

VOL. 3, NO. 12

OCTOBER, 1928

A. C. ROSE, EDITOR

CONTENTS

SNOW-REMOVAL REPORT FOR THE WINTER OF 1927-28 - - - - - - 1

CURRENT CONDITION OF FEDERAL-AID ROAD WORK, AS OF SEPTEMBER 30, 1928 - 21

CAPPING SPECIMENS FOR COMPRESSION TESTS OF CONCRETE - - - - 22

GRADER CUTTING EDGES STANDARDIZED BY THE MISSISSIPPI VALLEY STATE HIGHWAY ASSOCIATION - - - - - 24



SNOW-REMOVAL REPORT FOR THE WINTER OF 1927-28

CONTRIBUTED BY H. G. MCKELVEY OF THE DIVISION OF CONSTRUCTION

COMPILED PRINCIPALLY FROM DATA COLLECTED FROM THE 36 STATE HIGHWAY DEPARTMENTS WITHIN THE HEAVY-SNOWFALL AREA

DURING THE WINTER OF 1927-28 SNOW WAS REMOVED FROM 111,645 MILES OF MAIN HIGHWAYS IN THE 36 STATES LYING WITHIN THE AREA OF HEAVY-SNOWFALL, ACCORDING TO REPORTS OF THE AUTHORITIES IN CHARGE OF THE WORK RECEIVED BY THE BUREAU OF PUBLIC ROADS. THE TOTAL COST OF THE SERVICE AS REPORTED, WAS SLIGHTLY IN EXCESS OF FIVE MILLION DOLLARS, AVERAGING APPROXIMATELY \$45 A MILE.

Reviewing the snow-removal reports of the past several seasons it appears that the initial rapid extension of mileage cleared is at an end and that hereafter increase in mileage will be limited mainly to the addition of newly improved roads. As shown by Table 1, the mileage of the program during the past season exceeded that of the previous year by only 4.6 per cent, as compared with a gain of 15 per cent a year ago and increases of 50 per cent or more in each of the several previous years.

THE SAME GENERAL TENDENCY IS TO BE OBSERVED IN RESPECT TO THE TOTAL COST OF THE SNOW-REMOVAL PROGRAM - AN INCREASE OF LESS THAN 9 PER CENT IN THE LAST YEAR AS COMPARED WITH INCREASES OF 24, 106, AND 93 PER CENT RESPECTIVELY IN THE THREE PRECEDING YEARS.

The average cost per mile cleared during 1927-28 was about 4 per cent greater than the average cost of the previous year, which in turn represented an advance of nearly 8 per cent over the costs of the preceding season. Since the winter of 1925-26, the expenditure per mile has increased only from \$40.38 to \$45.18. In the three years previous to the season of 1925-26 the cost per mile was less than \$30.

As there is little doubt that the work of removal has been conducted with increasing efficiency each year, the increase in cost per mile probably reflects a tendency - once the benefits of clearing have been demonstrated - more and more completely to remove the snow that falls. Undoubtedly the work done at an average cost of \$45.18 a mile in 1927-28 represented a much more complete service than that which in 1922-23 was done at a cost of \$28.12 a mile. In this connection it may be observed that the reports for the past season indicate that the snowfall in 22 of the 36 States was unusually light. Had the precipitation in these States been heavier the average cost per mile for the last year would doubtless have been higher. a the second second

A Deckard

and a stand of the second s The second se The second sec

Table 1.- Snow-removal mileage and expenditures in the 36 meavy-snowfall States puring the five-vear period from 1923 to 1928

