THE NEWS LETTER
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BUREAU OF PUBLIC ROADS

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CONTENTS

(NOT FOR RELEASE)

THE EFFECT OF CALCIUM CHLORIDE ON FEDERAL-AID PAVEMENTS *

THE INFORMATION AVAILABLE, BOTH EXPERIMENTAL AS WELL AS THAT OBTAINED FROM THE USE OF CALCIUM CHLORIDE AS A CURING AGENT ON NUMEROUS FEDERAL-AID PROJECTS, DURING THE PAST SEVERAL YEARS, SEEMS TO WARRANT THE FOLLOWING GENERAL CONCLUSIONS.

SURFACE CURING

THE PREPONDERANCE OF THE EVIDENCE SEEMS TO SHOW THAT THE USE OF CALCIUM CHLORIDE AS A SURFACE CURING AGENT MAY BE ASSOCIATED WITH SURFACE SCALING. THIS APPEARS TO BE DUE, IN GENERAL, TO THE DIFFICULTY OF SECURING A UNIFORM DISTRIBUTION OF THE MATERIAL ON THE SURFACE OF THE PAVEMENT WITH A CONSEQUENT TENDENCY TOWARD A CONCENTRATION OF THE SALT IN CERTAIN AREAS, RESULTING IN A SOFTENING AND SCALING OF THE SURFACE. FOR THIS REASON THE BUREAU HAS BEEN RELUCTANT TO APPROVE THE USE OF CALCIUM CHLORIDE AS A SURFACE CURING AGENT.

INTEGRAL CURING

ALTHOUGH REPORTS FROM THE FIELD DO NOT APPEAR TO ASSOCIATE SURFACE SCALING WITH THE USE OF CALCIUM CHLORIDE AS AN INTEGRAL CURING AGENT, TO THE SAME EXTENT AS WHEN THE MATERIAL IS USED ON THE SURFACE; TESTS MADE BY THE BUREAU ON THE MARYLAND AND VIRGINIA EXPERIMENTAL ROADS INDICATE THAT THE STRENGTH OF CONCRETE, MADE WITH CALCIUM CHLORIDE AS AN ADMIXTURE, MAY BE SLIGHTLY LESS THAN THE STRENGTH OF SIMILAR CONCRETE WITHOUT THE ADMIXTURE. WHETHER THE REDUCTION IN STRENGTH, WHICH HAS BEEN NOTED IN THESE AS WELL AS OTHER TESTS, IS SUFFICIENT TO BE HARMFUL IS STILL A MOOT QUESTION; AND OPINION, GENERALLY, IS SO DIVIDED THAT IT IS BELIEVED ADVISABLE TO WITHHOLD FINAL JUDGMENT, PENDING THE FINDINGS FROM MORE EXTENSIVE STUDIES.

States Now Using Calcium Chloride as a Curing Agent

An inspection of available State highway specifications shows that, at the present time, calcium chloride is permitted without restriction by twelve States as follows:

Surface Curing	Integral Curing
Arkansas	Connecticut
Illinois	Kentucky
Kentucky	North Carolina
Minnesota	New Hampshire
Missouri	South Carolina
Tennessee	Vermont
Wisconsin	

In addition to the above, the following ten additional States permit the use of calcium chloride either as a surface curing agent or as an admixture, under certain restrictions, such as specific approval by the engineers, etc.

Surface Curing	Integral Curing
Colorado	Alabama
Kansas	Delaware
Mississippi	Iowa
Nebraska	Maine
Ohio	
West Virginia	

Reports from District Offices

In response to a request from the headquarters office, the District Engineers of the Bureau have recently submitted reports on the condition of a number of Federal-aid pavements cured with calcium chloride. This information shows that the material has been used on 76 projects - on 36 as a surface curing agent and on 40 as an admixture.

A tabulation of the replies for twenty-one States gives the following results:

Opinion	Surface Treatment Number of Projects	Admixture Number of Projects
Favorable	15	21
Unfavorable	13	4
Non-committal	8	15
	36	40

THE STATES COVERED BY THESE REPORTS - WHICH WERE ALL EAST OF THE ROCKY MOUNTAINS, WITH ONE EXCEPTION - WERE: ALABAMA, COLORADO, GEORGIA, ILLINOIS, IOWA, KANSAS, MARYLAND, MICHIGAN, MINNESOTA, MISSISSIPPI, MISSOURI, NEW HAMPSHIRE, NEW YORK, NORTH CAROLINA, OHIO, OKLAHOMA, PENNSYLVANIA, RHODE ISLAND, TENNESSEE, TEXAS, AND VERMONT.

THE REPORT ON EACH PROJECT WAS CLASSIFIED AS FAVORABLE OR UNFAVORABLE ON THE BASIS OF THE CONCLUSIONS REACHED BY THE ENGINEER MAKING THE REPORT - PROVIDED SUCH CONCLUSIONS SEEMED TO BE JUSTIFIED BY THE EVIDENCE PRESENTED. IN MANY CASES, DUE TO THE PRESENCE OF FACTORS WHICH TENDED TO OBSCURE THE REAL ISSUE IT WAS FOUND IMPOSSIBLE TO CLASSIFY REPORTS EITHER AS FAVORABLE OR UNFAVORABLE. IN SUCH CASES THE REPORTS WERE CLASSIFIED AS NON-COMMITTAL.

REFERENCE TO THE ABOVE TABLE INDICATES AT ONCE THAT OPINIONS AS TO THE RESULTS SECURED BY THE USE OF CALCIUM CHLORIDE AS A SURFACE CURING AGENT ARE ABOUT EQUALLY DIVIDED. A FURTHER STUDY OF THE REPORTS, HOWEVER, SHOWS THAT ON MANY OF THE PROJECTS REPORTING UNFAVORABLE RESULTS, AS MUCH AS 3 POUNDS PER SQUARE YARD WAS USED. THIS IS PARTICULARLY TRUE OF THE OLDER PROJECTS CONSTRUCTED WHEN THIS MATERIAL WAS FIRST COMING INTO USE. PRACTICALLY THE ONLY DELETERIOUS EFFECT ATTRIBUTED TO THE CURING AGENT IS SURFACE SCALING, AND THIS APPEARS TO BE MORE MARKED EITHER ON PROJECTS ON WHICH 3 POUNDS PER SQUARE YARD WAS SPECIFIED, OR ON PROJECTS WHERE THERE WAS EVIDENCE THAT THE SALT HAD BEEN UNEVENLY APPLIED. SUBSTANTIALLY THE SAME CONCLUSIONS WERE REACHED BY MR. CLIFFORD SHOEMAKER OF THE DIVISION OF CONSTRUCTION IN A REPORT, OF A FIELD INVESTIGATION OF SURFACE-CURED PAVEMENTS IN OHIO AND ILLINOIS, MADE DURING 1925. MR. SHOEMAKER'S REPORT CONCLUDES AS FOLLOWS:

1. AN EXCESSIVE AMOUNT OF CALCIUM CHLORIDE - MORE THAN 2-1/2 POUNDS PER SQUARE YARD - WILL CAUSE SCALING.

2. AN UNEVEN APPLICATION OF CALCIUM CHLORIDE - EVEN THOUGH THE AVERAGE AMOUNT BE LESS THAN 2-1/2 POUNDS PER SQUARE YARD - WILL CAUSE SCALING.

3. A CONCENTRATION OF THE CALCIUM-CHLORIDE LIQUID IN THE LOW SPOTS OF THE PAVEMENT, CAUSED BY THE UNEVEN SURFACE, WILL CAUSE SCALING IN THOSE AREAS.

THE SCALING OBSERVED BY MR. SHOEMAKER DURING HIS FIELD STUDIES RANGED IN DEPTH FROM .01-INCH TO .25-INCH IN EXTREME CASES. THE ORDINARY THICKNESS, HOWEVER, WAS ONE-EIGHTH OF AN INCH. THE REPORT ALSO CALLED ATTENTION TO THE FACT THAT SCALING WAS ALMOST UNKNOWN IN OHIO PRIOR TO THE INTRODUCTION OF CALCIUM CHLORIDE, AND THEN CONTINUED WITH A DESCRIPTION OF NUMEROUS OTHER POSSIBLE CAUSES FOR SCALING. FIGURE 1 SHOWS TYPICAL SCALED SURFACES OF CONCRETE PAVEMENTS CURED BY THE SURFACE TREATMENT WITH CALCIUM CHLORIDE, IN ILLINOIS AND COLORADO.

THE REPORTS FROM THE DISTRICT OFFICES INDICATE, IN GENERAL, THAT THE USE OF CALCIUM CHLORIDE AS AN ADMIXTURE, IN THE PROPORTION OF NOT TO EXCEED 2 PER CENT OF THE WEIGHT OF THE CEMENT, HAS PROVEN SATISFACTORY - AT LEAST INSOFAR AS MAY BE DETERMINED FROM VISUAL INSPECTION. THE SAME TENDENCY TO SCALE DOES NOT SEEM TO EXIST AS ON THE PAVEMENTS CURED BY A SURFACE APPLICATION OF THE MATERIAL. HOWEVER, IN CERTAIN CASES, A MARKED ACCELERATION OF THE SET WAS OBSERVED, MAKING IT NECESSARY TO CARRY ON THE FINISHING OPERATION IMMEDIATELY FOLLOWING THE DEPOSITING OF THE CONCRETE. ON ONE PROJECT, A TENDENCY OF THE CEMENT TO SET IN THE DRUM OF THE MIXER WAS REPORTED. EXPERIENCE, IN THOSE STATES WHERE THIS METHOD OF CURING HAS BEEN IN USE FOR SOME TIME, INDICATES THAT MOST OF THE MECHANICAL DIFFICULTIES MAY BE AVOIDED BY THE USE OF THE PROPER EQUIPMENT, AND AN ORGANIZATION EXPERIENCED IN THE USE OF THE MATERIAL.

