felt that opportunities for use of blended mixtures using dissimilar aggregates should not be abandoned at this time.

Considering the Sprinkle Treatment test sections: AC-10 coating is better than No. 6 Pre-coat Oil; a Pre-coat Aggregate of Grade 4 size would do better than the Grade 5 (approximate) size that was used; the aggregate should be coated enough to have a residual film on the particles; the initial skid resistant values on all of these test sections was about 30 points above all the rest of the pavement placed even though the ultimate aggregate retention was about 50% of that placed. If it is

possible to reduce the initial density imparted to the asphalt mat through the screed of the lay-down machine, then it is probable that a Sprinkle Treatment Aggregate would then better penetrate the surface of the mat and result in better aggregate retention. The cost of applying the sprinkle treatment was \$2.41 per ton of Hot Mix "Ty. D" that was treated.

The intent of Field Change No. 1 and Extra Work Order No. 1 has been achieved with a high degree of success. Test data that will be beneficial in the continuing quest for safer, more skid-resistant pavements has been obtained.

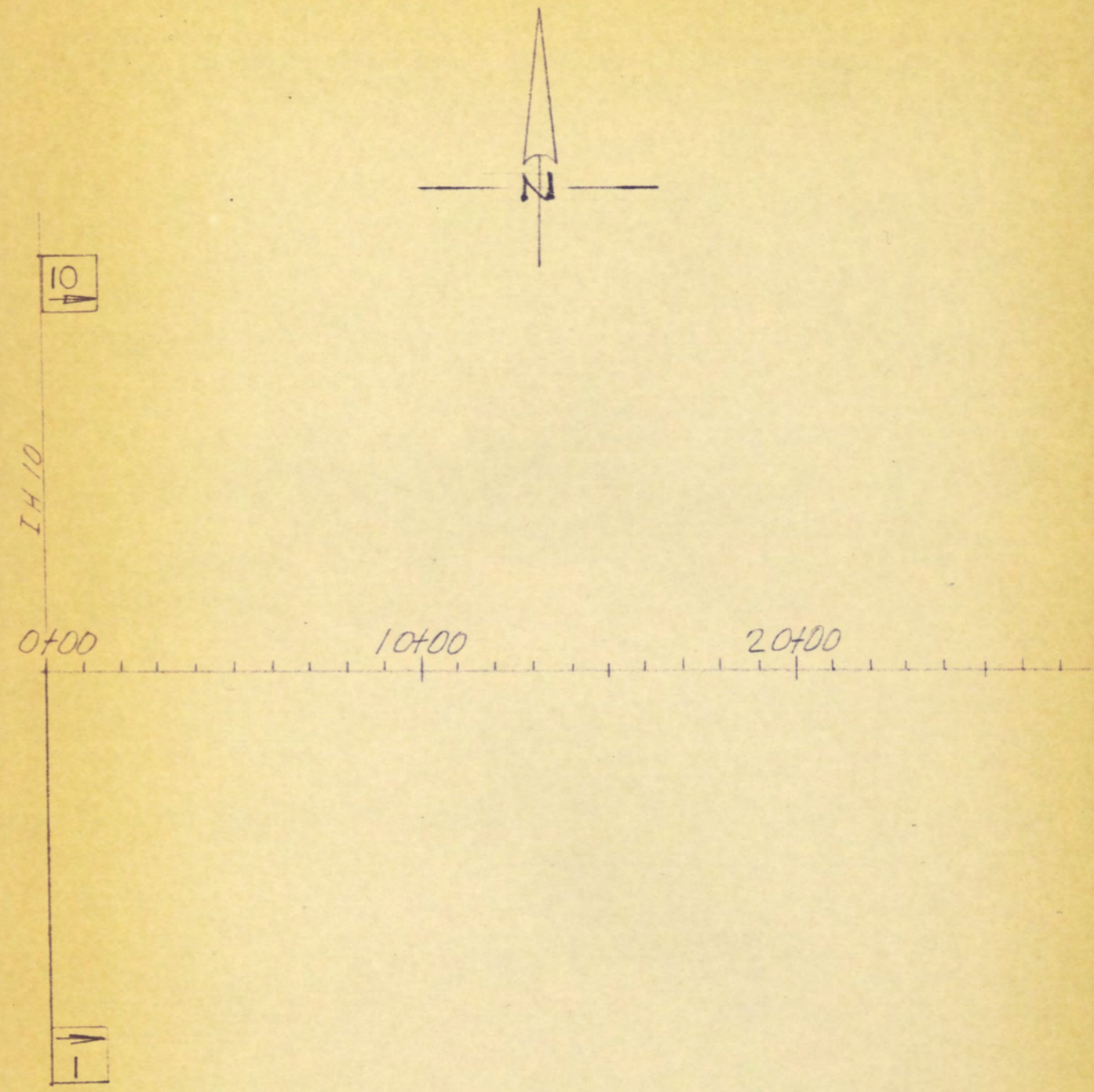
ATTACHMENT "A"
 To Narrative Report of Test Sections on FM 1604
 Project C 73-5-38, Bexar County
 SKID RESISTANCE VALUES