5

I NCREASE	OVER	PRECED ING	YEAR	PER CENT				-18.5		28.3		37.4		7.7		3°9	
AVERAGE :	COST :	PER	MILE :	••	••	\$ 28.12:	••	22.91 :	••	29.39 :	••	40.38 :	••	43.50 :	••	45. 13 :	••
I NCREASE :	OV ER	PRECEDING :	YEAR :	PER CENT :	••	••	••	24 .	••	93	••	106 .	••	24	••	8.7:	••
: TOTAL :	: COST :	: OF SNOW :	: REMOVAL :	••	••	\$ 762,159:	••	946,262;		:1,826,813:	•••	:3,757,633:	•••	:4,641,037:	•••	:5,043,779:	•••
NCREASE	OVER	PRECEDING	YEAR	PER CENT				25		20		20		15		4	
TOTAL MILEAGE	: OF ROADS :	: CLEARED :	: OF SNOW :	MILES :	••	: 27,096	•••	: 41,302 :	•••	: 62,167 :		: 93,006		: 106,721 :	•••	: 111,645 :	•••
		WINTER				1922-23		1923-24		1924-25		1925-26		1926-27 :		1927-28	••

- 2 -





-

and the second second

Ξ.

IN THE SIX YEARS SINCE THE FIRST SNOW-REMOVAL REPORT WAS ISSUED THERE HAS BEEN A STEADY IMPROVEMENT IN THE MACHINES AND EQUIPMENT AVAILABLE FOR THE WORK AND AN INCREASING AMOUNT OF EQUIPMENT HAS BEEN EMPLOYED IN EACH SUCCESSIVE YEAR. THE LATTER FACT IS INDICATED BY TABLE 2. SINCE [922 THE NUMBER OF TRUCK PLOWS IN USE HAS MULTIPLIED OVER 18 FOLD - FROM 184 TO 3,4[2. THE NUMBER OF TRACTOR PLOWS HAS INCREASED IN THE SAME PERIOD FROM 28] TO 1,275. THE FACT THAT THE TOTAL NUMBER OF EOTH TYPES OF PLOWS - 4,687 IN [927-28 - MULTIPLIED MORE THAN 11 FOLD IN THE SIX-YEAR PERIOD DURING WHICH THE MILEAGE OF ROAD CLEARED INCREASED ONLY ABOUT 4 FOLD IS ANOTHER INDICATION OF THE GREATER COMPLETENESS OF REMOVAL. THE USE DURING THE PAST SEASON OF LESS THAN HALF THE NUMBER OF GRADERS EMPLOYED DURING THE PREVIOUS YEAR SEEMS TO INDICATE THAT THE GRADER HAS BEEN FOUND LESS EFFECTIVE THAN THE TRUCK AND TRACTOR PLOWS.

TREND TOWARD STATE CONTROL

IN 17 OF THE 36 STATES IN WHICH SNOW WAS CLEARED FROM THE HIGHWAYS IN 1927-28, ALL WORK DONE WAS UNDER THE SUPER-VISION OF THE STATE HIGHWAY DEPARTMENT. IN 15 OTHER STATES WORK WAS DONE BY BOTH THE STATE AND THE COUNTIES OR OTHER LOCAL GOVERNMENTS. IN SOME OF THESE STATES THE STATE-HIGHWAY DEPART-MENT COOPERATED WITH THE LOCAL AUTHORITIES, IN OTHERS THE COUNTIES INDEPENDENTLY CLEARED CERTAIN ROADS UNDER THEIR JURISDICTION AND SO ADDED TO THE MILEAGE CLEARED BY THE STATE. IN ONLY 4 STATES IN 1927-28 WAS THE WORK DONE SOLELY UNDER LOCAL CONTROL.

IN 1922-23, THE FIRST YEAR FOR WHICH REPORTS WERE RECEIVED, THE WORK WAS DONE EXCLUSIVELY BY THE STATE IN 11 STATES, BY BOTH THE STATE AND THE LOCAL GOVERNMENTS IN ONE STATE, AND EXCLUSIVELY BY THE LOCAL GOVERNMENTS IN 8 STATES. SINCE THAT YEAR THERE HAS BEEN A STEADY TREND TOWARD INCREASED ACTIVITY BY THE STATE AND DECREASED ACTIVITY BY THE LOCAL GOVERNMENTS AS INDICATED BY TABLE 3. .»

And the second

.

