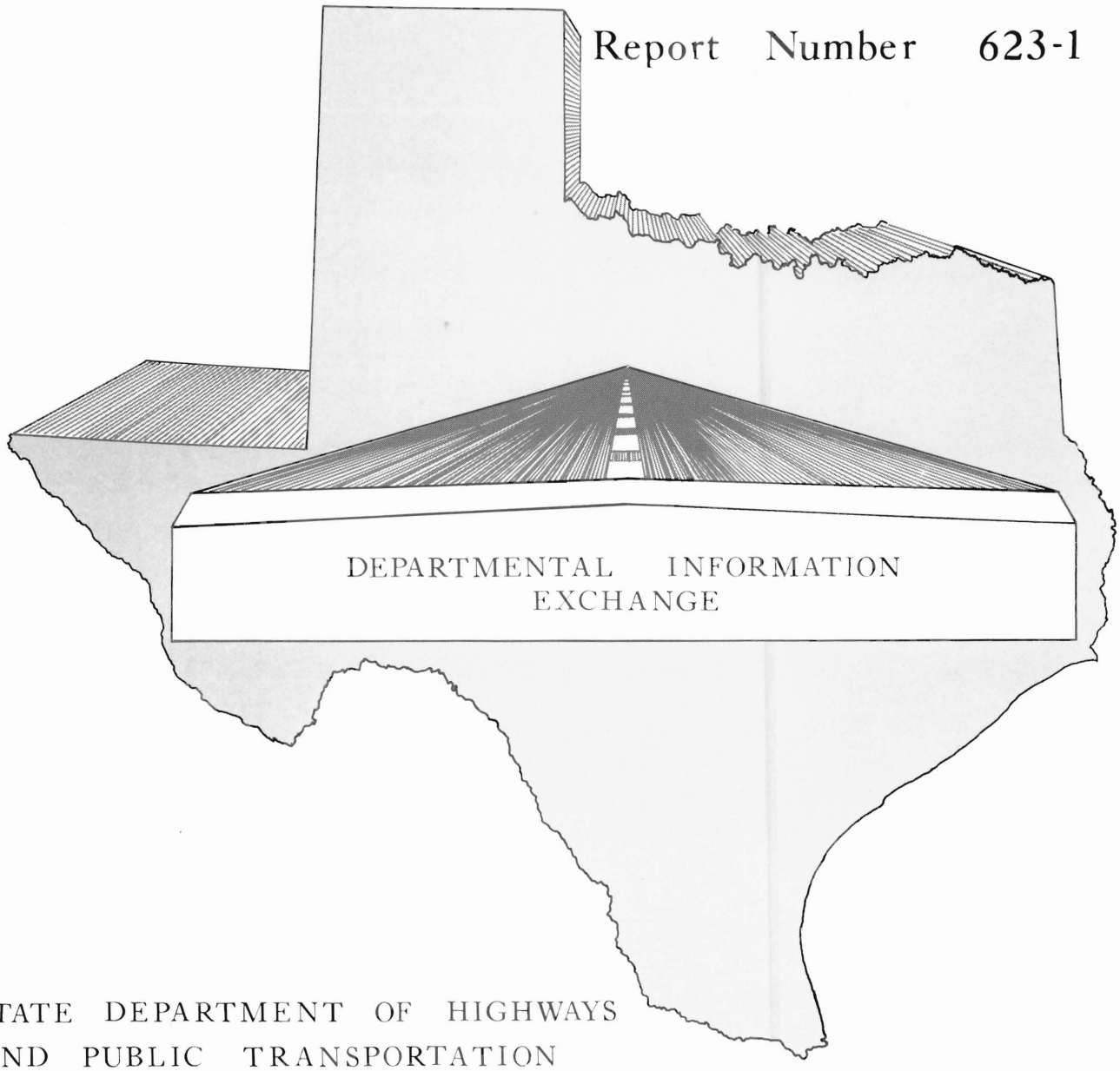
EXPERIMENTAL PROJECTS

EXPERIMENTAL TRANSVERSE TINE FINISH ON CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Report Number 623-1



STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

EXPERIMENTAL

TRANSVERSE TINE FINISH

ON

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

Experimental Projects Report 623-1

US 281 North

San Antonio, Texas

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November, 1976

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.

A NARRATIVE REPORT

Two construction projects on US 281 North, referred to for several years as the North Expressway, and now designated as the McAllister Freeway, were recently completed and opened to the traveling public in San Antonio.

Both projects, originally financed with State and Federal Funds, then shut down by Court Stay Orders, were finally completed with State Funds approximately six years after work first began. More than three years of this total time was involved in Court Stay Order time.

One of these projects went from Pearl Parkway to Mulberry Ave. and was contracted by Killian-House Co. This project will be referred to as Project C 73-8-9 or the K & H Job throughout the remainder of this report.

The second project went from Tuxedo Ave. to 0.2 mile South of IH 410. Contracted by H.B. Zachry Co., this project will be referred to as Project C 73-8-10 or the Zachry Job throughout the remainder of this report.

Upon the resumption of work, numerous Field Changes were executed, including those which permitted the use of transit mix concrete for Concrete Pavement and, also, those which required a Transverse Tine Finish instead of the originally planned burlap drag finish on the Concrete Pavement.

Project C 73-8-9 (K & H Job) involved the placement of 42,026 Square Yards of 8" Continuously Reinforced Concrete Pavement. The transit-mix concrete was furnished by McDonough Bros., Inc. The coarse aggregate was crushed limestone gravel; the fine aggregate was a mixture of 75% natural limestone sand and 25% silica sand. The cement was Alamo Type 1 Normal.

