Conference of State officials called by

Gov. Frank J. Lausche at Columbus, Ohio,

Dec. 5 and 6, 1949.

Inter-Regional Council on Highway Transportation

organized, T. J. Kauer, Director, Geo Lewis

Ohio Department of Highways, Chairman.

Connecticut, Delaware, Illinois, Kentucky, Maryland, Michigan, New Jersey, Ohio, Pennsylvania, Virginia, Wisconsin, D.C., BPR

Committee appointed to select a test road.

Purpose: To test effect of various legal axle

loads on an existing pavement.

Difficulty of isolating effects of particular loads

on roads in public use.

Location of Road selected: U.S. Route 301, 9 miles south of La Plata, in Charles County, Maryland - Road Test One - MD.

Original belief about subgrade.

Rainfall about 23 inches in 6-month period June 23 to Dec. 23, almost exactly equal to 10-year average.

Drainage: Generally good; exceptions.

Pavement constructed in 1941.

Lanes, 12 feet wide, 9-7-9 inches thick.

Welded wire fabric reinforcement, No. 2 wires, leng. 6 in., transv. 12 in., c. to c., weight 59.4 lb. per 100 sq. feet, 2 to 3 in. from surface.

Expansion joints, 120 feet apart; contraction joints 40 feet.

Load transfer - 3/4 in. round dowels, 15 inches c. to c.

Road 1.1 miles long, divided 0.5 mile for Sections 1 and 2 (18,000 and 22,400); 0.6 mile for Sections 3 and 4, (32,000 and 44,800).

Settled sections omitted. Test sections 1 and 2, 2,000 feet (50 slabs) 3 and 4, 2,840 (71 slabs).

Concrete strength, 750 lbs. per sq. in. modulus of rupture.

Test traffic operated both directions, turnarounds at each end of the test sections.

Speed of vehicles 10 to 38 miles per hour.

Transverse distribution - as planned.

Answer to criticism.

1. Transverse distribution - similar to normal 12 ft. only 2% off pavement.

2. Acceleration - normal traffic, none over 18,000 pounds on single axle, none over 28,000 pounds on tandems.

3. Drainage, generally good, exceptions, effect of; 20 to 1 instead of 12 to 1.

4. Cross section trapped water - no evidence in soil tests.

5. Maintenance - policy and reason, actual $2,750 (at rate of more than $5,000 per year).

6. Difference in length of sections - reduction to 40 ft. slab basis.

7. Soil - comparison on basis of like soils, A-1; A-6.

8. Tandems equal to two singles - disproved by strain and deflection tests - refer to picture, single ejection. Slide

Pretest cracks.

	Sections			
	1	2	3	4
Number	11	14	4	14
Length, feet	31.6	71.5	30.0	62.0
No. of slabs involved	7	9	2	9
Percent of slabs	14.0	18.0	2.8	12.7

Soil Classification - over 6,000 tests on 1,300 soil samples.

Section	Group											
	A-1		A-2		A-4		A-6		A-7-6	
	No.	%	No.	%	No.	%	No.	%	No.	%
1	14	27	1	2	2	4	29	56	6	11
2	13	25	3	6	2	4	28	54	6	11
3					10	14	49	68	13	18
4					10	14	47	65	13	21

Load Applications

	To December 23			To Oct.9	To Oct.13
	1	2	3	3	4
Applications	238,281	238,263	164,523	92,363	92,166

Cracks - total, feet

To December 23			To Oct.9	To Oct.13
1	2	3	3	4
196(1)	1269(6)	1,050	302(1)	3704(12)

Cracks - Average per 40 foot slab - on A-6 soil, and number of applications.

Section	October 13 Feet	December 23 Feet
1	0(152,876) (1st.Oct.15)	4(238,281)
2	13(146,332)	28(238,263)
3	4(92,363)	15(164,523)
4	50(92,166)	

Truck applications for first pumping and first cracking. (average)

Section	First pumping (1,000)	First Cracking (1,000)	Difference (1,000)
1	126	210	84
2	85	144	59
3	44	106	62
4	31	50	19

Companion cracks in sections 1 and 2

July 18 Slabs 92-94 (sec.2) 2 transverse cracks.

Sept 18 Slabs 91-93 (sec.1) 2 transverse cracks.

Subgrade A-7-6, both sides.

Average settlement of joints - October 2

Section	Average settlement Inches
1	3/16
2	3/8
3	1/4
4	7/8

Difference in Behavior of Slabs Laid on A-1, A-2, and A-6, A-7-6 Soils.

A-1, A-2. Almost no pumping, no cracking, very slight settlement, low stresses even under heavy loads. None under sections 3 and 4.