1997 - 1997 - 1997 1997 - 1997 - 1997 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1

1. A.

,C

TABLE 2.- EQUIPMENT USED IN SNOW-REMOVAL OPERATIONS IN THE 36 HEAVY-SNOWFALL STATES DURING THE SIX-YEAR PERIOD FROM 1922 TO 1928 BEGINNING WITH THE WINTER OF 1922-23

)

UI PMENT		GRADERS		,									1,511		4,272		2,075	
ANEOUS EQ	••	FRACTORS:	••	••	••	••	••	••	••	••	••	••	1,348:	••	1,600:	••	2,245:	••
MISCELLA	••	TRUCKS:	•••	••	••	••	••	•••	••	•••	••	••	: 3,943:	••	: 4,365:	••	: 5,239:	••
INCREASE	: OVER	PRECEDING	: YEAR		PER CENT			•••	: 274	•••	: 26	•••	: 76	•••		•••	20	••
TOTAL NUM-	BER OF	TRUCK AND	TRACTOR	PLOWS			405		1,514		1,902		3,349		3,896		4,687	
INCREASE :	OVER :	PRECEDING:	YEAR :	••	PER CENT :	••	••	••	30	••	55 :	••	80	••	33 :	••	19	••
NUMBER OF	TRACTOR :	PLOWS :		••			281		287		446		803	•••	1,069	•••	1,275	
INCREASE	OVER :	PRECEDING:	YEAR :		PER CENT				567 :		0		. 75 :		11			
NUMBER OF	: TRUCK	: PLOWS :					: 184		: 1,227		: 1,456		: 2,546		: 2,827		3,412	
		WINTER					1922-23		1923-24		1924-25		1925-26		1926-27		1927-28	

- 4 -

•

·. ·. •• ... ** +A +*

	:	NUMBER OF STATES	
WINTER	: CONTROL	: CONTROL BY	: CONTROL
	: EXCLUSIVELY	STATE AND LOCAL	: EXCLUSIVELY
	: BY STATE	GOVERNMENTS	BY LOCAL
	:	:	GOVERNMENTS
1922-23	: 11	I	8
1923-24	: 21	2	3
1924-25	21	3	12
1925-26	4	16	4
1926-27	10	19	7
1927-28	: 17	15	4

TABLE 3 .- CONTROL OF SNOW REMOVAL



. . : : :

¢ : 8 :

SNOW-REMOVAL COSTS

To DETERMINE APPROXIMATELY THE COST OF SNOW REMOVAL, THE BUREAU OF PUBLIC ROADS HAS MADE A BRIEF STUDY DURING THE PAST YEAR OF THE EXPENDITURES IN THOSE STATES AND COUNTIES WHERE RECORDS WERE MOST READILY AVAILABLE. THE TERRITORIES SELECTED ARE FAIRLY REPRESENTATIVE, AND THEIR COSTS IN EACH CASE HAVE BEEN REDUCED TO A COST PER INCH-MILE OF SNOW REMOVED.

THESE FIGURES ARE NOT EXPECTED TO SUPPLY A RELIABLE SCALE WITH WHICH TO ESTIMATE THE COST OF SNOW REMOVAL FROM RURAL HIGH-WAYS GENERALLY, BUT IT IS BELIEVED THAT THEY WILL SUGGEST WITHIN REASONABLE LIMITS, THE PROBABLE COST OF WORK OF THIS NATURE IN AREAS OF SIMILAR SNOWFALL AND TEMPERATURE AND LIKE WORKING CONDITIONS.

WHILE THE AVERAGE TOTAL DEPTH OF SNOWFALL OVER THE ENTIRE AREA DURING THE SEASON IS EMPLOYED IN CALCULATING THE COST PER INCH-MILE FOR ITS REMOVAL, IT IS WELL KNOWN THAT IT IS NEVER NECESSARY TO REMOVE ALL THE SNOW THAT FALLS. WHEN THE TEMPER-ATURE IS ABOVE THE FREEZING POINT DURING OR AFTER THE STORM THE SNOW MELTS RAPIDLY AND DOES NOT NEED TO BE REMOVED. ALSO IT IS THE PRACTICE IN MOST STATES NOT TO REMOVE SNOW WHICH FALLS TO DEPTHS OF LESS THAN 2 INCHES. FOR THESE AND SIMILAR REASONS THE COSTS PER INCH-MILE REPORTED HEREAFTER ARE PROBABLY LOWER THAN THE TRUE COSTS OF THE WORK ACTUALLY PERFORMED.