The basic batch design data was as follows:

> Cement Factor = 5 Sacks/CY: C.A.F. = 75:
> Water = 6.5 Gal. (reduced to 5.3 by use of Daratard 40
> C.D.A., 10 Oz/Sack of Cement): 5% Entrained Air was obtained
> by the addition of Darex A.E.A. at the rate of 0.7 Oz/sack
> of cement.

Hauled in 8 C.Y. and 10 C.Y. transit-mix trucks a distance of 15 miles, the concrete was dumped on the sealed cement-stabilized base course at a 2" slump. The paving equipment was a Rex Spreader, Rex Finisher, and Rex Bullfloat, all operating on 8" Steel Forms. Using this type of older, more conventional, paving equipment precluded the application of Transverse Tine Finishing by mechanical means unless we were willing to pay in excess of $1.00 per square yard for that type of finish. We therefore permitted the Transverse Tine Finishing to be done by hand at no change in bid price.

On Project C 73-8-10 (Zachry Job) we placed 68,541 Square Yards of 8" Continuously Reinforced Concrete Pavement. This transit-mix concrete was furnished by Vulcan Materials Co. The coarse aggregate was crushed limestone gravel; the fine aggregate was a mixture of 85% manufactured limestone sand and 15% silica sand. The cement was Capitol Type 1 Normal. The basic batch design data for this concrete was as follows:

> Cement Factor = 5 sacks/CY: C.A.F. = 78; Water = 6.5 Gal.
> (reduced to 5.3 by use of Daratard 40 C.D.A., 7 Oz to 8.5
> Oz/sack of cement): 5% Entrained Air was obtained by the
> addition of Darex A.E.A. at the rate of 0.7 Oz/sack of cement.

This concrete was hauled a distance of 7 miles in 7 C.Y. transit-mix trucks and was dumped on the sealed cement-stabilized base course at a 1" slump. The paving train on the Zachry Job was all C.M.I. equipment and consisted of a Slipform Paver, a Tube Finisher and a Texture-Curing Machine.

Originally equipped to impart a burlap drag finish, the Texture-Curing Machine was modified to scribe a metal-tine Transverse Tine Finish to the concrete pavement. This modification resulted in an increase in bid price of $0.086 per square yard, or an overall cost of $5,895.13 to the project. This same machine was then used to apply the membrane curing compound.

A copy of the Plan Note requiring the Transverse Tine Finish is incorporated herein as Attachment "A". This Plan Note was included in the Field Changes on both projects.

On the K & H Job, where the tine finish was applied by hand, the tine tool was 5 Ft. in width, rectangular in shape with metal tine bristles 6" long. This tool, resembling a large comb, was attached to a 26' handle, made of aluminum tubing with an offset connection at the point of connection. Two or three men operated this tool, pulling it across the concrete in a steady continuous motion. It was then necessary to pick it up and return it to the other side of the pavement and again pull it across. A 3' wide tine comb was also used at times, this tool requiring only one man to operate it.

On the Zachry Job the tine comb was 10' long with steel tine bristles about 12" long. Mounted in a vertical position, it was operated by a sprocket and chain drive and pulled transversely across the concrete behind the tube finisher. Upon completion of one motion across the pavement, the comb was hydraulically raised and then belt driven across and over the concrete; the machine was then driven forward approximately 10 ft.; the

tine tool was then hydraulically lowered and again pulled back across the pavement. The forward and reverse motion of this machine was such that it could not always be exactly controlled and in some cases the tine comb overlapped a portion of the previous tine application.

We found that a uniformly tine textured pavement surface was not easily obtained. Slightly wetter loads would result in a wetter surface in the middle of a surface that was otherwise ready to be finished. In comparing the two projects, the finish on the Zachry Job was of a more uniform quality than that on the K & H Job.

After completion of paving operations, and prior to opening the pavements to the traveling public, random spots were tested for Skid Values and Texture Depths on both projects.

On the K & H Job (C 73-8-9), Skids and Texture Depths were obtained from Lane B on the Northbound Lane and from Lane A on the Southbound Lane. Skid Values ranged from 48 to 71 with Texture Depths measuring from 0.039" to 0.061" on the Northbound Lane. On the Southbound Lane we obtained Skid Values between 51 and 73 with Texture Depths between 0.053" and 0.074".

We followed through with the same pattern of testing on Project C 73-8-10 (Zachry Job). Random Texture Depths in both directions measured 0.057" to 0.083" with Skid Values ranging from 60 to 73.

The attempt to obtain Transverse Tine Finish was made in an effort to provide a texture that would combat hydroplaning and skidding accidents. We believe that we have accomplished that intent, even though our texture is not uniformly of a text book appearance.

Both of these projects are now under traffic, however, the volume of traffic is very low at this time, due to the fact that the project between these two is still under construction. When that project is under traffic we will then be able to better evaluate the durability and effectiveness of this type finish on concrete pavements constructed of aggregates that are known to polish under heavy traffic.

Additional Skid Data and Texture Depths will be reported at a later date.

PLAN NOTE

Project C 73-8-10, etc.
Control 73-8-10, etc.
US 281
Bexar County

Field Change No. 15

Item 360: Concrete Pavement - Burlap drag finish will not be required. The texture on concrete pavement shall be applied with 1/8" wide metal tines with clear spacing between the tines being not less than 1/4" nor more than 1/2". The texture shall be applied transversely. The average texture depth shall be not less than 0.060" with a minimum texture depth of 0.050". Should the texture depth fall below that intended, the finishing procedures shall be revised to produce the desired texture.

ATTACHMENT "A"