<u>TEST SECTION</u>	<u>1-14-75</u>	<u>2-14-75</u>	<u>3-17-75</u>	<u>6-3-75</u>	<u>8-18-75</u>	<u>11-5-75</u>
Westbound No. 1: PV 33 W/Sprinkle	80	68	65	59	49	46
Westbound No. 2: PV 33 W/Sprinkle	79	60	59	64	53	46
Westbound No. 3: PV 32 W/20% Lt. Wt.	54	56	53	52	44	41
Westbound No. 4: PV 32 W/20% Lt. Wt.	54	53	52	51	43	40
Westbound No. 5: PV 32 W/10.8% Lt. Wt.	50	51	50	48	40	37
Westbound No. 6: PV 32 W/30.2% Lt. Wt.	44	49	51	47	35	33
Westbound No. 7: PV 32 W/25.2% Lt. Wt.	50	49	50	48	38	36
Westbound No. 8: PV 32 W/8.1% Lt. Wt.	47	48	46	46	38	34
Westbound No. 9: PV 32 Raw	52	51	49	44	39	30
Westbound No. 10: PV 33 Raw	52	47	47	43	38	32
Eastbound No. 1: PV 33 Raw	46	47	44	43	33	28
Eastbound No. 2: PV 32 W/20% Lt. Wt.	52	53	54	53	42	39
Eastbound No. 3: PV 35 W/20% Lt. Wt.	50	55	53	51	42	37
Eastbound No. 4: PV 33 W/Sprinkle	77	61	58	56	45	41
Eastbound No. 5: PV 33 W/Sprinkle	71	63	58	54	44	39
Eastbound No. 6: PV 33 W/Sprinkle	76	57	54	49	39	36
Eastbound No. 7: PV 33 W/Sprinkle	75	58	59	52	43	37
Eastbound No. 8: PV 33 W/Sprinkle	85	64	No Test Equip. Failed	59	46	43

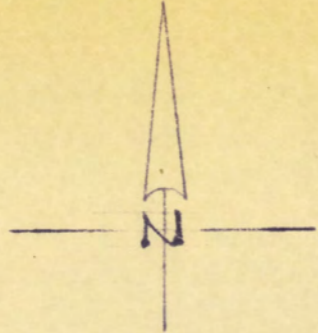
TEST SECTIONS
VARIOUS ASPH MIXTURES
AND
SPRINKLE TREATMENT

LINE DIAGRAM
OF FM 1604

FR: IH 10
TO: 0.3 MI. E. OF US 281



Eastbound Test Section No 1
Sta. 0 to Sta 220
Ty. D' Hot Mix PV = 33
No Admix
Initial Skid Value = 46



Westbound Test Section No 10
 Sta. 0 to Sta 119
 Ty 'D' H. Mix PV=33
 No Admix
 Initial Skid Value = 52

10

I.H. 10

0+00

10+00

20+00

30+00

40+00

50+00

T₁ NO RR

Co. Rd.

Bacon Rd.

TRADESMEN

Eastbound Test Section No 1
 Sta. 0 to Sta 220
 Ty 'D' H. Mix PV = 33
 No Admix
 Initial Skid Value = 46

10

60+00

70+00

80+00

90+00

100+00

110+00

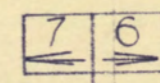
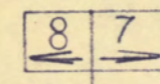
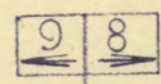
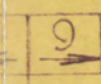
F.M. 1535

W.B. Test Section No 9
Sta. 119 to Sta. 140
Ty. 'D' H. Mix P.V. = 32
Zero % Lt. Wt. Added
Initial Skid Value = 52

W.B. Test Section No 8
Sta. 140 to Sta. 154
Ty. 'D' H. Mix P.V. = 32
Est. 15% Lt. Wt. Added
Actual 8.1% Lt. Wt. Added
Initial Skid Value = 47

W.B. Test Section No 7
Sta. 154 to Sta. 168
Ty. 'D' Hot Mix P.V. = 32
Est. 30% Lt. Wt. Added
Actual 25.2% Lt. Wt. Added
Initial Skid Value = 50