STRENGTH DATA BEARING ON THE USE OF CALCIUM CHLORIDE AS AN ADMIXTURE ARE SOMEWHAT MEAGER. MANY TESTS, INCLUDING THOSE MADE BY THE BUREAU ON THE MARYLAND AND VIRGINIA EXPERIMENTAL ROADS INDICATE A SLIGHT DECREASE IN STRENGTH FOR THE CONCRETE IN WHICH CALCIUM CHLORIDE IS USED AS AN ADMIXTURE, AS COMPARED TO THE UNTREATED CONCRETE. THIS APPLIES TO STRENGTH TESTS MADE AT THE AGE OF 7 DAYS OR LATER AND NOT TO TESTS MADE AT ANY EARLY PERIODS. IN CONNECTION WITH THE MARYLAND EXPERIMENTS, TESTS MADE ON CONCRETE CYLINDERS AT PERIODS UP TO 4 DAYS OLD, INDICATE AN APPRECIABLY HIGHER STRENGTH FOR THE CONCRETE CONTAINING THE ADMIXTURE. AS NOTED ABOVE, THIS DIFFERENTIAL DISAPPEARS AT LATER PERIODS, THE NORMAL CONCRETE OVERTAKING AND SOMETIMES EVEN PASSING THE CALCIUM CHLORIDE CONCRETE.

WITH REFERENCE TO THE USE OF CALCIUM CHLORIDE AS AN ACCELERATOR, IT WOULD APPEAR UNWISE TO DEPEND UPON THIS EARLY HARDENING EFFECT TO THE EXTENT OF OPENING THE ROAD TO TRAFFIC SOONER

FIGURE 1—(TOP)— TYPICAL SCALING ON A CONCRETE PAVEMENT IN ILLINOIS, SURFACE TREATED WITH CALCIUM CHLORIDE.

(BOTTOM)— SCALING ON SECTIONS OF COLORADO FEDERAL-AID PROJECT 67E-A, SURFACE-TREATED WITH CALCIUM CHLORIDE.

THAN WOULD NORMALLY BE THE CASE UNLESS STRENGTH TESTS WERE MADE ON THE JOB FOR THE PURPOSE OF ASCERTAINING WHEN THE DESIGN STRENGTH HAD BEEN REACHED.

IN CONCLUSION, IT MAY BE SAID THAT INSOFAR AS SERVICE BEHAVIOR TO DATE IS CONCERNED, THE USE OF CALCIUM CHLORIDE AS AN ADMIXTURE, APPEARS TO BE SATISFACTORY. IN VIEW, HOWEVER, OF THE APPARENT TENDENCY OF CONCRETE IN WHICH THE MATERIAL IS USED TO SHOW SLIGHTLY LOWER STRENGTH THAN NORMAL CONCRETE, IT WOULD NOT SEEM WISE TO GIVE UNQUALIFIED APPROVAL TO THIS METHOD OF CURING, UNTIL FURTHER DATA ALONG THIS LINE HAVE BEEN OBTAINED.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

F-1 (1926)
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TOTAL INCOME AND FUNDS AVAILABLE 1926

FOR STATE ROAD AND BRIDGE WORK UNDER SUPERVISION OF THE STATE HIGHWAY DEPARTMENTS DURING FISCAL YEAR.

STATES	FISCAL YEAR ENDS	TOTAL FUNDS AVAILABLE (100%)	BALANCE AT BEGINNING OF YEAR	% OF TOTAL FUNDS	TOTAL INCOME DURING YEAR	% OF TOTAL FUNDS	STATE HWY. BONDS, NOTES, ETC. SOLD	% OF TOTAL FUNDS	STATE TAX LEVIED FOR HIGHWAYS, ETC	% OF TOTAL FUNDS	APPROPRIATION BY STATE FOR HIGHWAYS	% OF TOTAL FUNDS	MISCELLANEOUS STATE INCOME FOR HIGHWAYS	% OF TOTAL FUNDS	MOTOR VEHICLE FEES, ETC. FOR ROAD PURPOSES	% OF TOTAL FUNDS	GASOLINE TAX APPLICABLE TO HIGHWAYS	% OF TOTAL FUNDS	TRANSFERRED FUNDS FROM COUNTIES, ETC	% OF TOTAL FUNDS	FEDERAL AID POST ROAD FUNDS USED	% OF TOTAL FUNDS
ALABAMA	9/30	$ 12,186,642	$ 2,519,745	20.6	$ 9,666,897	79.4	$ 5,627,954	46.2	-	-	-	-	$ 70,126	0.6	$ 2,247,268	18.5	-	-	$ 102,279	0.9	$ 1,619,280	13.2
ARIZONA (1)	6/30	2,398,554	244,286	10.1	2,154,268	79.9	-	-	$ 624,277	26.2	9,250	0.4	18,085	0.8	452,662	18.8	$ 449,993	18.7	41,750	1.7	558,251	23.3
ARKANSAS (1)	6/30	10,406,312	847,501	8.2	9,558,811	91.8	-	-	-	-	-	-	-	-	3,526,577	33.9	4,017,176	38.6	307,000	2.9	1,708,059	16.4
CALIFORNIA	12/31	25,324,939	5,235,048	20.6	20,089,891	79.4	-	-	-	-	4,889,518	19.3	-	-	3,594,423	14.2	8,027,580	31.7	302,538	1.2	3,275,832	13.0
COLORADO	11/30	7,599,043	1,452,481	19.7	6,146,562	-	2,101,991	28.7	1,017,095	-	-	-	93,000	1.3	691,322	9.5	1,043,197	14.2	63,914	0.8	1,136,043	15.4
CONNECTICUT	6/30	18,789,326	5,561,326	30.1	13,128,000	69.9	-	-	-	-	3,166,500	16.9	1,266,588	6.1	6,110,729	32.5	2,404,689	12.8	-	-	179,494	1.0
DELAWARE	12/31	4,075,552	430,916	10.5	3,644,636	89.5	1,107,835	27.2	-	-	-	-	57,307	1.4	775,965	19.0	396,656	9.8	1,065,610	26.1	241,263	6.0
FLORIDA	12/31	18,334,063	2,427,151	13.2	15,906,912	86.8	-	-	524,426	2.9	-	-	210,842	1.2	4,913,663	26.8	8,636,359	47.2	614,138	3.3	1,007,484	5.4
GEORGIA	12/31	10,592,171	1,228,656	11.6	9,363,515	88.4	-	-	-	-	-	-	330,594	3.1	3,280,548	31.0	2,328,574	22.0	852,094	8.0	2,571,705	24.3
IDAHO	12/31	4,231,525	219,930	5.1	4,011,595	94.9	-	-	321,227	7.6	-	-	18,737	0.5	142,137	3.4	1,182,584	28.0	947,302	22.3	1,399,608	33.1
ILLINOIS	12/31	26,978,131	4,836,199	18.7	21,141,932	81.3	4,953,100	19.1	-	-	-	-	214,330	0.8	13,937,580	63.6	-	-	-	-	2,036,922	7.8
INDIANA	9/30	15,349,735	1,361,613	8.9	13,988,122	91.1	-	-	-	-	-	-	286,868	1.9	5,304,537	34.6	5,753,374	37.5	143,614	0.9	2,499,729	16.3
IOWA	11/30	21,293,182	3,790,912	17.8	17,502,270	82.2	(2)4,128,987	19.4	-	-	-	-	238,574	1.1	9,348,934	43.9	1,575,222	7.4	88,955	0.4	2,121,598	10.0
KANSAS	12/31	14,698,069	3,720,969	25.4	10,977,100	74.6	-	-	-	-	135,000	0.9	-	-	3,317,428	22.6	4,276,000	29.1	1,500,000	10.1	1,748,672	11.9
KENTUCKY	6/30	7,498,367	(-4,804,126)	-	12,302,493	10.0	-	-	874,192	7.1	-	-	263,551	2.1	3,909,966	31.9	3,475,861	28.2	2,149,661	17.4	1,629,282	13.3
LOUISIANA	12/31	10,715,310	1,350,316	12.6	9,364,994	87.4	-	-	-	-	-	-	24,622	0.2	3,845,533	35.9	2,656,985	24.8	1,962,022	18.3	875,832	8.2