However, it will be observed that the costs reported in MANY INSTANCES INCLUDE CAPITAL INVESTMENTS WHICH RIGHTLY SHOULD BE CHARGED TO THE WORK OF SEVERAL YEARS, BUT WHICH, BECAUSE OF THE INADEQUACY OF ACCOUNTING METHODS EMPLOYED, IT IS NOT POSSIBLE SO TO DISTRIBUTE WITH SUFFICIENT ACCURACY TO WARRANT THE ATTEMPT. THE INCLUSION OF THESE ITEMS WOULD TEND TO INCREASE THE COST.

FOR THESE AND OTHER REASONS THE COSTS WHICH ARE PRESENTED HEREAFTER SHOULD BE REGARDED AS ROUGH APPROXIMATIONS. SO RE-GARDED, IT IS BELIEVED THAT THEY WILL BE FOUND USEFUL UNTIL SUCH TIME AS MORE ACCURATE ANALYSES MAY BE POSSIBLE.

METHODS AND COSTS OF SNOW REMOVAL IN IOWA.

IOWA IS DIVIDED INTO 9 ENGINEERING DISTRICTS. SNOW RE-MOVAL FROM THE STATE HIGHWAYS IS DIRECTED BY THE MAINTENANCE ENGINEER OF THE STATE HIGHWAY DEPARTMENT THROUGH THE VARIOUS DISTRICT ENGINEERS. THESE ENGINEERS USUALLY APPOINT ASSISTANT DISTRICT ENGINEERS TO TAKE CHARGE OF SNOW REMOVAL AND OTHER MAINTENANCE WORK, AND THESE ASSISTANT ENGINEERS IN TURN SUB-DIVIDE THE DISTRICTS INTO MAINTENANCE SECTIONS, CONSISTING OF FROM ONE TO THREE COUNTIES, WHICH ARE PLACED IN CHARGE OF MAINTENANCE SUPERINTENDENTS. NUMEROUS COUNTIES REMOVE SNOW FROM COUNTRY ROADS, BUT THIS REPORT COVERS STATE WORK ONLY.

TABLE 4 SHOWS THE SNOWFALL, TEMPERATURE, COST OF SNOW REMOVAL PER INCH-MILE OF ROAD, EQUIPMENT USED, AND OTHER DATA FOR THE ENTIRE STATE OF IOWA, SEGREGATED BY DISTRICTS. DIS-TRICT NO. 5 IS LOCATED IN THE SCUTHEASTERN PART OF THE STATE WHERE THE WEATHER AND OTHER CONDITIONS PREVAILING DURING THE PAST WINTER CONTRIBUTED TOWARDS REDUCING THE COST OF THE RE-MOVAL WORK TO A MINIMUM. BECAUSE OF THE UNUSUALLY LOW TOTAL COST OF THE WORK, THE DATA WERE NOT CONSIDERED REPRESENTATIVE AND THE AVERAGE PER INCH-MILE WAS NOT COMPUTED.

THE MILEAGE UNDER THE CAPTION "ROAD CLEARED" INCLUDES THE ROADS IN EACH DISTRICT WHERE SNOW REMOVAL MAY BE REQUIRED, BUT CERTAIN SECTIONS MAY BE SO LOCATED TOPOGRAPHICALLY AS TO MAKE LITTLE IF ANY CLEARING WORK NECESSARY DURING THE SEASON, WHILE OTHER SECTIONS MAY NEED STRENUOUS EFFORTS IN ORDER TO KEEP THEM OPEN AND PASSABLE.

