

Re: Roadbond EN 1 trial with flyash
Texas DOT, US 83 in King County

Introduction

Jones Brothers Construction Company was contracted to rehab US 83 near Guthrie, Texas. Gary Mizer, P.E. is the area engineer and the plan called for the existing roadway to be pulverized to a depth of six-inches. An additional four inches of low quality local base was imported and mixed with the in-place material. Approximately 7% flyash was then mixed into the ten inches and shaped and compacted as usual.

The trial was installed on July 13, 1999 in the southbound lane and consisted of sections 24 by 4,200 feet divided into two application rates of Roadbond EN 1 and an untreated control. The sections are designated as follows:

- Section 1 Control
- Section 2 Roadbond EN 1 at 168 SY per gallon (80% labeled rate)
- Section 3 Roadbond EN 1 at 112 SY per gallon (labeled rate)

Mr. Jay Hurt, the inspector for TxDOT, confirmed the start and stop markers that identify the trial portions of the road. Moving south in the southbound lane, Section 1 begins at 19+580 thru 20+025. Section 2 starts at 20+110 and continues to 20+880 where Section 3 begins and ends at 21+395. The flyash rate of application was constant at 7% for the control and both trial sections.

30-day Evaluation

The trial was evaluated on August 19, 1999 with the Kessler DCP field CBR device. Shari Thomason with the TxDOT District lab was present as well as Dallas Junior with Jones Brothers Construction and Bill Gerard and Steve Merritt with Roadbond Service Company.

Each section consisted of three test sites and an average CBR result was obtained in the following manner:

The test sites were selected randomly with each trial section with an attempt to locate each test site equidistant from the others. A small hole was bored through the chip-seal to expose the base. The DCP was placed in the hole and given 4 blows to seat the cone firmly into the base. The starting elevation was measured and recorded. Twenty blows were then applied to the anvil and the ending elevation was recorded. The difference between the beginning elevation and the ending elevation is the total penetration in millimeters. The hole was repaired and the procedure was repeated in all three sections.

Refer to the following table for a comparison of the three sections.

| <i>Site</i> | <i>Start</i> | <i>Stop</i> | <i>Penetration</i> <i>n</i> | <i>Average/</i> <i>20 Blows</i> |
|-----------------------------|--------------|-------------|--------------------------------|------------------------------------|
| Sec 1 Control | | | | |
| Site 1 19+580 | 20 | 64 | 44 | |
| Site 2 19+700 | 11 | 45 | 34 | |
| Site 3 20+025 | 13 | 48 | 35 | 38 |
| Sec 2 (80% label) | | | | |
| Site 1 20+170 | 10 | 33 | 23 | |
| Site 2 20+330 | 11 | 40 | 29 | |
| Site 3 20+820 | 11 | 36 | 25 | 26 |
| Sec 3 (labeled rate) | | | | |
| Site 1 20+950 | 18 | 49 | 31 | |
| Site 2 21+190 | 19 | 51 | 32 | |
| Site 3 21+315 | 8 | 39 | 31 | 31 |

The value of the average penetration per twenty blows was input into the Kessler software program to determine the in-place CBR of each section. The CBR of the control section was determined to be 142.3 and the CBR of Section 2 and Section 3 was determined to be 217.7 and 178.7 respectively. Surprisingly, the lower rate of Roadbond EN 1 resulted in the greater strength increase at the 30-day evaluation.

6-month Evaluation

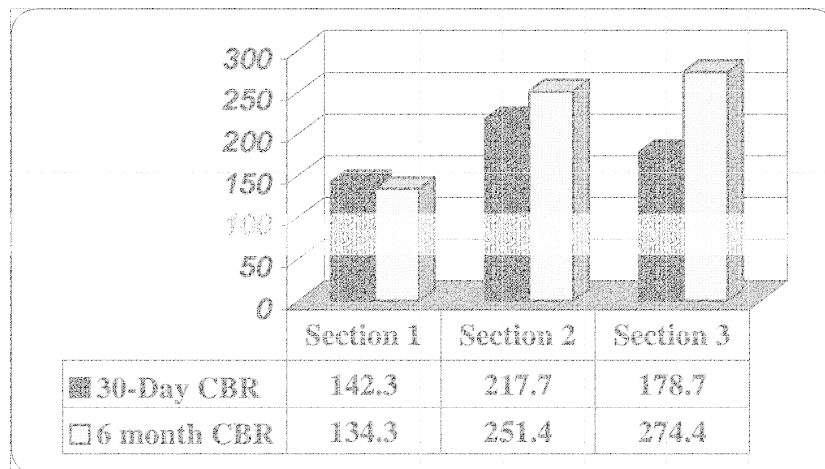
The trial was evaluated again on January 20, 2000 with the Kessler DCP. Ronald Hatcher and Shari Thomason with the TxDOT District lab were present along with Steve Merritt with Roadbond Service Company. Each section consisted of 5 sites that were selected and prepared in the same manner as the 30-day evaluation. However this time the DCP was given 3 blows to seat the cone and seven blows to determine the penetration. The following table illustrates the results.

| <i>Site</i> | <i>Start</i> | <i>Stop</i> | <i>Penetration</i> <i>n</i> | <i>Average/</i> <i>20 Blows</i> |
|--------------------------|--------------|-------------|--------------------------------|------------------------------------|
| Sec 1 Control | | | | |
| Site 1 19+850 | 14 | 28 | 14 | |
| Site 2 19+900 | 15 | 30 | 15 | |
| Site 3 19+940 | 18 | 32 | 14 | |
| Site 4 19+980 | 18 | 30 | 12 | |
| Site 5 20+020 | 13 | 28 | 15 | 70 |
| Sec 2 (80% label) | | | | |
| Site 1 20+175 | 13 | 25 | 12 | |
| Site 2 20+215 | 9 | 16 | 7 | |
| Site 3 20+300 | 12 | 19 | 7 | |
| Site 4 20+440 | 9 | 16 | 7 | |
| Site 5 20+800 | 13 | 20 | 7 | 40 |

| <i>Site</i> | <i>Start</i> | <i>Stop</i> | <i>Penetration</i> | <i>Average/ 20 Blows</i> |
|-----------------------------|--------------|-------------|--------------------|------------------------------|
| Sec 3 (labeled rate) | | | | |
| Site 1 20+975 | 12 | 23 | 9 | |
| Site 2 21+000 | 11 | 23 | 12 | |
| Site 3 21+100 | 14 | 18 | 4 | |
| Site 4 21+175 | 14 | 20 | 6 | |
| Site 5 21+300 | 8 | 14 | 6 | 37 |

The Kessler software was used to determine an in-place CBR value for the control of 134.3, which is a 6% decline from the 30-day strength. The CBR of section 2 and 3 was determined to be 251.4 and 274.4 respectively. Note the significant increase in CBR of both trials from the 30-day test and also the labeled rate has surpassed the lower rate of application.

The chart illustrates the values of the 3 sections.



Summary

Roadbond EN 1 has significantly improved the CBR of the flyash treated material. Thirty days after construction, Section 2 was 53% stronger and Section 3 was 26% stronger than the control. Six months after construction the results were even more remarkable. At that point, Section 2 was 87% stronger and Section 3 was 104% stronger than the control. In addition, the CBR of the control decline by 6% over time while the treated sections improved over that same time period.