MAINE	12/31	11,841,722	1,379,318	11.7	10,462,404	88.3	2,676,064	22.6	700,439	5.9	300,000	2.5	381,833	3.2	2,468,437	20.8	1,799,696	15.2	1,373,933	11.6	762,003	6.5
MARYLAND	9/30	12,524,294	1,723,471	13.7	10,800,823	86.3	1,863,533	14.9	2,921,836	23.3	-	-	329,501	2.6	2,205,913	17.6	1,687,282	13.5	1,072,205	8.6	720,453	5.8
MASSACHUSETTS	11/30	17,511,597	1,748,896	10.0	15,762,701	90.0	-	-	-	-	-	-	-	-	11,261,109	64.3	-	-	3,689,637	21.1	811,965	4.6
MICHIGAN	6/30	29,773,273	2,525,718	8.5	27,247,555	91.5	30,000	0.1	-	-	-	-	325,499	1.1	11,236,425	37.7	9,313,693	31.3	3,541,941	11.9	2,799,997	9.4
MINNESOTA	12/31	24,807,761	4,530,161	18.2	20,277,600	81.8	-	-	1,852,848	7.9	-	-	653,856	2.6	9,872,202	39.8	4,956,498	20.0	-	-	2,842,196	11.5
MISSISSIPPI	12/31	6,459,305	1,085,372	16.8	5,373,933	83.2	-	-	-	-	-	-	56,027	0.9	156,754	2.4	1,822,569	28.2	1,925,569	29.8	1,413,024	21.9
MISSOURI	12/31	37,902,725	4,272,464	11.3	33,630,261	88.7	15,127,342	39.9	-	-	-	-	702,527	1.8	7,869,267	20.8	6,006,934	15.8	-	-	3,924,191	10.4
MONTANA (1)	6/30	1,261,406	138,704	10.9	1,122,702	89.1	-	-	-	-	-	-	56,903	5.4	-	-	110,741	8.8	285,153	22.6	659,905	52.3
NEBRASKA (1)	12/31	10,039,439	3,400,346	33.8	6,639,093	66.2	-	-	-	-	100,000	1.0	-	-	1,034,181	10.3	3,015,962	30.0	134,072	1.4	2,354,878	23.5
NEVADA	11/30	2,069,553	66,798	3.3	2,002,755	96.7	-	-	40,541	1.9	131,750	6.4	114,555	6.5	71,358	3.4	230,390	11.3	483,414	23.3	930,747	44.9
NEW HAMPSHIRE	12/31	4,147,032	1,366,250	32.9	2,780,782	67.1	-	-	-	-	-	-	147,258	3.6	1,516,264	36.6	760,217	18.3	50,936	1.2	306,107	7.4
NEW JERSEY	12/31	32,355,334	8,432,518	26.1	23,922,816	-	5,085,615	-	6,066,369	18.9	-	-	8,586	-	10,775,915	33.4	-	-	735,116	2.3	1,251,215	3.9
NEW MEXICO (1)	6/30	3,255,228	529,828	16.3	2,725,400	83.7	90,000	2.8	579,172	17.8	-	-	47,176	1.4	274,729	8.5	590,222	18.1	124,059	3.8	1,020,042	31.3
NEW YORK	12/31	91,742,201	26,867,593	29.2	64,874,608	70.8	22,200,000	24.1	-	-	15,171,940	16.5	1,671,481	1.9	16,500,000	18.0	-	-	5,718,642	6.3	3,812,445	4.0
NORTH CAROLINA	6/30	50,187,926	2,480,808	4.9	47,687,118	95.1	15,174,980	30.2	-	-	2,684	-	3,464,977	6.9	7,423,665	14.8	6,923,324	13.8	11,598,672	23.2	3,098,816	6.2
NORTH DAKOTA	6/30	2,776,988	167,572	6.1	2,609,416	93.9	-	-	-	-	350,000	12.6	75,981	2.7	799,708	28.8	445,119	16.1	9,572	0.3	929,036	33.4
OHIO	12/31	30,483,268	5,268,583	17.3	25,214,685	82.7	-	-	-	-	2,024,435	6.6	-	-	5,398,511	17.7	5,651,285	18.5	9,590,900	31.8	2,449,554	8.1
OKLAHOMA	12/31	12,937,707	2,195,412	16.9	10,742,295	83.1	-	-	-	-	-	-	71,659	0.5	2,072,964	16.0	4,138,000	32.0	2,539,716	19.7	1,919,956	14.9
OREGON (1)	11/30	10,888,900	1,452,458	13.3	9,436,442	86.7	-	-	-	-	-	-	182,903	1.7	4,260,000	39.1	3,013,149	27.7	715,701	6.6	1,264,689	11.6
PENNSYLVANIA	12/31	75,894,337	18,718,273	24.7	57,176,064	75.3	14,178,900	18.7	-	-	-	-	90,390	0.1	24,761,010	32.6	8,473,420	11.1	7,345,473	9.7	2,326,871	3.1
RHODE ISLAND	11/30	4,522,928	1,002,178	22.1	3,520,750	77.9	-	-	351,395	7.8	17,510	0.4	-	-	1,858,242	41.1	700,105	15.5	72,145	1.6	521,353	11.5
SOUTH CAROLINA	12/31	9,893,205	160,236	1.6	9,732,969	98.4	-	-	-	-	-	-	242,462	2.5	1,907,197	19.3	2,682,151	27.1	3,342,491	33.8	1,558,668	15.7
SOUTH DAKOTA	12/31	6,580,341	1,008,123	15.3	5,572,218	84.7	-	-	190,391	2.9	575,000	8.7	65,690	1.0	1,268,276	19.3	1,924,758	29.3	83,874	1.3	1,464,229	22.2
TENNESSEE (1)	6/30	14,970,216	1,774,494	11.8	13,195,722	88.2	500,000	3.3	23,494	0.1	-	-	167,381	1.1	3,362,727	22.5	3,915,107	26.3	2,849,466	19.0	2,377,547	15.9
TEXAS	12/31	20,012,951	91,076	0.5	19,921,875	99.5	-	-	-	-	-	-	61,860	0.3	10,486,876	52.4	3,920,164	19.6	651,638	3.2	4,801,337	24.0
UTAH	12/31	2,672,002	86,474	3.2	2,585,528	96.8	-	-	-	-	-	-	25,443	0.9	46,000	1.8	1,143,000	42.8	463,176	17.3	907,909	34.0
VERMONT (1)	2/1	4,052,855	542,417	13.4	3,510,438	86.6	-	-	143,798	3.6	2,100,000	51.8	370,152	9.1	-	-	190,757	4.7	-	-	705,731	17.4
VIRGINIA	6/30	13,234,355	512,922	3.9	12,721,433	96.1	-	-	1,830,794	13.8	-	-	339,092	2.6	4,241,882	32.1	2,865,528	21.7	929,766	6.9	2,514,371	19.0
WASHINGTON	12/31	8,825,455	-	-	8,825,455	100.0	-	-	-	-	-	-	-	-	4,011,530	45.5	3,452,963	39.1	3,551	-	1,357,411	15.4
WEST VIRGINIA	12/31	24,096,970	7,418,657	30.8	16,678,313	69.2	9,000,000	37.3	-	-	-	-	215,290	0.9	4,121,300	17.1	2,878,702	11.9	-	-	463,021	2.0
WISCONSIN	6/30	16,491,880	1,864,215	11.4	14,627,665	88.6	-	-	-	-	12,500	-	226,701	1.3	7,399,662	44.9	4,895,721	29.7	392,205	2.4	1,700,876	10.3
WYOMING	12/31	3,023,533	144,820	4.8	2,878,713	95.2	-	-	116,700	3.9	(3) 881,961	29.2	25,024	0.8	490,265	16.3	571,449	18.9	9,680	-	783,634	26.1
TOTALS		806,687,608	138,283,304 -4,804,126 133,479,178	16.6	673,208,430	83.4	103,846,301	12.8	18,278,994	2.3	29,868,048	3.7	13,223,531	1.6	224,551,631	27.8	134,303,154	16.7	69,973,570	8.7	79,163,201	9.8