THE STATE REPORTS THAT 90 PER CENT OF THE ROADS IN THE VARIOUS DISTRICT PROGRAMS WERE PROTECTED FROM DRIFTING CONDI-TIONS WITH SNOW FENCE OR BY OTHER MEANS, WHERE SUCH PROTECTION WAS CONSIDERED NECESSARY. FOR (ISTRICTS 1, 2, 3, 4, 7 AND 8, IT HAS BEEN ESTIMATED THAT 80 PER CENT OF THE WORK WAS ON INITIAL OR PATROL CLEARING, AND 20 PER CENT ON WIDENING OPER-ATIONS. FOR DISTRICT 5, ALL OF THE WORK REPRESENTS INITIAL CLEARING, AND FOR DISTRICTS 6 AND 9, 90 PER CENT WAS INITIAL AND 10 PER CENT WIDENING WORK. THE TOTAL COST ITEMS INCLUDE PURCHASE OF EQUIPMENT; PURCHASE, INSTALLATION AND REMOVAL OF SNOW FENCE, WAGES PAID LABORERS, FOREMEN, AND MOTOR DRIVERS, AND THE SALARY OF THE MAINTENANCE SUPERINTENDENT. OF COURSE, TO MAKE THE COST PER INCH-MILE MORE RELIABLE AND USEFUL, THE AMOUNTS EXPENDED FOR EQUIPMENT, SNOW FENCE, AND FOR THE OTHER ITEMS SHOULD BE SHOWN SEPARATELY BUT THOSE DATA ARE NOT AVAIL-ABLE FOR THE PAST SEASON.

- 8 -

NOTE: THE FIGURES FOR AVERAGE SNOWFALL, MEAN TEMPERATURE, AND COST PER INCH-MILE ARE APPROXIMAJE.

	: FENCE				:WILES		: 130	••••••	53 •••••		: 36		: : 135	: 35	: 598
	GRADERS					36	55	16	16	8	18	23	24 44	40	213
	: ACTORS			••	••	55	15	55	5 5 5	44	5	50	9 2	37	232
	JCKS:TF		••		••	46	47 :	14	14	14	23 	30 ::	23	 50	31 :
	R: TRU	••	••	•••	••	••••	•• ••	•• ••		•• ••	•• ••			•••••	∾
I PIMENT	TRACTO ROTARY	PLOWS				1	Ю		-	I	1	1	I	1	<u>م</u> ا
EQU	RACTOR	MENT :	PLOWS :	••	••	സ വ	പ	4	4	۰۰ ۰۰ ما	т. М	 9	ω	·· ·· ··	35 :
		NS:	••	••	••	•••	•••	•• ••	•• ••	•• ••		•• ••	•• •• •	• •• ••	••
	TRUCI	PLO				I	വ		-	ł	ł			ł	9
	NUCK:	ACE-	AENT :	LOWS:	••••	52 52	24	12		თ	5	15	15	10	143 :
	OST :Tr PER : C	NCH- : PL	11LE : N	••	••	2.24	2.05:	1.89	1.48:	•• ••	2.28:	1.94:	2.64:	3.52:	••
•••	TOTAL :C COST :		2	••		\$ 38,510:\$	50,474:	32,083:	12,412:	1,903:	23,649:	: 39,315:	64,416:	23,152:	, 285,914:
••	VIDTH .			••	FEF	58	58 58	8 2	58	58	58 58 58	58 58	80 80 10	58	••
••	ROAD V			••	MILES :	865	750 :	812	697	796	812	822	754 :	773 :	,081 :
••	MEAN :	ATURE :	••	••	DEGREES:	36.0 :	32.1 :	33.5 :	37.7 :	39.1 :	36.9	33.5	33.2	38.5 :	
•••	VERAGE :	927-28 :	••	••	INCHES :[19.9	32.9	20.9	12.0 :	16.6	12.8	24.6 :	32.4	8.5 8	••
•••	A:-1710	No. :1	••		••	•••	 വ		4	۰۰ ۰۰ م	 9			•••••• σ	OTALS

SWOWLEEWOVAL DATA - SEASON DE 1927-1928 - FOR THE STATE DE 10WA <

.

.

			 		 	 1.1	 	
••				•				

•

	,	
	•	

والمراجع والمراجع والمراجع والمراجع والمعاصر والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع

•			•	

and the second second

	 ••	· · · · · ·	 •• •• •• ••	
•	 	••• •• •• •	 ··	

.

