

# Laredo District PAVEMENT DESIGN REPORT



**HWY: FM 190**  
**CSJ: 0963-01-029**  
**County: Dimmit**  
**Project Limits:**  
**From 13<sup>th</sup> Street To US 83 North Intersection**  
**Project Length: 1.5 Miles**

**Selected Option:** STRATEGY 2 OPTION 1

**Designed by:**

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**Date:** 8/30/13

**Approved By:**

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Director of Maintenance

**Date:** 11/30/12

NOTE: This document is released for the purpose of interim review and is not intended for bidding, construction, or permitting purposes.

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## **GENERAL PROJECT INFORMATION**

### **Location**

This pavement design report is for the proposed rehabilitation of FM 190 in Dimmit County for a length of 1.5 miles from 13<sup>th</sup> Street to US 83 North intersection.

The project location map is shown as Exhibit A.

### **Facility**

The section was transferred to the state with a surface of 18 foot wide, 1.4 inches thick, and a base of 8.5 inches thick. This section of roadway was reconstructed in 1960 to a surface of 20 feet wide and a surface treatment. The base was constructed at 28 feet wide and 8 inches thick. This information was obtained from the roadway inventory logs.

The roadway existing layers in this section consist of approximately 1.5 inches of sealcoat material, and 8 inches of flexible base as per the roadway inventory logs.

The proposed typical section of this roadway is 12' lanes and 4' shoulders.

The typical sections are shown as Exhibit B.

### **Soil Conditions**

The subgrade modulus is assumed to be 8 ksi for the design purposes. Falling Weight Data (FWD) indicates a subgrade modulus average of approximately 10.1 ksi. However, this value was not used for the design due to the many weak spots. This design assumes the weaker spots will not be addressed. Falling Weight data can be seen in Exhibit D "Falling Weight Data". The predominant soil type is fine sandy loam and clay. Predominant soil information can be seen in EXHIBIT G "Subgrade Soil Data".

Existing base strength was estimated at 20 ksi based on FWD data.

### **Traffic Data**

The Traffic data was obtained from TP&P on August 24, 2012. The 20 year traffic obtained is summarized below:

From: 13<sup>th</sup> Street To: US 83 North Intersection:

2016 ADT: 400

Percent Trucks in ADT: 62.4

2036 ADT: 1,000

ATHWLD: 11,400

Flex 18k ESALs: 1,200,000

Percent Tandem Axles in ATHWLD: 70

## **FLEXIBLE PAVEMENT DESIGN**

The design was performed with the Flexible Pavement Design System (FPS-21) program and input values were selected using TxDOT guidelines. All design data and parameters are included as Exhibit E, FPS input and output.

The process used for determining the preferred proposed pavement structure included incorporating the most efficient pavement structure for the location that would meet or exceed a design life of 20 years with a minimum overlay timeframe of 8 years. Although the base was constructed to a width of 28 feet (sufficient width for this design), weathering, erosion, and traffic has deteriorated this section.

This process resulted in the following pavement design options:

### **STRATEGY 1 - CEMENT STABILIZE BASE**

**Option 1:** Consists of the following:

- Surface: 2 Course surface treatment
  - Prime coat: RC-250 w/GR 5
  - Surface: AC-20-5TR w/GR 3
- Base 1 - 6" Cement Treat Existing Material (6" existing material spread out to 3.8" across entire width with an additional 2.20" of new base material)
- Base 2 - 3.5" Untreated base material to remain
- T(1) - Time to first 2" Overlay = 13 Years
- T(2) - Design Life = 26 Years

This FPS design was checked with Modified Triaxial Design Procedure (Exhibit F), and failed.

**Option 2:** Consists of the following:

- Surface: 2 Course surface treatment
  - Prime coat: RC-250 w/GR 5
  - Surface: AC-20-5TR w/GR 3
- Base 1 - 8" Cement Treat Existing Material (7.5" existing material spread out to 4.75" across entire width with an additional 3.25" of new base material)
- Base 2 - 2" Untreated base material to remain
- T(1) - Design Life = 21 Years

This FPS design was checked with Modified Triaxial Design Procedure (Exhibit F) and passed with a factor of 1.0, but did not pass with a factor of 1.5.

\*\* (The Pavement Design Task Force (PDTF, 2009) recommends a factor of 1.0 be used for all designs where traffic loading is below 5 M ESALs.)

**Option 3:** Consists of the following:

- Surface: 2 Course surface treatment
  - Prime coat: RC-250 w/GR 5
  - Surface: AC-20-5TR w/GR 3
- Base 1 - 9" Cement Treat Existing Material (7.5" existing material spread out to 4.75" across entire width with an additional 4.25" of new base material)
- Base 2 - 2" Untreated base material to remain
- T(1) - Design Life = 26 Years

This FPS design was checked with Modified Triaxial Design Procedure (Exhibit F), and passed.

## **STRATEGY 2 - CEMENT STABILIZE BASE WITH OVERLAY**

**Option 1:** Consists of the following:

- Surface: 2" D-GR TY C
- Base 1 - 6" Cement Treat Existing Material (6" existing material spread out to 3.8" across entire width with an additional 2.20" of new base material)
- Base 2 - 3.5" Untreated base material to remain
- T(1) - Design life = 40 Years

This FPS design was checked with Modified Triaxial Design Procedure (Exhibit F), and passed.

## **STRATEGY 3 - HOT MIX**

This strategy would require repairing all the failed locations prior to application.

**Option 1:** Consists of the following:

- Surface 1: New 2" D-GR TY C
- Base:
  - Existing width: 8" Existing Flexible base to remain
  - Widened width: 4" HMA CP
- T(1) - Time to first 2" Overlay = 7 Years
- T(2) - Design Life = 14 Years

This FPS design was checked with Modified Triaxial Design Procedure (Exhibit F), and failed.

**Option 2:** Consists of the following:

- Surface 1: New 4" D-GR TY C
- Base:
  - Existing width: 8" Existing Flexible base to remain
  - Widened width: 4" HMA CP
- T(1) - Time to first 2" Overlay = 19 Years
- T(2) - Design Life = 38 Years

This FPS design was checked with Modified Triaxial Design Procedure (Exhibit F), and passed with a factor of 1.0, but did not pass with a factor of 1.5.

\*\*(The Pavement Design Task Force (PDTF, 2009) recommends a factor of 1.0 be used for all designs where traffic loading is below 5 M ESALs.)

**Option 3:** Consists of the following:

- Surface 1: New 4.5" D-GR TY C

- Base:
- Existing width: 8" Existing Flexible base to remain
- Widened width: 4" HMA CP
- T(2) - Design Life = 24 Years

This FPS design was checked with Modified Triaxial Design Procedure (Exhibit F), and passed.

**STRATEGY 4 - Engineer's Option:**

**Option 1:** Consists of the following:

- Surface: \_\_\_\_\_
- Base: \_\_\_\_\_
- Base: \_\_\_\_\_

**CONCLUSION**

The Director of Maintenance will be review the options noted in the previous section "Flexible Pavement Design" and determine the proposed material and types and determine the most viable and cost effective option.

Subgrade "weak spots" should be addressed prior to, or with the construction project.

In reference of the elements considered for the selection of the roadway surface layer aggregate properties, see the information contained in **Appendix A** – Surface Aggregate Selection Form.