W.B. Test Section No 6
Sta. 168 to Sta. 181
Ty. 'D' H. Mix P.V. = 32
Est. 40% Lt. Wt. Added
Actual 30.2% Lt. Wt. Added
Initial Skid Value = 44



120+00

130+00

140+00

150+00

160+00

170+00

Westbound Test Section No 5
Sta 181 to Sta. 203
Ty'0' H. Mix PV = 32
Est. 20% Lt. Wt. Added
Actual 10.8% Lt. Wt. Added
Initial Skid Value = 50

6	5
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5	4
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Salado Creek

180+00

190+00

200+00

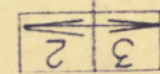
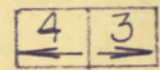
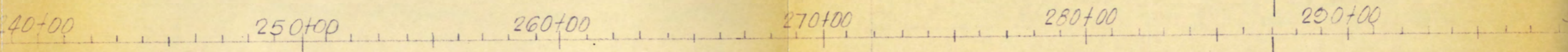
210+00

220+00

230+00

1	2
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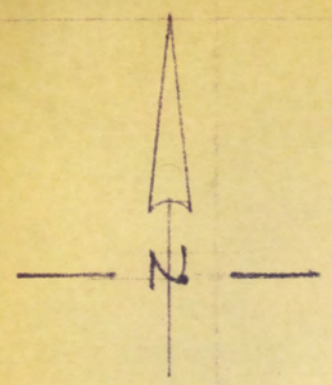
Westbound Test Section No 4
 Sta. 203 to Sta 287
 T_y. 'D' H.Mix. PV = 32
 w/20% L_t. W_t. Added
 Initial Skid Value = 54



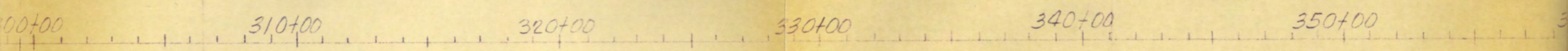
Eastbound Test Section No 2
 Sta. 220 to Sta. 287
 T_y. 'D' H.Mix. PV = 32
 20% L_t W_t Added
 Initial Skid Value = 52

Westbound Test Section No 3.
Sta. 287 to Sta. 397.
T₉'D' H.Mix P.V. = 32
w/ 20% Lt. Wt. Added
Initial Skid Value = 54

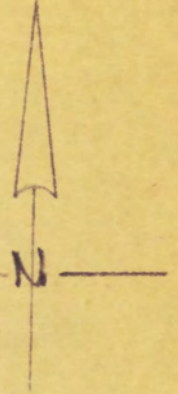
Eastbound Test Section No 3
Sta. 287 to Sta. 360
T₉'D' H.Mix P.V. = 35
20% Lt. Wt. Added
Initial Skid Value = 50



Blanco Rd



Westbound Test Section No 2
 Sta. 397 to Sta. 411 PV=33
 Sprinkle Trt. Pre Coat Lt. Wt.
 5% No 6 Pre Coat Oil.
 Applied 1 to 337
 Initial Skid Value = 79



3 2

2 1

60+00 370+00 380+00 390+00 400+00 410+00

Brooming Dr.