REMARKS: ABOVE FUNDS GENERALLY APPLICABLE TO STATE HIGHWAY FINANCING.

NOTES: (1) IN EIGHT STATES THE FISCAL YEAR ENDING HAS BEEN CHANGED FROM THAT OF 1925
(2) COUNTY BONDS, ASSUMED AS STATE OBLIGATIONS
(3) INVESTED BY TREASURER FOR BOND SINKING FUND.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

F-2 (1926)
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TOTAL DISBURSEMENTS, 1926.

FOR STATE ROAD AND BRIDGE WORK UNDER SUPERVISION OF THE STATE HIGHWAY DEPARTMENTS
INCLUDING STATE BOND PAYMENTS, DURING FISCAL YEARS OF - 1926.

STATES	FISCAL YEAR ENDS	TOTAL DISBURSEMENTS DURING YEAR (100%)	CONSTRUCTION ON ROADS & BRIDGES	% OF TOTAL DISB-MTS	MAINTENANCE ON ROADS & BRIDGES	% OF TOTAL DISB-MTS	MISCELLANEOUS EXPENSES (2)	% OF TOTAL DISB-MTS	BONDS, NOTES, ETC- PAID ON PRINCIPAL	% OF TOTAL DISB-MTS	BONDS, NOTES, ETC. PAID ON INTEREST	% OF TOTAL DISB-MTS	EQUIPMENT, MACHINERY & MATERIALS	% OF TOTAL DISB-MTS	A-COUNTY FUNDS B-RIGHT-OF-WAY C-TRAFFIC, ETC	% OF TOTAL DISB-MTS	UNEXPENDED BALANCE AT THE END OF YEAR	STATES
ALABAMA	9/30	$ 10,290,349	$ 6,853,846	66.6	$ 417,662	4.1	$ 813,655	7.9	$ 868,224	8.4	$ 798,610	7.8	$ 538,353	5.2	-	-	$ 1,896,293	ALABAMA
ARIZONA (1)	6/30	2,565,202	1,342,114	52.3	923,170	36.0	164,932	6.4	-	-	-	-	127,486	6.0	A $ 7,500	0.3	D (-166,648)	ARIZONA
ARKANSAS (1)	6/30	9,562,657	3,785,200	39.6	1,093,484	11.4	303,132	3.2	-	-	-	-	1,380,841	14.4	A 3,000,000	31.4	843,655	ARKANSAS
CALIFORNIA	12/31	21,095,329	9,896,370	46.9	4,285,436	20.3	1,419,265	6.7	1,775,000	8.5	3,114,517	14.7	335,728	1.6	B 269,013	1.3	4,229,610	CALIFORNIA
COLORADO	11/30	5,850,373	3,513,568	64.3	786,664	14.4	478,861	8.8	630,214	-	411,107	-	24,913	0.4	C 6,046	0.1	1,748,670	COLORADO
CONNECTICUT	6/30	10 503,716	3,338,742	31.8	6,720,620	53.9	444,454	4.2	-	-	-	-	-	-	-	-	8,286,610	CONNECTICUT
DELAWARE	12/31	3,469,191	2,420,833	69.8	133,010	3.8	106,526	3.1	244,500	7.0	400,420	11.5	30,418	0.9	BC 134,484	3.9	606,361	DELAWARE
FLORIDA	12/31	13,657,014	10,735,901	78.6	1,863,441	13.6	843,960	6.2	-	-	-	-	213,712	1.6	-	-	4,677,049	FLORIDA
GEORGIA	12/31	9,564,849	6,694,894	70.0	1,520,801	15.9	965,639	10.0	-	-	-	-	335,319	3.5	AC 58,196	0.6	1,027,322	GEORGIA
IDAHO	12/31	4,190,725	2,694,286	61.9	534,671	12.7	364,070	8.7	29,500	0.7	163,399	3.9	422,131	10.1	AB 82,768	2.0	40,800	IDAHO
ILLINOIS	12/31	24,267,209	14,007,463	57.7	1,531,442	6.3	2,388,147	9.8	2,000,000	8.2	3,510,843	14.4	330,113	1.3	A 499,201	2.0	1,710,922	ILLINOIS
INDIANA	9/30	12,428,784	8,493,981	68.3	2,301,005	18.5	608,077	4.9	-	-	-	-	894,443	7.2	B 131,278	1.1	2,920,951	INDIANA
IOWA	11/30	15,272,455	8,096,767	53.1	3,673,063	24.0	765,639	6.0	(3) 1,986,490	13.0	(3) 170,228	1.1	-	-	B 680,278	3.8	6,020,727	IOWA
KANSAS	12/31	9,171,240	6,720,382	73.3	2,000,000	21.8	450,858	4.9	-	-	-	-	-	-	-	-	5,626,829	KANSAS
KENTUCKY	6/30	9,820,057	6,953,259	70.8	1,030,598	10.6	750,708	7.6	-	-	(4) 480,169	4.9	204,703	2.1	A 400,620	4.1	D (-2,321,690)	KENTUCKY
LOUISIANA	12/31	10,562,656	7,340,031	69.5	2,604,820	24.7	443,098	4.2	28,000	0.3	26,425	0.2	-	-	C 120,282	1.1	152,664	LOUISIANA
MAINE	12/31	10,279,269	6,983,501	68.0	1,783,046	17.3	411,755	4.0	179,000	1.7	492,285	4.8	290,573	2.8	B 139,108	1 4	1,662,454	MAINE
MARYLAND	9/30	10,597,544	3,650,836	34.5	3,952,943	37.3	295	-	2,002,640	18.9	990,830	9.3	-	-	-	-	1,926,750	MARYLAND
MASSACHUSETTS	11/30	13,794,244	7,189,453	52.1	1,999,616	14.5	1,244,515	9.0	521,000	3.8	207,914	1.5	142,109	1.0	A 2,489,637	18 1	3,717,353	MASSACHUSETTS
MICHIGAN	6/30	25,997,517	11,291,391	43.4	2,410,604	9.3	2,987,842	11.5	1,844,417	7.1	2,625,075	10.1	1,578,832	6.1	AB 3,259,356	12.5	3,775,756	MICHIGAN
MINNESOTA	12/31	17,978,952	10,171,242	56.5	2,891,468	16.1	130,013	0.7	(3) 159,088	0.9	(3) 1,597,109	8.9	2,523,945	14.6	AB 406,087	2.3	6,828,809	MINNESOTA
MISSISSIPPI	12/31	4,697,573	2,827,842	60.2	1,618,832	34.5	151,039	3.2	-	-	-	-	53,208	1.1	A 46,652	1.0	1,761,732	MISSISSIPPI
MISSOURI	12/31	30,841,307	23,620,002	76.8	1,914,144	6.2	1,655,226	6.4	2,005,060	6.5	1,646,875	5.3	-	-	-	-	7,061,418	MISSOURI
MONTANA (1)	6/30	1,154,824	872,372	75.5	97,821	8.5	169,119	14.7	-	-	-	-	6,076	0.5	A 9,436	0.8	106,582	MONTANA
NEBRASKA (1)	12/31	7,639,284	5,539,611	72.6	1,592,322	20.8	254,207	3.3	-	-	-	-	204,680	2.7	BC 48,464	0.6	2,400,166	NEBRASKA
NEVADA	11/30	1,698,876	982,420	57.8	282,209	16.6	186,351	11.0	100,000	6.9	31,750	1.9	86,332	5.1	AC 29,814	1.7	370,677	NEVADA
NEW HAMPSHIRE	12/31	3,016,992	1,188,848	39.5	1,319,710	43.7	448,660	14.8	-	-	-	-	59,774	2.0	-	-	1,130,040	NEW HAMPSHIRE
NEW JERSEY	12/31	24,377,507	12,103,931	49.8	1,617,864	6.7	2,669,482	11.0	1,374,440	-	891,500	3.7	51,325	0 2	AB 5,668,965	23.3	7,977,827	NEW JERSEY
NEW MEXICO (1)	6/30	2,928,454	1,599,597	54.7	929,669	31.7	133,509	4.6	20,000	0.7	113,600	3.8	131,718	4.5	A 361	-	326,774	NEW MEXICO
NEW YORK	12/31	41,781,030	21,107,388	50.5	7,955,938	19.0	2,577,555	6.2	400,000	1.0	4,240,000	10.1	377,979	0.9	A 5,122,170	12.3	49,961,171	NEW YORK
NORTH CAROLINA	6/30	37,216,148	21,424,989	57.6	4,630,448	12.5	2,173,063	5.8	400	-	3,402,171	9.1	4,899,452	13.2	A 685,625	1.8	12,961,778	NORTH CAROLINA
NORTH DAKOTA	6/30	1,977,838	1,326,231	67.0	161,229	8.1	438,667	22.2	-	-	-	-	52,711	2.7	-	-	799,150	NORTH DAKOTA
OHIO	12/31	29,495 800	14,003,261	47.5	14,772,451	60.1	720,088	2.4	-	-	-	-	-	-	-	-	987,468	OHIO
OKLAHOMA	12/31	10,419,979	7,984,944	76.7	1,768,869	17.0	659,575	6.3	-	-	-	-	-	-	A 6,591	-	2,617,728	OKLAHOMA
OREGON (1)	11/30	10,018,492	4,259,674	42.6	2,290,409	22.9	263,559	2.6	1,197,000	11.9	1,722,762	17.2	-	-	ABC 285,088	2.8	870,408	OREGON
PENNSYLVANIA	12/31	50,912,638	(5) 26,417,008	51.9	13,237,691	26.9	3,152,410	6.2	1,110,000	2.2	3,891,400	7.6	651,724	1.3	ABC 2,452,405	4.8	24,981,699	PENNSYLVANIA
RHODE ISLAND	11/30	3,870,599	1,505,689	38.9	1,284,343	33.2	263,041	6.8	41,852	1.1	116,020	3.0	519,435	13.4	AB 140,219	3.6	652,329	RHODE ISLAND
SOUTH CAROLINA	12/31	9,640,281	6,287,302	65.3	1,150,371	11.9	346,621	3.6	-	-	-	-	1,524,066	15.8	A 331,921	3.4	252,924	SOUTH CAROLINA
SOUTH DAKOTA	12/31	5,843,422	3,240,828	55.5	1,174,034	20.1	653,523	11.2	450,000	7.7	296,292	5.1	21,604	0.4	C 7,141	-	736,919	SOUTH DAKOTA
TENNESSEE (1)	6/30	14,037,015	7,626,816	54.3	2,098,802	14.9	1,247,324	8.9	-	-	24,000	0.2	3,040,073	21.7	-	-	933,201	TENNESSEE
TEXAS	12/31	19,659,280	10,413,570	53.0	8,445,437	42.9	325,327	1.7	-	-	-	-	474,946	2.4	-	-	353,671	TEXAS
UTAH	12/31	2,448 055	923,716	37.7	504,217	20.8	112,075	4.8	412,500	18.8	325,000	13.3	165,773	6.8	C 4,774	0.2	223,947	UTAH
VERMONT (1)	2/1	3,713,177	2,050,281	55.2	1,417,014	38.2	121,763	3.3	-	-	-	-	124,119	3.3	-	-	339,678	VERMONT
VIRGINIA	6/30	12,013,755	7,028,589	58.5	2,816,439	23.5	575,266	4.8	-	-	-	-	241,000	2.0	AB 1,352,461	11.2	1,220,600	VIRGINIA
WASHINGTON	12/31	8,825,455	5,865,034	66.5	2,037,910	23.1	689,383	7.8	-	-	-	-	-	-	B 233,128	2.6		WASHINGTON
WEST VIRGINIA	12/31	17,492,256	11,020,414	63.1	2,033,436	11.6	555,356	3.2	2,000,000	11.4	1,883,050	10.8	-	-	-	-	6,604,714	WEST VIRGINIA
WISCONSIN	6/30	12,130,946	6,426,409	53.0	3,368,967	27.7	393,174	3.2	-	-	-	-	78,626	0.7	AC 1,855,770	15.4	4,360,934	WISCONSIN
WYOMING	12/31	2,973,896	1,502,512	60.5	841,383	21.6	166,785	5.6	500,000	16.8	116,700	3.9	46,616	1.6	-	-	49,637	WYOMING
TOTALS		621,744,210	351,222,337	56.5	125,617,313	20.2	37,176,689	6.0	21,879,325	3.5	33,690,051	5.4	22,284,756	3.8	29,873,839	4.8	187,431,736 -2,488,338 184,943,398	TOTALS

REMARKS: THE DISBURSEMENTS REPORTED ABOVE, IN GENERAL, COVER MONEY SPENT ON STATE HIGHWAYS-

NOTES: (1) IN 8 STATES THE ENDING OF FISCAL YEAR HAS BEEN CHANGED FROM THAT OF 1925
(2) INCLUDES ADMINISTRATION AND ENGINEERING FORMERLY REPORTED SEPARATELY
(3) PAYMENTS ON COUNTY BOND OBLIGATIONS ASSUMED BY STATE
(4) INTEREST ON ROAD WARRANT NOTES
(5) INCLUDES $1,279,585 ON STATE HIGHWAYS FINANCED BY COUNTIES

United States Department of Agriculture
Bureau of Public Roads

DIVISION OF CONTROL.
GASOLINE TAX RATES, BY STATES

As of August 1, 1927

Showing Present Tax Rate Per Gallon and the Dates Rates Were Effective

Tax Rate	States	Date Effective	Tax Rate	States	Date Effective
Cents			Cents		
5	Arkansas	6/9/27	3	Montana	1/1/27
	Florida	7/1/27		New Hampshire	5/1/27
	Kentucky	2/21/26		Ohio	5/11/27
	New Mexico	3/7/27		Oklahoma	3/23/25
	South Carolina	3/23/25		Oregon	5/24/23
				Pennsylvania	7/1/27
4½	Virginia	3/10/26		Tennessee	2/9/25
				Texas	3/16/27
4	Alabama	1/4/27		Vermont	7/1/27
	Idaho	2/28/27		Wyoming	4/1/25
	Maryland	4/1/27			
	Mississippi	4/1/26	2	Connecticut	7/1/25
	Nevada	4/1/25		Illinois	8/1/27
	North Carolina	2/21/25		Kansas	5/1/25
	South Dakota	7/1/27		Louisiana	8/1/24
	West Virginia	7/1/27		Minnesota	5/1/25
				Missouri	1/1/25
3½	Georgia	8/26/25		Nebraska	4/1/25
	Utah	4/1/25		New Jersey	7/1/27
				North Dakota	7/30/26
3	Arizona	6/9/23		Rhode Island	6/1/27
	California	7/29/27		Washington	1/1/24
	Colorado	5/1/27		Wisconsin	4/1/25
	Delaware	3/24/27		District of	
	Indiana	4/1/25		Columbia	5/23/24
	Iowa	7/4/27	No		
	Michigan	9/4/27	Tax	Massachusetts	
	Maine*	7/11/25		New York	
				Hawaii	

* Due to a petition submitted to the Secretary of State the four cent gas tax law did not become effective on July 16,1927 The tax rate will continue to be three cents.

(NOT FOR RELEASE)

DIGEST OF RECENT DECISIONS OF THE U. S. SUPREME COURT RELATIVE TO INTERSTATE MOTOR VEHICLE TRAFFIC

(THIS BRIEF COVERS THE FIRST THREE OF A SERIES OF SEVEN RECENT DECISIONS OF THE UNITED STATES SUPREME COURT. THE REST OF THE RULINGS WILL BE PUBLISHED IN THE NEXT ISSUE OF THE NEWS LETTER.)