A-6, A-7-6. Pumping, cracking, settlement, high stress, all increasing with axle load.

Cases of Loading for Strain and Deflection Measurements.

1. Corner - longitudinal
2. Edge - longitudinal
3. Interior - longitudinal ~~and transverse~~
4. Transverse joint - transverse
5. Special (cause of longitudinal cracking) - transverse

(All cracking caused by 1 and 5)

(Critical deflections caused by 1 and 2)

Typical Character of Cracking

Transverse - Slightly diagonal from edge 8 to 10 feet from corner to corner 4 to 5 feet from transverse joint.

Longitudinal - Significantly only in section 4.

Explanation of Effects of Loads

Associated with pumping, explain action

Deflection is stroke of pump.

Compare light and heavy loads of like type.

Compare single and tandem axle loads.

32,000 vs. 18,000 pound loads.

Lessons:

Pavement similar to test pavement adequate for very heavy loads (up to 30,000 lb. single, 60,000 lb. tandem) if laid on granular soil.

Test does not answer questions regarding granular bases.

18,000 pound axle will cause pumping, even 14,000 pound, but at low rate - crack development slow.

32,000 pound tandem causes same stress under all conditions of support as 18,000 pound single, but pumps more and faster and builds stress to breaking point faster.

22,400 pound single causes earlier and greater pumping than 18,000 pound, and more stress under all conditions of support.

44,800 pound tandem causes rapid pumping and high stress on pumping soil.

Read by C. F. Rogers.

HIGHWAY NEEDS AND PROBLEMS

By Herbert S. Fairbank, Deputy Commissioner
Bureau of Public Roads

Effect of Speed

Stress 20% less at 40 m.p.h. than at creep speed.

Effect of Lateral Placement

Stress with wheels 30 inches from edge only 50 percent of stress with wheels 6 inches from edge.

Higher stress with wheels at edge.

Effect of Faulting (Simulated 3/4-inch fault)

Stress and deflection in depressed slab both reduced.

Read by C. F. Rogers.

HIGHWAY NEEDS AND PROBLEMS

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Pumping soils widely prevalent in humid area of U.S. (slide)

Policy indication - Hold line at 18,000 pounds.

Existing pavements similar to test pavement have good life expectancy under this load as maximum.

If heavier axle loading adopted - need bases under concrete roads. Where bases are absent, rapid failure.

Hold line at 32,000 pound tandem. It is a little more severe than 18,000 pound single.

Before Movie

Origin,
Auspices
HRB Direction
Location
Purpose and reason a test road was required

After Movie

Repeat purpose -
Emphasize Relativity
Explain time since traffic test
6000 tests on 1400 soil samples and analysis
12,000 strain and deflection measurements
2500 values for influence lines

All previous official statements limited to bare facts of traffic test results on entire road.

These results affected by variety of soil conditions and not specifically attributable to particular conditions.

Reported results meager and conservatively stated.

On basis of these incomplete preliminary reports - a rash of news items, articles speeches - many of them undiscriminating, sensational, biased.

Reports of consulting engineers on general observations and limited published data - without access to any of the specific soil, strain and deflection data.

Then those reports misrepresented (Hoosels) Test a failure.

Criticisms -

Soil - Muck

Drainage - Water. Why need ponderous road test

Cross-Section - Trapped water.

Thickness -

Transverse distribution

Acceleration - N.J. 2500
Mass. 1000
N.C. Fou
Road Test 1300
800-Fou

Difference in length of lanes
Most comparisons across – same length –

Comparisons between two ends on basis of 40' slab.

Differences in number of applications – valid

Pretest cracking
(See p. 6)

Maintenance – $2750 at rate of $5000 per year

Explain subsealing

Tandems equal to 2 singles — Slide

Results most simply stated

Relative cracking – Due to pumping
Page 8

(5)

Ladder the overall result—
all soils.

Soil Classification
Page 7
Explain.

Cracks per 40 ft. slab—
Page 9 4-6. Soil Slide

$\frac{3}{1} = 4$ $\frac{4}{1} = 3$ to 5

$\frac{3}{2} = \frac{1}{2}$ $\frac{4}{2} = 4$

$\frac{4}{3} = 12.5$ $\frac{2}{1} = 7$

Relation between 1st pumping
+ first cracking
Pages 9 & 10

Settlement - after result of cracking - Compare Iowa Page 10

All cracking due to pumping.

Explain process

Show Slides - typical transverse & longitudinal cracks, and explain cause from Strain - deflection measurements

Deflection - Stroke of pump

Lessons, etc.

See pages 13 et seq.