Construction and Monitoring of the Fine PFC Section for Odessa

Researchers developed specifications and let a contract to Reece Albert Construction of Midland to construct two fine-graded PFC mixtures on the entrance to the facility using a relatively good quality limestone from Vulcan Materials in Eastland and a rhyolite gravel from Capital Aggregates' Hoban Pit.

TTI designed the mixes using a single aggregate fraction from each source. The aggregate gradations for each mix are shown in Table 1. The minimum gradation specification requirement on the No. 3/8 was lowered from 95% (as originally proposed) to 94% to allow the use of the Hoban material which could not meet the 95% specification. A minimum asphalt content of 6.5% was specified and was also selected as optimum for both mixtures and 0.3% fibers were used. Lime was not included in the mix design since the capability at the plant was not available. The mixtures were designed according to TxDOT procedure Tex 204-F, Part V.

TABLE 1 Mix Design Compositions for Field Testing at Odessa

	PFC Mix Design No. 1	PFC Mix Design No. 2	Draft Specification Lower and Upper Specification Limits	
	Capital Aggregates Hoban	Vulcan Materials Eastland Limestone		
Sieve Size	Cum. % Pass	Cum. % Pass		
No. 1/2	100.0	100.0	100	100
No. 3/8	94.5	97.8	94	100
No. 4	30.2	46.4	20	55
No. 8	4.8	3.4	0	15
No. 16	1.0	1.9	0	12
No. 30	0.4	1.6	0	8
No. 50	0.3	1.5	0	8
No. 200	0.2	1.3	0	4

Asphalt Type: PG 76-22 **Binder Percent:** 6.5% **Lime:** 0% **Fibers:** 0.3%

Selecting Optimum Asphalt Content

As discussed previously, since these mixes had higher air void contents than conventional PFC mixes, additional tests (Hamburg and Overlay) were added to ensure adequate field performance. These tests were also used to aid in selecting the asphalt content. The results are presented in Table 2. Samples were molded at 6.0, 6.5, and 7.0 percent asphalt and evaluated for density, Hamburg, and Overlay test characteristics. The Hoban Rhyolite mixture failed the Hamburg requirement of no more than 12.5 mm rut depth at 10,000 cycles but passed this criteria at 6.5% asphalt. Overlay test data exceeded the minimum of 300 cycles for all 3 asphalt contents. All 3 asphalt contents met the density requirements of between 70 and 74 percent. So based on the Hamburg criteria, the acceptable asphalt content was selected as 6.5%.

The Eastland mix had acceptable Hamburg and Overlay Test results at all 3 asphalt contents but the least rut depth was at 6.5 percent asphalt. The density results for all 3 asphalt contents exceeded the proposed specification values of between 70 and 74. This density value is controlled by the aggregate gradation and since the aggregate is from a single fraction (or stockpile) no change in the gradation could be made given this is what was available from this quarry. A goal of the research was to determine if the proposed specifications were acceptable based on field performance characteristics. So allowing a mix to be constructed which was

outside of the density specifications provided additional information which may be used to validate and/or modify the specifications. An asphalt content of 6.5% was selected for the Eastland limestone mix.

While considered a good quality limestone, the Eastland material still did not meet TxDOT the polish value requirements for a Class A in the Surface Aggregate Classification System. A Class A aggregate must also have a Los Angeles Abrasion loss of less than 30 and a Magnesium Sulfate Soundness loss of less than 20 and both aggregates met these values. The final specification requirement for the fine-graded PFC will likely require 100% class A aggregates. Soundness values for the Eastland and Hoban materials were as follows:

Eastland: LAA = 25%, Soundness = 13%

Hoban: LAA = 20%, Soundness = 10%.

TABLE 2 Mix Design Performance Test Results at Different Asphalt Contents

Mixture Type	Asphalt Content, %	Density, Density %	Hamburg Results, Rut depth@ No of cycles	Overlay Test Results		Performance Testing Outcome
				Max Load, lbs	Number of Cycles to Failure	
PFC-1 Hoban Rhyolite	6.0	73.1	12.5 mm @ 4900	336.3	402	Fail
	6.5	73.5	8.1 mm @ 10000	367.0	450	Pass
	7.0	73.7	12.5 @ 7000	317.0	1000	Fail
PFC-2 Eastland Limestone	6.0	76.3	9.12 @ 10000	478.4	337	Pass
	6.5	77.8	6.29 @ 10000	419.0	300	Pass
	7.0	78.4	8.50 @ 10000	494.5	1000	Pass

The mixtures were placed side-by-side on the entry road to the facility as shown in Figure 3. Standard equipment for asphalt concrete pavement construction was used, including a material transfer vehicle, paver equipped with an infrared monitoring system, and 3 passes with a 13.5-ton tandem steel wheel roller operated in static mode.

FIGURE 3 PFC Mix in Odessa.