MICHIGAN PUBLIC UTILITIES COMMISSION V. DUKE
266 U. S. 571

THE DUKE CARTAGE COMPANY, AT THE TIME OF THE PASSAGE OF THE STATE ACT (ACT NO. 209, PUBLIC ACTS OF 1923 OF MICHIGAN), CONCERNING TRANSPORTATION FOR HIRE BY MOTOR VEHICLES, HAD THREE CONTRACTS TO TRANSPORT FROM DETROIT, MICH., TO TOLEDO, OHIO, AUTOMOBILE BODIES MADE AT THE PLANTS OF THREE MANUFACTURERS IN DETROIT AND INTENDED FOR THE USE OF AN AUTOMOBILE MANUFACTURER AT TOLEDO. THEY HAD BEEN DOING SUCH HAULING FOR SOME YEARS, AND HAD A LARGE INVESTMENT IN PROPERTY USED EXCLUSIVELY FOR THAT PURPOSE. THEY OPERATED UPON THE PUBLIC HIGHWAYS OF MICHIGAN, WHICH FORMED A PART OF THE ROUTE BETWEEN DETROIT AND TOLEDO. THEY WERE ENGAGED SOLELY IN INTERSTATE HAULING. THEY HAD NO OTHER BUSINESS AND DID NOT HOLD THEMSELVES OUT AS A PUBLIC CARRIER.

IN 1923, THE STATE OF MICHIGAN PASSED AN ACT (ACT NO. 209, PUBLIC ACTS OF 1923 OF MICHIGAN) WHICH PROVIDED AMONG OTHER THINGS THAT ALL PERSONS ENGAGED IN THE TRANSPORTATION OF PERSONS OR PROPERTY FOR HIRE BY MOTOR VEHICLE OVER THE PUBLIC HIGHWAYS OF THE STATE SHALL BE COMMON CARRIERS AND SUBJECT TO EXISTING LAWS RELATIVE TO SUCH AGENTS. THE ACT FURTHER PROVIDED THAT THE MOTOR VEHICLE COMMON CARRIER MUST CARRY LIABILITY INSURANCE FOR THE PROTECTION OF PROPERTY AND PERSONS FROM INJURY. A RULE ADOPTED BY THE STATE PUBLIC SERVICE COMMISSION REQUIRED ALL COMMON CARRIERS TO PROVIDE AN INDEMNITY BOND IN AN APPROVED AMOUNT, PRIOR TO GRANTING A PERMIT TO OPERATE. THE ACT FURTHER PROVIDED FOR A FEE TO BE PAID BY ALL COMMON CARRIERS AND PROVIDED ALSO THAT THIS FEE SHALL BE APPROPRIATED TO THE GENERAL HIGHWAY FUND. IT FURTHER PROVIDED PENALTIES FOR VIOLATIONS OF THE ACT OR RULINGS OF THE COMMISSION.

WHEN THE DUKE CARTAGE COMPANY REFUSED TO RECOGNIZE THE VALIDITY OF THE ACT AND NEGLECTED TO MAKE ANY APPLICATION FOR A PERMIT, THE STATE POLICE AND LOCAL OFFICERS INTENDED TO PROHIBIT THEIR USE OF THE HIGHWAYS. THE CASE WAS BROUGHT INTO COURT WHEN THE COMPANY SOUGHT AN INJUNCTION TO PREVENT THE STATE FROM PROHIBITING THEM FROM THE USE OF THE ROAD. DUKE ALLEGED THAT

THE ENFORCEMENT OF THE ACT WOULD CAUSE HIS COMPANY IRREPARABLE INJURY, THE LOSS OF THEIR CONTRACTS, THE DESTRUCTION OF THEIR BUSINESS, AND THE LOSS OF A SUBSTANTIAL PART OF THEIR CAPITAL INVESTMENT. HE ASSAILED THE ACT AS INVALID; AND, AMONG OTHER THINGS, AVERRED THAT IT CONTRAVENED THE COMMERCE CLAUSE OF THE CONSTITUTION OF THE UNITED STATES; THAT IT IS REPUGNANT TO THE DUE PROCESS CLAUSE OF THE FOURTEENTH AMENDMENT, AND THAT IT VIOLATES THE CONSTITUTION OF MICHIGAN, BECAUSE IT CONTAINS A PLURALITY OF OBJECTS, AND ITS REAL OBJECT IS NOT EXPRESSED IN THE TITLE.

THE LOWER COURT GRANTED THE INJUNCTION TO THE DUKE CARTAGE COMPANY ON THE GROUNDS THAT THE INDEMNITY BONDS REQUIRED BY THE ACT IMPOSED A DIRECT BURDEN ON INTERSTATE COMMERCE AND THAT PRIVATE CARRIERS COULD NOT BE CLASSED AS COMMON CARRIERS BECAUSE SUCH AN INTERPRETATION WAS FOREIGN TO THE TITLE OF THE ACT.

THE CASE WAS THEREUPON APPEALED TO THE SUPREME COURT OF THE UNITED STATES. THIS TRIBUNAL HELD THAT THE DUKE CARTAGE COMPANY WAS A PRIVATE CARRIER AND AFFIRMED THE DECREE OF THE LOWER COURT. THE DECISION WAS BASED UPON THE FOLLOWING REASONING: THE SOLE BUSINESS OF THE DUKE CARTAGE COMPANY WAS INTERSTATE COMMERCE, AND IT WAS LIMITED TO THE TRANSPORTATION COVERED BY THEIR THREE CONTRACTS. THEY HAD NO POWER OF EMINENT DOMAIN OR FRANCHISE UNDER THE STATE, AND NO GREATER RIGHT TO USE THE HIGHWAYS THAN ANYONE ELSE. THEY DID NOT UNDERTAKE TO CARRY FOR THE PUBLIC, AND DID NOT DEVOTE THEIR PROPERTY TO ANY PUBLIC USE. THE PUBLIC WAS NOT DEPENDENT ON THEM OR THE USE OF THEIR PROPERTY FOR SERVICE, AND HAD NO RIGHT TO CALL ON THEM FOR TRANSPORTATION. THE STATE ACT LEFT IT TO THE COMMISSION TO REQUIRE THE DUKE CARTAGE COMPANY, IF THEY WERE TO USE THE HIGHWAYS, TO BE PREPARED TO FURNISH ADEQUATE SERVICE TO THE PUBLIC. IT WOULD MAKE THEM COMMON CARRIERS AND SUBJECT THEM TO ALL THE BURDENS OF THAT BUSINESS, AND WOULD REQUIRE THEM TO FURNISH BOND FOR THE PROTECTION OF THOSE FOR WHOM THEY HAUL.

THE SUPREME COURT HAD PREVIOUSLY HELD THAT A STATE MAY RIGHTFULLY PRESCRIBE UNIFORM REGULATIONS NECESSARY FOR THE PUBLIC SAFETY AND ORDER IN RESPECT TO THE OPERATION OF ALL MOTOR VEHICLES UPON ITS HIGHWAYS - THOSE MOVING IN INTERSTATE COMMERCE AS WELL AS OTHERS. THEY HAD ALSO HELD THAT A REASONABLE GRADUATED LICENSE FEE IMPOSED BY THE STATE ON MOTOR VEHICLES USED IN INTERSTATE COMMERCE DOES NOT CONSTITUTE A DIRECT BURDEN ON INTERSTATE COMMERCE (HENDRICK V. MARYLAND, 235 U. S. 610, 622; KANE V. NEW JERSEY, 242 U. S. 160, 167). SUCH REGULATIONS WERE DEEMED REASONABLE AND AFFECT INTERSTATE COMMERCE ONLY INCIDENTALLY AND INDIRECTLY. BUT

THE SUPREME COURT HELD THAT THE STATE HAD NOT POWER TO IMPOSE UNREASONABLE REGULATIONS AND THEY HAD NO RIGHT TO MAKE THE DUKE CARTAGE COMPANY ACT AS A COMMON CARRIER BECAUSE THIS WOULD TAKE AWAY FROM THEM THE USE OF THE INSTRUMENTALITIES BY WHICH THEY CARRIED ON INTERSTATE COMMERCE AND SO WOULD DIRECTLY BURDEN AND INTERFERE WITH IT. THE COURT FURTHER HELD THAT IT WAS A BURDEN ON INTERSTATE COMMERCE TO COMPEL THE DUKE CARTAGE COMPANY TO FURNISH AN INDEMNITY BOND, SINCE CLEARLY THIS REQUIREMENT HAD NO RELATION TO PUBLIC SAFETY OR ORDER IN THE USE OF MOTOR VEHICLES UPON THE HIGHWAYS, OR TO THE COLLECTION OR COMPENSATION FOR THE USE OF THE HIGHWAYS. THE POLICE POWER DID NOT EXTEND SO FAR. IT WAS HELD, THEREFORE, THAT, IF APPLIED TO THE BUSINESS OF THE DUKE CARTAGE COMPANY, THE ACT WOULD VIOLATE THE COMMERCE CLAUSE OF THE CONSTITUTION.

MOREOVER, IT IS BEYOND THE POWER OF A STATE BY LEGISLATIVE FIAT TO CONVERT PROPERTY USED EXCLUSIVELY FOR THE PURPOSES OF A PRIVATE CARRIER INTO A PUBLIC UTILITY, OR TO MAKE THE OWNER A PUBLIC CARRIER, FOR THAT WOULD BE TAKING PRIVATE PROPERTY FOR PUBLIC USE WITHOUT JUST COMPENSATION, WHICH NO STATE CAN DO CONSISTENTLY WITH THE DUE PROCESS OF LAW CLAUSE OF THE FOURTEENTH AMENDMENT.

BASED UPON THIS REASONING, THEREFORE, THE DECREE OF THE LOWER COURT WAS AFFIRMED SINCE THE SUPREME COURT HELD THAT THE ENFORCEMENT OF THE ACT WOULD DEPRIVE THE DUKE CARTAGE COMPANY OF THEIR RIGHTS UNDER THE FEDERAL CONSTITUTION. THE SUPREME COURT OF MICHIGAN HAD NOT DECIDED WHETHER THE ACT CONTRAVENED THE STATE CONSTITUTION. THE UNITED STATES SUPREME COURT, THEREFORE, AFFIRMED THE DECREE ON THE GROUND THAT THE ENFORCEMENT OF THE ACT AGAINST DUKE WOULD DEPRIVE HIM OF HIS RIGHTS UNDER THE FEDERAL CONSTITUTION.