METHODS AND COSTS OF SNOW REMOVAL IN NEW YORK

THE STATE OF NEW YORK EXPERIENCES GENERALLY CONSIDERABLE SNOWFALL. ITS, REMOVAL FROM THE MAIN HIGHWAYS IS ACCOMPLISHED BY THE COUNTIES OR TOWNSHIPS, AND IN SOME INSTANCES BY BOTH. IN TABLE 5 ARE GIVEN DATA ON THE COST PER INCH-MILE FOR SEVERAL COUNTIES IN THE WESTERN, CENTRAL, AND EASTERN SECTIONS OF THE STATE.

CHAUTAUQUA COUNTY LIES ALONG THE SHORE OF LAKE ERIE, AND IN THE EXTREME SOUTHWESTERN PART OF THE STATE. APPROXIMATELY 60 PER CENT OF THE WORK INVOLVED CONSISTED OF INITIAL OR PATROL CLEARING, AND 40 PER CENT OF WIDENING OPERATIONS. ABOUT 30 PER CENT OF THE TOTAL EXPENDITURE WAS FOR THE PURCHASE OF EQUIPMENT; 18 PER CENT WAS FOR THE PURCHASE, INSTALLATION AND REMOVAL OF SNOW FENCE; 17 PER CENT WAS FOR WAGES OF LABOR, FOREMEN, MOTOR DRIVERS AND FOR SUPERINTENDENCE; 10 PER CENT COVERED DEPRECIA-TION, UPKEEP OR RENTAL OF EQUIPMENT, INSURANCE ON LABOR, ETC., AND 25 PER CENT WAS FOR SUCH ITEMS AS GASOLINE, OIL, GARAGE CHARGES, AND MATERIALS. THE SUPERINTENDENT OF HIGHWAYS IN CHARGE OF THIS COUNTY CONTENDS THAT THE COST OF SNOW-REMOVAL WORK DOES NOT DEPEND SO MUCH ON THE DEPTH OF FALL AS UPON THE DIRECTION AND INTENSITY OF THE WIND DURING THE PRECIPITATION. ATTENTION IS CALLED TO THE FACT THAT THE COST PER INCH-MILE FOR THIS COUNTY WAS COMPUTED FROM A TOTAL COST ABOUT 30 PER CENT OF WHICH WAS USED FOR THE PURCHASE OF EQUIPMENT, AND 18 PER CENT FOR THE PURCHASE AND MANIPULATION OF SNOW FENCE.

The MAIN HIGHWAYS OF CATTARAUGUS COUNTY, ADJOINING CHAUTAUQUA COUNTY ON THE EAST AND FORMING A PART OF THE SOUTH-ERN TIER OF THE STATE, WERE COVERED WITH A TOTAL OF APPROX-IMATELY 55 INCHES OF SNOW DURING THE PAST WINTER. THE AGGRE-GATE COST INDICATED FOR THE REMOVAL WORK INCLUDES THE AMOUNTS SPENT FOR LABOR, FOREMEN, MOTOR DRIVERS, AND SUPERINTENDENTS; ESTIMATED AMOUNTS TO COVER OVERHEAD EXPENSE, UPKEEP OF EQUIP-MENT, INSURANCE ON LABOR, AND MISCELLANEOUS ITEMS. SEVENTY PER CENT OF THE WORK WAS INITIAL OR PATROL CLEARING, AND 30 PER CENT WAS THE WIDENING OF PRELIMINARY CUTS. IN ADDITION TO THE TOTAL SHOWN, THE COUNTY EXPENDED \$7,900 FOR THE PUR-CHASE OF NEW EQUIPMENT AND SNOW FENCE. THE INSTALLATION AND REMOVAL OF SNOW FENCE WAS ACCOMPLISHED BY THE TOWNSHIPS. IT IS REPORTED THAT 50 PER CENT OF THE MILEAGE IN THE PROGRAM WAS PROTECTED BY SNOW FENCE.

