RIGID PAVEMENT DESIGN

Geometric Design

Each of the three new test items was 75 ft. (22.9 m) long by 60 ft. (18.3 m) wide and separated by 25 ft. (7.6 m) long rigid transitions. The slab size was 15 by 15 ft. (4.57 by 4.57 m). There were a total of 20 slabs per test item. The selection of the slab size was based on the results of a previous experiment conducted at the NAPTF, documented in [2, 4]. The results demonstrated the reduction of corner cracking due to curling when using a smaller size slab.

Pavement Design

The materials were selected according to FAA construction standards [5]. The test item built on 10 in. (25.4 cm) of conventional subbase (P-154 Uncrushed Aggregate) was called MRC, on grade MRG and on 6 in. (15.2 cm) of stabilized base (P-306 Econocrete), built during the original rigid pavement construction, MRS. All the test items were placed on a medium strength clay subgrade. The upper 4 ft. (1.2 m) of the subgrade were rebuilt to a target CBR of 7 under MRG and MRC. The slab thickness of 12 in. (30.5 cm) was selected as optimum to support heavy loads and fail within a reasonable time. The design layout of the test items is presented in Figure 1.

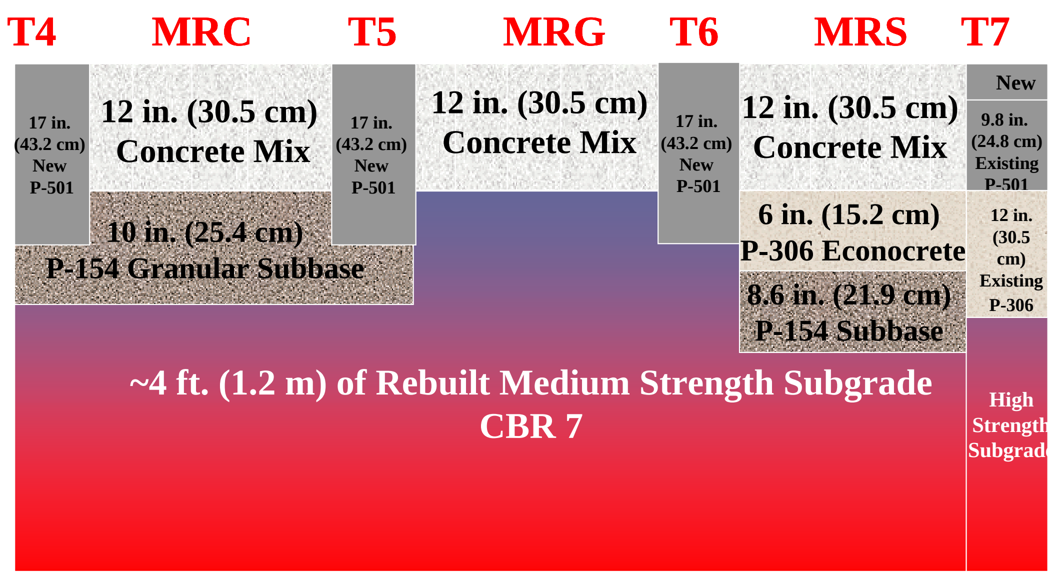

Figure 1. New Rigid Pavement Items Layout.

Material Properties

The target values for the material properties for the new rigid test items were as follows:

- P-501 (PCC Slab) E=4,000,000 psi (*R*=750 psi)
- P-306 *E*=700,000 psi
- P-154 *E*= (Variable)
- Subgrade (Clay CH) *E*= 10,500 psi (CBR=7)

The *k* values obtained from plate load testing for the North Wheel Track (NWT) and South Wheel Track (SWT) are presented in Table 1:

Table 1. Plate Load Test Results

TEST ITEM	LAYER TESTED	K, psi/in (MPa/m)	
		NWT	SWT
MRC	Subgrade Top	132 (35.85)	130 (35.30)
	Top of P-154 Granular Subbase	159 (43.18)	149 (40.46)
MRG	Subgrade Top	149 (40.46)	133 (36.12)
MRS	Top of P-306 Econocrete	532 (144.47)	479 (130.08)

The concrete mix laboratory flexural and compressive strengths at 28 days for the three test items are presented in Table 2. The mix, designed for 750-psi (5.2 MPa) flexural strength, contained 50% flyash class "C" in the cementitious mix. The flyash was used to reduce the concrete strength and control curling of the slabs by allowing thicker slabs for a given pavement life. The properties of mixes with various replacement proportions of the flyash were studied previously at the NAPFT [2].

Table 2. Test Items Concrete Mix Laboratory Strength

Test Items	Flexural Strength At 28 Days, psi (MPa)			Compressive Strength At 28 Days, psi (MPa)		
	Placement 1	Placement 2	Average	Placement 1	Placement 2	Average
MRC	780 (5.38)	709 (4.89)	744 (5.13)	3,620 (24.96)	3,431 (23.66)	3,526 (24.31)
MRG	792 (5.46)	873 (6.02)	833 (5.74)	3,478 (23.98)	3,596 (24.80)	3,537 (24.39)
MRS	747 (5.15)	636 (4.38)	691 (4.77)	3,785 (26.10)	3,290 (22.68)	3,537 (24.39)

Predicted Life

The current FAA design procedures, Layered Elastic Design FAA (LEDFAA 1.3) based on layered elastic theory and the Finite Element Design FAA (FEDFAA 1.3) beta testing procedure were used to predict the number of passes to failure for the three test items under 4- and 6-wheel gear loads. Table 3 shows the calculated life by FEDFAA and LEDFAA for the new rigid test items with Subgrade CBR 7 and 9, and the average flexural strengths shown in Table 2.

Table 3. Life Calculated by FEDFAA and LEDFAA

Number of Passes to Failure by FEDFAA (as configured at the time the predictions were made)

CBR	4-wheels			6-wheels		
	MRS	MRC	MRG	MRS	MRC	MRG
7	7,981	674	703	4,304	422	443
9	68,713	1,254	1,408	36,361	810	920

Number of Passes to Failure by LEDFAA

CBR	4-wheels			6-wheels		
	MRS	MRC	MRG	MRS	MRC	MRG
7	3,309	2,495	3,932	7,373	1,688	2,609
9	17,667	3,809	6,628	17,690	3,809	6,576