BUCK V. KUYKENDALL, DIRECTOR OF PUBLIC WORKS, STATE OF WASHINGTON, 267 U. S. 307

A. J. BUCK, A CITIZEN OF WASHINGTON, WISHED TO OPERATE AN AUTO STAGE LINE OVER THE PACIFIC HIGHWAY BETWEEN SEATTLE, WASH., AND PORTLAND, ORE., AS A COMMON CARRIER FOR HIRE EXCLUSIVELY FOR THROUGH INTERSTATE PASSENGERS AND EXPRESS. HE OBTAINED FROM OREGON THE LICENSE PRESCRIBED BY ITS LAWS. HAVING COMPLIED WITH THE LAWS OF WASHINGTON RELATING TO MOTOR VEHICLES, THEIR OWNERS AND DRIVERS, AND ALLEGING WILLINGNESS TO COMPLY WITH ALL APPLICABLE REGULATIONS CONCERNING COMMON

carriers, Buck then applied for the prescribed certificate of public convenience and necessity. It was refused on the ground that, under the laws of the State, a certificate may not be granted for any territory which is being adequately served by the holder of a certificate; and that, in addition to frequent steam railroad service, adequate transportation facilities between Seattle and Portland were already being provided by means of four connecting auto stage lines, all of which held such certificates from the State of Washington (Re Buck, P.U.R. 1923 E, 737).

To enjoin interference by the officials of the State with the operation of the projected line, Buck brought suit against Kuykendall, the director of public works. The injunction was refused in the lower courts on the following grounds: Buck claimed that the action of the State officials violated rights conferred by the Federal-aid road legislation and guaranteed both by the Fourteenth Amendment and the commerce clause, since portions of the Pacific Highway in Washington were built with Federal-aid funds.

The State attorneys agreed that the right of interstate motor vehicle travel upon the public highways may be a privilege or immunity of citizens of the United States; and a citizen may have, under the Fourteenth Amendment, the right to travel and transport his property upon them by auto vehicle, but he has no right to make the highways his place of business by using them as a common carrier for hire. Such use is a privilege which may be granted or withheld by the State in its discretion, without violating either the due process clause or the equal protection clause. The attorneys further argued that the highways belonged to the State and that it might make appropriate provision for securing the safety and convenience of the public in the use of them. It may impose fees with a view both to raising funds to defray the cost of supervision and maintenance and to obtaining compensation for the use of the road facilities provided. With the increase in number and size of the vehicles used upon a highway, both the danger and the wear and tear grow. To exclude unnecessary vehicles - particularly the large ones commonly used by carriers for hire - promotes both safety and economy. State regulation of that character is valid even as applied to interstate commerce, in the absence of legislation by Congress which deals specifically with the subject. Neither the recent Federal highway acts, nor the earlier post road acts, do that. The State statute is not objectionable because it is designed primarily to promote good service by excluding unnecessary competing carriers. That purpose is within the State's police power.

The case was then appealed to the United States Supreme Court which held that this argument by the State's attorneys was unsound. In its decision the Court stated that it may be assumed that the State statute - prohibiting common carriers for hire from using the highways without first securing a certificate of convenience and necessity from the State - was consistent with the Fourteenth Amendment; and also, that appropriate State regulations adopted primarily to promote safety upon the highways and conservation in their use are not obnoxious to the commerce clause, where the indirect burden imposed upon interstate commerce is not unreasonable. They held, however, that the provision here in question is of a different character. Its primary purpose is not regulation with a view to safety or to conservation of the highways, but the prohibition of competition. It determines not the manner of use, but the persons by whom the highways may be used. It prohibits such use to some persons while permitting it to others for the same purpose and in the same manner. Moreover, it determines whether the prohibition shall be applied by resort, through State officials, to a test which is peculiarly within the province of Federal action - the existence of adequate facilities for conducting interstate commerce. The vice of the legislation is dramatically exposed by the fact that the State of Oregon had issued its certificate which, despite existing facilities, declared that public convenience and necessity required the establishment by Buck of the auto stage line between Seattle and Portland. Thus, the provision of the Washington statute is a regulation, not of the use of its own highways, but of interstate commerce. Its effect upon such commerce is not merely to burden but to obstruct it. Such State action is forbidden by the commerce clause. It also defeats the purpose of Congress expressed in the legislation giving Federal aid for the construction of interstate highways. The United States Supreme Court, therefore, reversed the decision of the lower courts which had been favorable to the State.

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Bush v. Maloy, et al., constituting Public Service Commission of Maryland, 267 U.S. 317

A statute in Maryland prohibits common carriers of merchandise or freight by motor vehicle from using the public highways over specified routes without a permit. The State Public Service Commission is charged with the duty to "investigate the expediency of granting said permit" when applied for; and it is authorized to refuse the same if it "deems the granting of such permit prejudicial to the welfare and convenience of the public."

This statute was made an issue when George W. Bush and Sons Co. applied for a permit to do an exclusively interstate business as a common carrier of freight over specified routes, alleging its willingness and intention to comply with all applicable regulations concerning the operation of motor vehicles. After due hearing the permit was denied. The Company then brought suit in a court of the State to restrain the State officials from interfering with such use of the Company's trucks. The bill alleged, and it was admitted by demurrer, that the highways were not unduly congested; that they are so constructed that they can carry burdens heavier than that which would be imposed by the Company's trucks; that the operation of its trucks would impose no different burden upon the highways than the operation of the trucks of the same kind and character by private persons, which was freely permitted; and that, in refusing the permit, the Commission had considered merely "whether or not existing lines of transportation would be benefited or prejudiced and in this way the public interest affected." The Company claimed that, regardless of permit, it was entitled to use the highways as a common carrier in exclusively interstate commerce. The trial court dismissed the bill and its decree was affirmed by the highest court in the State.

The United States Supreme Court, to which the case was appealed by Bush, reversed the decision of the lower courts. They held that, "This case presents two features which were not present in Buck v. Kuykendall, No. 345, decided this day. The first is that the highways here in question were not constructed or improved with Federal aid. This difference does not prevent the application of the rule declared in the Buck case. The Federal-aid legislation is of significance, not because of the aid given by the United States for the construction of particular highways, but because those acts make clear the purpose of Congress that State highways shall be open to interstate commerce. The second feature is that here the permit was refused by the Commission, not in obedience to a mandatory provision of the State statute, but in the exercise, in a proper manner, of the broad discretion vested in it. This difference also is not of legal significance in this connection. The State action in the Buck case was held to be unconstitutional, not because the statute prescribed an arbitrary test for the granting of permits, or because the director of public works had exercised the power conferred arbitrarily or unreasonably, but because the statute as construed and applied invaded a field reserved by the commerce clause for Federal regulation."

JUSTICE MCREYNOLDS, WHO DISSENTED FROM THE OPINION OF THE SUPREME COURT, EXPRESSED THE VIEW THAT IT WAS A STATE MATTER AND THAT REGULATIONS OF THIS CHARACTER FALL WITHIN THAT CLASS OF POWERS WHICH MAY BE EXERCISED BY THE STATES UNTIL CONGRESS HAS SEEN FIT TO ACT UPON THE SUBJECT.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PUBLIC ROADS