Trailcrest

4

5 4

6 5

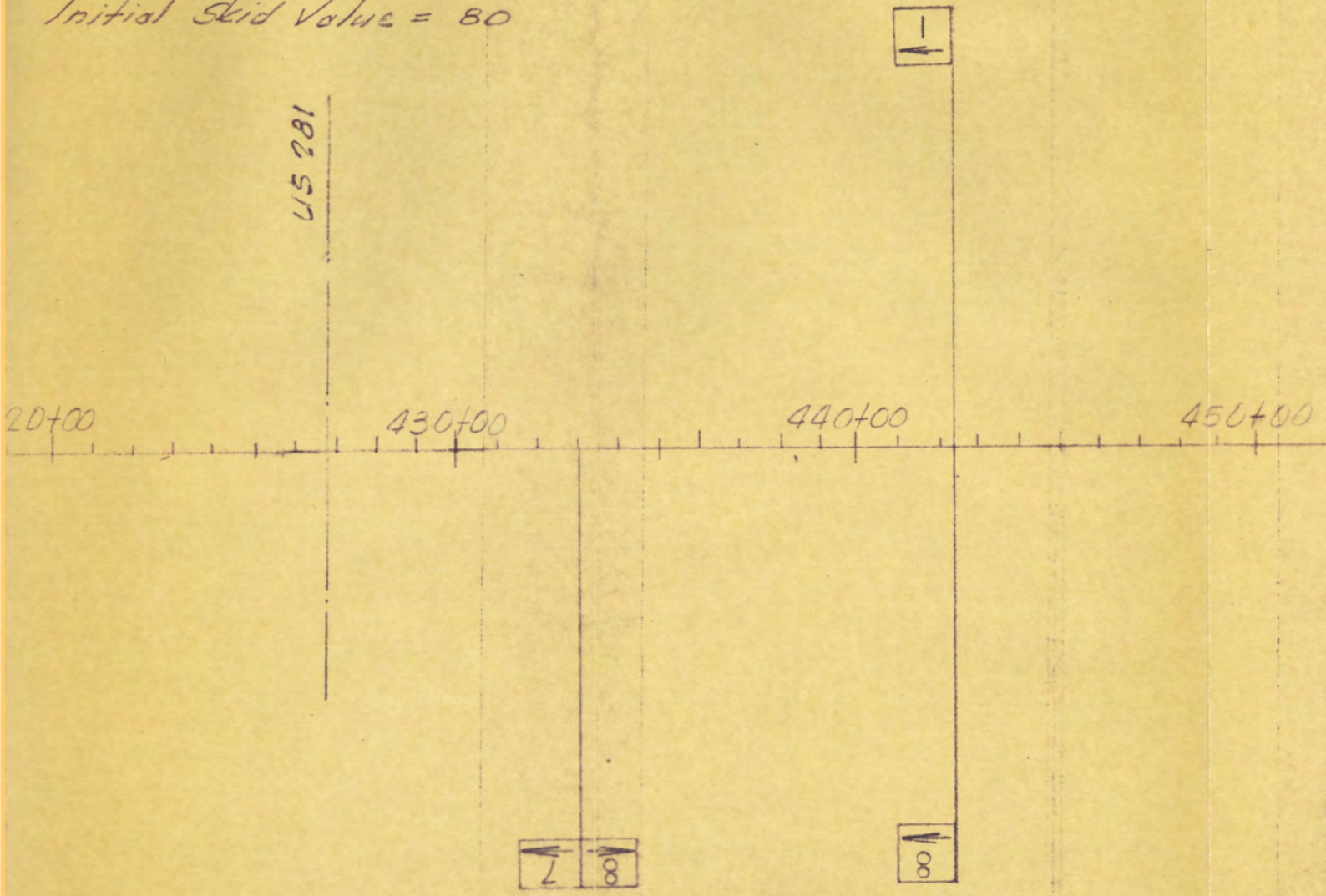
7 6

Eastbound Test Section No 4
 Sta. 360 to Sta. 382 PV33
 Sprinkle Trt. Pre Coat Lt. Wt.
 3.5% No 6 Pre Coat Oil
 Applied 1 to 515
 Initial Skid Value = 77

E.B. Test Sect. No 5
 Sta 392+50 to Sta. 403 PV33
 Sta 382 to Sta 392+50 PV33
 Sprk. Trt. Pre Coat Lt. Wt.
 3.2% No 6 Pre Coat Oil
 Applied 1 to 288
 Initial Skid Value = 71

E.B. Test Sect. No 6
 Sta 392+50 to Sta. 403 PV33
 Sprk. Trt. Pre Coat Lt. Wt.
 3.5% No 6 Pre Coat Oil
 Applied 1 to 400 by
 use of THD Chat Sprink.
 Initial Skid Value = 76

Westbound Test Section No 1
 Sta. 411 to Sta. 442+50 PV = 33
 Sprinkle Treat. Pre Coat Lt. Wt.
 5% No 6 Pre. Ct. Oil.
 Applied 1 to 415
 Initial Skid Value = 80



TEST SECTIONS
 VARIOUS ASPH MIXTURES
 AND
 SPRINKLE TREATMENT

LINE DIAGRAM
 OF FM 1604

FR: IH. 10
 TO: 0.3 MI E OF US 281

Eastbound Test Section No 1
 Sta. 403 to Sta. 433 PV 3
 Sprinkle Tt. Pre Coat Lt. Wt.
 5% No 6 Pre Coat Oil
 Applied 1 to 511
 Initial Skid Value = 75

E. B. Test Sect. No 8
 Sta. 433+76 to Sta. 442+50 PV 33
 Spt. Tt. P. Ct. Lt. Wt.
 4% AC 10
 Applied 1 to 400
 Initial Skid Value = 85

PROJ. C 73-5-38
 Cont. 2452-2-8
 Cont. 2452-3-19