STATUS OF CURRENT FEDERAL AID ROAD WORK

FOR THE FISCAL YEAR ENDING JUNE 30, 1928

AS OF JULY 31, 1927

B.P.R.-F.A.-A-1
M-JULY, 1927 -A

STATES	BALANCE OF FEDERAL AID FUND AVAILABLE FOR NEW PROJECTS	* UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			AMOUNT PAID STATES DURING FISCAL YEAR	COMPLETED AND PAID DURING FISCAL YEAR			AGREEMENTS NOW IN FORCE			P.R.&E. RECOMMENDED FOR APPROVAL BY DISTRICT ENGINEER			STATES
		FEDERAL AID	MILES ORIGINAL	MILES STAGE	FEDERAL AID	MILES ORIGINAL	MILES STAGE		FEDERAL AID	MILES ORIGINAL	MILES STAGE	FEDERAL AID	MILES ORIGINAL	MILES STAGE	FEDERAL AID	MILES ORIGINAL	MILES STAGE	
ALABAMA	2,951,058.59	3,259,311.99	395.6	1.9	60,894.48	2.8		165,340.42				3,210,398.64	392.1	1.9	110,109.83	5.3		ALABAMA
ARIZONA	2,918,225.82	951,236.28	52.7	4.4	347,511.63	19.1		92,085.11				1,291,583.47	81.8	4.4	17,264.44			ARIZONA
ARKANSAS	1,630,275.03	1,431,936.82	211.3		284,001.03	19.5		5,998.43	12,394.37	0.1		1,549,504.65	228.2		156,333.20	2.6		ARKANSAS
CALIFORNIA	4,095,537.25	3,205,702.36	136.3	0.4	62,014.26	4.5		210,119.71	224,871.31	15.9		3,225,938.15	139.6	0.4	41,778.47	1.2		CALIFORNIA
COLORADO	2,519,454.40	3,060,024.71	278.1	9.1	20,057.34	2.9		65,370.64	48,486.64	0.9		2,609,367.75	228.6	9.1	490,714.30	52.4		COLORADO
CONNECTICUT	577,309.35	1,558,064.22	69.9		216,991.88	7.1						1,725,525.71	74.2		59,529.39	2.8		CONNECTICUT
DELAWARE	4,319.29	312,891.57	32.9	1.9	178,900.72	15.5						291,954.57	32.9		197,837.72	15.5	1.9	DELAWARE
FLORIDA	943,567.53	3,917,573.09	190.1	24.9	398,091.78	24.1		219,930.94	94,260.00	6.3		3,735,287.89	194.2	24.9	580,396.98	20.0		FLORIDA
GEORGIA	659,344.57	4,253,317.42	345.0	118.9	203,323.84	8.4	5.3	180,073.40	193,943.57	13.8		3,589,847.77	305.5	100.1	757,793.49	48.9	24.0	GEORGIA
IDAHO	507,707.11	1,540,701.94	183.4	17.4	270,883.89	25.0	9.6	159,508.93				1,501,459.92	183.4	16.5	310,125.91	25.0	10.4	IDAHO
ILLINOIS	2,599,457.76	5,129,438.53	375.7		2,377,164.01	168.9						5,454,802.36	407.0		2,041,850.28	137.5		ILLINOIS
INDIANA	360,534.45	7,875,345.44	485.9		737,574.77	53.5	0.5	135,133.07	99,273.14	6.4		7,839,411.60	485.7		773,509.31	53.5	0.5	INDIANA
IOWA	149,342.89	5,384,815.47	597.1	222.3	300,298.39	11.6	7.8					6,943,957.73	608.7	227.1	41,157.53		3.0	IOWA
KANSAS	507,651.54	5,702,839.06	741.3	7.5	490,379.53	93.1	6.9	257,923.20	101,233.29	11.4		5,134,839.95	670.3	8.4	1,058,378.74	164.1	6.1	KANSAS
KENTUCKY	98,091.91	4,480,432.48	435.4	52.9	412,849.17	29.9	26.9	174,579.97	128,687.99	9.4		4,285,430.41	421.9	57.7	607,851.24	43.4	22.1	KENTUCKY
LOUISIANA	954,440.53	1,858,179.94	122.5	7.5	309,000.00	0.9		61,914.04	70,203.32	10.7		1,858,179.84	122.5	7.5	309,000.00	0.9		LOUISIANA
MAINE	1,134,280.79	943,327.05	69.5		112,521.00	10.1		27,127.11	47,040.48	5.2		987,283.05	75.1		68,565.00	4.5		MAINE
MARYLAND	8,352.09	373,135.64	33.9		653,700.00	70.7						373,135.54	33.9		653,700.00	70.7		MARYLAND
MASSACHUSETTS	2,059,355.53	1,489,290.59	89.5		162,296.57	10.9		50,955.00	50,955.00	3.4		1,446,780.69	86.7		204,793.57	13.7		MASSACHUSETTS
MICHIGAN	1,995,819.55	5,451,826.35	369.9	12.6	780,125.00	40.9	6.5	367,325.88				5,003,222.35	357.2	12.5	1,228,729.00	53.5	6.5	MICHIGAN
MINNESOTA	550,476.43	2,114,898.90	378.3	115.7	1,000.00	11.1						2,115,898.90	389.4	115.7				MINNESOTA
MISSISSIPPI	793,915.75	3,357,827.47	376.5	29.5	258,792.68	48.4		132,196.53	21,156.48	3.8		3,138,974.66	349.3	14.7	477,645.49	75.7	14.9	MISSISSIPPI
MISSOURI	937,872.57	3,603,728.98	247.9	44.7	747,158.77	74.7	0.3	173,796.13	221,824.30	22.9	2.5	3,821,666.72	288.3	34.8	729,220.93	34.3	10.2	MISSOURI
MONTANA	4,337,103.11	1,434,103.69	144.5	5.7	1,715,075.80	273.1	3.4	92,929.16	92,808.71	18.1		3,150,951.59	408.9	9.1	48,217.90	8.7		MONTANA
NEBRASKA	825,172.75	6,311,208.98	1,298.1	589.9	1,029,504.31	125.1	295.5	198,526.06	314,090.57	80.3	57.1	6,385,822.37	1,281.6	699.2	954,900.92	141.6	135.2	NEBRASKA
NEVADA	740,733.00	1,294,255.53	177.9	26.2	100,430.91	17.8		57,772.07	19,135.88	4.9		1,285,640.91	177.8	26.2	109,045.53	17.8		NEVADA
NEW HAMPSHIRE	54,345.80	601,625.45	38.9		92,280.00	6.2		7,936.70	7,936.70	0.7		500,349.82	33.4		193,555.53	11.7		NEW HAMPSHIRE
NEW JERSEY	73,127.95	1,704,059.56	111.5		44,520.00	3.0		84,960.00	84,960.00	5.7		1,490,993.56	97.3		257,685.00	17.2		NEW JERSEY
NEW MEXICO	1,635,135.72	2,558,095.90	233.6					218,234.63	13,319.32			2,217,014.25	223.7		351,081.55	9.9		NEW MEXICO
NEW YORK	3,743,543.56	9,540,513.95	586.9		2,514,457.50	160.8	8.6	234,171.15	137,931.34	13.7		11,352,373.95	708.8		702,607.50	41.9	8.5	NEW YORK
NORTH CAROLINA	757,170.37	1,528,044.97	100.4	7.2	596,443.50	34.0	21.6	206,682.21				1,451,706.92	100.4		672,782.55	34.0	28.8	NORTH CAROLINA
NORTH DAKOTA	334,782.26	3,241,293.99	862.3	265.0	591,250.17	210.2	176.9	146,910.31				3,261,776.05	839.2	354.4	570,758.01	233.3	87.5	NORTH DAKOTA
OHIO	4,077,013.17	4,479,620.07	329.3	4.2	522,135.00	33.8		153,223.41	83,800.00	5.0		4,282,489.62	321.0	4.2	719,325.45	42.1		OHIO
OKLAHOMA	1,322,221.43	1,764,345.57	246.2	27.8	598,674.70	99.0	10.8	115,678.82	8,846.09	5.0		1,994,474.01	257.3	38.5	388,547.26	77.9		OKLAHOMA
OREGON	583,871.00	1,307,528.25	62.4	35.8	25,693.80	9.9						1,212,731.93	67.5	35.8	120,453.13	4.9		OREGON
PENNSYLVANIA	1,904,002.05	5,421,084.81	351.8		1,131,808.81	81.7		201,303.52				5,302,980.85	347.9		1,249,912.77	85.5		PENNSYLVANIA
RHODE ISLAND	531,395.20	338,055.00	22.5		165,263.74	10.2						457,313.74	29.6		45,005.00	3.1		RHODE ISLAND
SOUTH CAROLINA	348,521.80	2,928,901.40	247.1	30.6	52,000.00	15.5	10.8	158,624.45				2,738,414.01	230.5	19.2	242,487.39	32.0	22.2	SOUTH CAROLINA
SOUTH DAKOTA	43,120.44	2,030,331.29	655.2	79.3	249,050.74	101.0	39.3	79,257.45	57,825.99	29.1		2,094,541.15	695.1	82.4	244,840.97	61.1	38.2	SOUTH DAKOTA
TENNESSEE	1,376,155.59	3,514,987.07	225.7	60.3	357,056.79	31.7		49,073.80				3,313,903.78	203.0	42.7	657,840.08	54.4	17.6	TENNESSEE
TEXAS	5,579,825.98	8,503,161.05	497.5	196.4	1,007,930.61	62.6	51.9	375,677.62	449,844.91	30.8	25.3	6,617,192.79	483.2	214.6	893,898.98	76.9	33.7	TEXAS
UTAH	351,423.41	1,658,316.58	155.0		759,598.84	69.0	7.5	148,042.79	129,266.22	13.4		1,577,006.31	161.7		840,909.11	72.3	7.5	UTAH
VERMONT	173.74	1,138,088.13	51.2		147,004.12	10.3		20,048.12				992,449.96	52.6		292,552.29	18.9		VERMONT
VIRGINIA	19,132.14	1,970,948.28	109.2		345,874.43	15.6	4.0	215,097.61	72,129.90	6.5		2,130,735.71	115.8	4.0	196,087.00	9.0		VIRGINIA
WASHINGTON	1,215,156.05	1,675,600.00	63.4		65,000.00	19.2		121,533.10	75,000.00	4.8		1,740,600.00	73.6					WASHINGTON
WEST VIRGINIA	39,531.87	2,934,151.85	238.2	12.0	598,675.47	44.1	7.0					2,841,704.96	237.1	12.0	691,162.35	45.2	7.0	WEST VIRGINIA
WISCONSIN	2,377,373.83	4,883,058.80	394.5	47.0	159,950.00	25.0	1.6	4,530.50	38,828.47	1.3		4,533,885.80	370.4	39.4	511,123.00	49.1	9.2	WISCONSIN
WYOMING	563,244.98	1,729,838.73	203.0	101.9	46,077.34		6.6	40,355.00	22,215.00	4.2		1,424,084.67	163.1	65.9	351,831.40	39.9	42.6	WYOMING
HAWAII	805,975.35	562,362.64	29.7									562,362.64	29.7					HAWAII
TOTALS	43,544,100.09	145,571,490.76	13,685.8	2,160.9	22,299,450.82	2,203.4	709.4	5,411,046.79	2,977,277.09	337.7	84.9	145,756,921.68	13,874.0	2,283.6	22,214,009.90	2,015.2	585.7	TOTALS

* INCLUDES PROJECTS REPORTED COMPLETED (FINAL VOUCHERS NOT YET PAID) TOTALING: FEDERAL AID $39,575,452.01; MILEAGE ORIGINAL 3,550.6; MILES STAGE 744.4

(NOT FOR RELEASE)

DIATOMACEOUS EARTH ADMIXTURE PROPOSED FOR MARYLAND CONCRETE PAVEMENT TEST

CONTRIBUTED BY F. H. JACKSON OF THE DIVISION OF TESTS

A FIELD DEMONSTRATION OF THE EFFECT OF DIATOMACEOUS EARTH, AS AN ADMIXTURE, ON THE QUALITY OF CONCRETE PAVEMENT IS TO BE CONDUCTED BY THE MARYLAND STATE ROADS COMMISSION IN COOPERATION WITH THE BUREAU. FOUR EXPERIMENTAL SECTIONS, EACH ONE-QUARTER MILE IN LENGTH, ARE TO BE CONSTRUCTED ON THE CRAIN HIGHWAY, IN PRINCE GEORGES COUNTY, MD. THIS EXPERIMENT IS A CONTINUATION OF THE CURING EXPERIMENTS ON SODIUM SILICATE AND CALCIUM CHLORIDE CARRIED OUT ON THE CRAIN HIGHWAY IN 1926. THREE GRADES OF DIATOMACEOUS EARTH ARE TO BE TRIED IN COMPARISON WITH ONE PLAIN SECTION, AS FOLLOWS:

SECTION 1 - 1:2:4 - PLAIN CONCRETE
" 2 - 1:2:4 - $2\frac{1}{3}$ PER CENT "CELITE"
" 3 - 1:2:4 - $2\frac{1}{3}$ PER CENT DIATOMITE (C-MIX)
" 4 - 1:2:4 - $2\frac{1}{3}$ PER CENT DIATOMACEOUS EARTH.

THE SECTIONS ARE ALL TO BE CONSTRUCTED AND CURED IN THE SAME MANNER, AS NEARLY AS POSSIBLE. THE CONSISTENCY OF THE CONCRETE WILL BE MADE IN EACH CASE AS DRY AS POSSIBLE WITHOUT INTERFERING WITH THE PROPER HANDLING AND FINISHING OF THE CONCRETE. NO ATTEMPT WILL BE MADE TO MAINTAIN THE SAME SLUMP ON ALL FOUR SECTIONS. HOWEVER, ACTUAL DETERMINATIONS OF THE SLUMP WILL BE MADE, AS WELL AS DETAILED OBSERVATIONS REGARDING THE APPARENT WORKABILITY OF THE CONCRETE. DETERMINATIONS OF THE AMOUNT OF WATER USED IN EACH SECTION WILL BE MADE, AS ACCURATELY AS POSSIBLE, AND WITH SPECIAL REFERENCE AS TO WHETHER MORE OR LESS WATER IS REQUIRED FOR THE SECTIONS IN WHICH THE ADMIXTURES ARE USED, AS COMPARED WITH THE PLAIN CONCRETE.

FOR EACH DAY'S RUN, A SET OF FIVE 6 BY 6 BY 30-INCH BEAMS ARE TO BE TESTED AT THE AGES OF 7,28, 90, 180, AND 360 DAYS, RESPECTIVELY. THE BEAMS ARE TO REMAIN IN THE MOLDS FOR 24 HOURS AND WILL THEN BE CURED AT THE SITE OF THE WORK, UNTIL TESTED. SEVEN AND 28-DAY BEAMS WILL BE TESTED WITH A PORTABLE DEVICE AT THE SITE OF THE WORK. BEAMS FOR THE LATER TESTS WILL BE TAKEN TO THE ARLINGTON LABORATORY OF THE BUREAU.

SUPPLEMENTING THE FIELD WORK OUTLINED ABOVE, A SERIES OF LABORATORY TESTS WILL BE MADE TO DETERMINE THE RELATIVE YIELDS OBTAINED WITH THE MATERIALS, PROPORTIONS, AND CONSISTENCIES USED IN THE EXPERIMENTS PREVIOUSLY DESCRIBED.

(NOT FOR RELEASE)

VIRGINIA DEMONSTRATION ROAD BEING EXTENDED FOR MORE EXTENSIVE INVESTIGATIONS ON AGGREGATE AND CURING

CONTRIBUTED BY C. A. HOGENTOGLER OF THE DIVISION OF TESTS

THE VIRGINIA DEMONSTRATION ROAD IS BEING EXTENDED, BY BUILDING AN ADDITIONAL FIVE MILES OF CONCRETE PAVEMENT, IN ORDER TO MAKE MORE EXTENSIVE INVESTIGATIONS AS TO THE EFFECTS, UPON THE COMPLETED PAVEMENT, OF VARIOUS TYPES OF AGGREGATE AND METHODS OF CURING. THE CONSTRUCTION OF THE ORIGINAL TEN MILES OF THIS ROAD, AS A COOPERATIVE RESEARCH PROJECT OF THE BUREAU AND THE VIRGINIA STATE HIGHWAY COMMISSION, WAS COMPLETED IN MAY, 1927. A GENERAL OUTLINE OF THIS PROJECT WAS GIVEN IN THE AUGUST, 1926, ISSUE OF PUBLIC ROADS. THE CONSTRUCTION OF THE PRESENT 5-MILE EXTENSION OF THE PAVEMENT WHICH WAS BEGUN IN JULY, 1927, IS EXPECTED TO BE COMPLETED THE LATTER PART OF THIS YEAR.

THE 5-MILE EXTENSION INCLUDES TWO 1/4-MILE UNITS BUILT WITH GRAVEL AGGREGATE - ONE WITH COARSE GRAVEL AND THE OTHER WITH FINE. ADJOINING THESE SECTIONS THERE IS A 1/2-MILE LENGTH IN WHICH STONE FROM A LOCAL QUARRY IS USED AS THE COARSE AGGREGATE. FOLLOWING THIS A CURING INVESTIGATION WILL BE CARRIED OUT ON FOUR 1,500-FOOT SECTIONS, EACH TREATED WITH ONE OF THE FOLLOWING MATERIALS:

1. - "CAL" AS AN ADMIXTURE. THIS IS A COMMERCIAL PRODUCT CONSISTING OF A MIXTURE OF CALCIUM CHLORIDE AND HYDRATED LIME.
2. - CALCIUM CHLORIDE AS AN ADMIXTURE.
3. - SODIUM SILICATE AS A SURFACE APPLICATION.
4. - STANDARD WET-EARTH COVERING.

OBSERVATIONS SIMILAR TO THOSE ON THE ORIGINAL TEN MILES, WILL BE MADE ON THE NEW EXTENSION WITH REGARD TO THE VARIABLES OF SUBGRADE, CLIMATE, TRAFFIC, AND CONSTRUCTION. THE NEW STUDIES WILL INCLUDE MODULUS OF RUPTURE TESTS OF BEAMS MADE OF REPRESENTATIVE SAMPLES OF THE CONCRETE MIXTURE. FOR EACH OF THE NEW CURING SECTIONS THERE WILL BE MOLDED FORTY 6 x 6 x 30-INCH BEAMS, SPECIMENS OF WHICH WILL BE BROKEN AT THE AGES OF 1, 2, 4, 7, 14, 21, 28, 90, 180, AND 360 DAYS. ONE-HALF OF THE BEAMS FROM EACH SECTION WILL BE CURED BY THE SAME METHOD USED IN THE CONSTRUCTION OF THE SECTION, WHILE THE OTHER HALF WILL RECEIVE NO CURING OTHER THAN A WET-BURLAP COVERING FOR 24 HOURS.

(Not for release)

NEW RESEARCH PROJECT APPROVED

Title: Motor Truck Impact as Influenced by Wheel Type.

Approved: June 14, 1927.

Leader: James A. Buchanan.

Object: To establish data from which may be determined the relative cushioning effect of various types of motor truck wheels.

Procedure: Impact tests will be made on various types of cushion and rigid truck wheels. These tests, in general, will be similar in type but much less extensive than the tests recently conducted with various tire equipments. The operating conditions (load, speed, tires, etc.) will be constant, except for changes in wheel types; and by a comparison of the impact forces produced, a determination will be made of the cushioning qualities, if any, inherent in the various wheel types in actual use. It will be desirable to restrict such tests to the use of only one truck in order to eliminate a possible influence of truck design. For comparison with the best conditions of rigid-wheel operation, a pneumatic tire steel-disc wheel combination will be included.

The following tentative schedule of tests is proposed:

Truck: 2-ton.

Loads: 2500 lbs. and 5000 lbs. per rear wheel.

Tires: 36 inch by 6 inch dual pneumatic
36 inch by 5 inch dual new cushion
36 inch by 4 inch dual worn solid

Speeds: Full range from minimum to maximum.

Road Roughness: The artificially roughened test road at Arlington, which includes various sizes and types of steel obstructions bolted to a concrete road.

Selected nearby highways of various roughnesses.

WHEELS: STEEL DISC (FOR PNEUMATIC TIRES)
WOOD SPOKE - METAL FELLOE (RIGID TYPE)
CUSHION TYPE - MAKES A, B, C, ETC.

INSTRUMENTS: THE BUREAU COIL-SPRING ACCELEROMETER MOUNTED TO RECORD THE VERTICAL ACCELERATIONS OF THE RIGHT REAR WHEEL. THE UNSPRUNG COMPONENT WILL BE COMPUTED FROM THE ACCELERATIONS FOR THE VARIOUS TEST CONDITIONS AND ADDED TO THE STATIC SPRUNG COMPONENT IN ORDER TO ARRIVE AT THE TOTAL VERTICAL IMPACT REACTION. THIS PROCEDURE WAS SUCCESSFULLY FOLLOWED IN THE RECENT "ISOGRAM" TESTS AND MATERIALLY SHORTENED THE WORK.

IN ADDITION TO THE ABOVE, IT MAY BE OF ADVANTAGE TO CONDUCT SELECTED TESTS ON THE STATIC AND IMPACT TESTING MACHINES AND ON THE REACTION WHEEL.

COOPERATION: NONE. THE MANUFACTURERS OF THE TRUCK, TIRES, AND WHEELS WILL BE INVITED TO MAKE SUGGESTIONS AND WILL BE GIVEN THE OPPORTUNITY TO HAVE REPRESENTATIVES OBSERVE THE TESTS. THE CONSENT OF THE HIGHWAY AUTHORITIES OF THE DISTRICT OF COLUMBIA AND THE STATE OF VIRGINIA WILL BE OBTAINED PRIOR TO THE USE OF HIGHWAYS UNDER THE RESPECTIVE JURISDICTIONS. THE BUREAU OF STANDARDS HAS ASKED TO BE PERMITTED TO FURNISH AN OBSERVER DURING THE TESTS.

LOCATION: THE ARLINGTON EXPERIMENTAL FARM AND NEARBY HIGHWAYS WHERE SUITABLE ROAD SURFACES MAY BE FOUND.

LEGAL AUTHORITY: SECTION 21 OF THE FEDERAL HIGHWAY ACT, APPROVED NOVEMBER 9, 1921 (42 STAT. 212) FOR ADMINISTERING PROVISIONS OF THE ACT AND FOR CARRYING ON NECESSARY HIGHWAY RESEARCH AND INVESTIGATIONAL STUDIES. APPROPRIATION DESIGNATION: "COOPERATIVE CONSTRUCTION OF RURAL POST ROADS, ADMINISTRATIVE EXPENSES."

PROPOSED EXPENDITURES: $3,500.00, BASED ON AN ESTIMATED TEST PERIOD OF THREE MONTHS AND INCLUDING ALL SALARIES, MATERIALS, SUPPLIES, OPERATION OF EQUIPMENT AND CONTINGENCIES.

History: In the December, 1921, issue of Public Roads, results of impact tests on several cushion wheels were published and include the only available data on this subject. A number of wheel companies have advanced claims that a protection to the road is afforded by the use of cushion wheels.

Since these earlier tests were made, improved instruments and methods for measuring impact have been developed. With these it should be possible to determine more definitely whether or not any protection is afforded the highway by the use of cushion wheels.

Date effective: It is proposed to conduct this work during the summer months of 1927. The program can be carried out in conjunction with the other motor-truck-impact work now on hand. Much of the equipment and apparatus is now at the Arlington Experimental Farm.