- 9 -

and the second second

Ховк	
NEW	
Р	
State	
ПΗЕ	
FOR	
۱ m	
2020	
1927-	
ЧО	
SEASON	
1	
DATA	
٩L	
IOW-REMOV	
ະ ທີ	
0	
TABLE	

••

1

			the second										
••	••	••	••	••	••	!			LLJ.	QU: FMENT			
••	AVER-:	MEAN :	ROAD :	WIDTH :	TOTAL :(Cosr :T	RUCK: T	RUCK	TRACTOF	RAC'OR	••		
COUNT JES :	AGE :1	TEMPER-:	CLEARED:	CLEARED:	COST :	Р Е R	L: -S - O	CTARY:	-S10	ROTARY	:TRUCKS:	TRACTORS	SNOW
••	-MONS	ATURE :	••	••	••	INCH- : P	LACE-		PLACE-	: PLOWS	••		FENCE
••	FALL :	••	••	••		MILE :	· THILW	••	MENT	••	••		
••	1927-28:	••	••	••	••	••	L.C.NS:	••	PLOWS	••	••		
••	NCHES:[DEGREES:	MILES :	FEET :	••	••	•••	••		••			:MILES
CHAUTAUQUA :	53.2 :	37.5 :	161	24	9 40,500:	\$4.73:	 00		4	1	•• ຫ	4	: 65
••	••	••	••	••		••	••	••		•••	•••		
CATTARAUGUS:	55.5:	38.0 :	310 :	18 :	26,205:	1.52:	13 :	 1	4	، 	: 17 :	4	: 25
••	••	••	••	••	••	••	••	••		••	•••		••
ERIE	80.7 :	35.7 :	400	10	112,542:	3.49:	: 09	1	18		 09 	19	: 32
••	•••	••	•••	•••	••	••	•••	•,		•••	•••		
NIAGARA :	37.5 :	35.5 :	125 :	16	5,537:	1.18:	•• 0	••	თ	۱ 		9	00
••	••	••	••	••	••	••	••	••		e. a	••		••
ONONDAGA :	87.1 :	36.3 :	305 :	22-30:	18,182.	0.63:	23 :	••	1	دى 	: 23 :	വ	: 11
••	•••	••	••	••	••	••	••	••			•••		
WARREN :	85.5	35.2 :	125	30	15,000:	1.40:	 വ	••	2	۱ ۰۰	••	I	9
••	••	••	••	••	••	••	••	••		•••	••		
TOTALS :	••	••	1,426 :	••	\$217,966:		12		39	: 3	: 115 :	35	: 147
				A REAL PROPERTY AND A REAL PROPERTY A REAL PROPERTY AND A REAL PROPERTY AND A REAL PROPERTY AND A REAL PROPERTY AND A REAL PROPERTY A REAL									
NOTE: THE F	IGURES F	FOR AVER	AGE SNOW	FALL, ME.	AN TEMPER	ATURE,	AND 00	OST PER	-HON I	ALE ARE	APPROX IN	ATE.	

- 10 -

T

and the second second

1. A state of the state of t

The second s

THE TOTAL COST OF THE WORK IN ERIE COUNTY, SURROUNDING THE CITY OF BUFFALO, MAY BE SEPARATED INTO THE FOLLOWING ITEMS: 43.9 PER CENT FOR THE PURCHASE OF EQUIPMENT AND SNOW FENCE; 34 PER CENT FOR THE INSTALLATION AND REMOVAL OF SNOW FENCE, WAGES OF LABOR, FOREMEN, AND MOTOR DRIVERS, AND SALARY OF SUPERINTENDENTS;22.1 PER CENT FOR THE INSURANCE OF LABOR AND FOR MISCELLANEOUS EXPENSES. IT IS BELIEVED THAT THE HIGH COST PER INCH-MILE IS ACCOUNTED FOR LARGELY BY THE FACT THAT APPROX-IMATELY 66 PER CENT OF THE TOTAL COST WAS EXPENDED ON PURCHASE OF EQUIPMENT, INSURANCE OF LABOR, ETC. ANOTHER FACTOR THAT SHOULD BE CONSIDERED IS THAT THIS COUNTY INCLUDES HILLY TERRAIN WHICH IS RESPONSIBLE FOR CONSIDERABLE DRIFTING.

NIAGARA, THE EXTREME NORTHWESTERN COUNTY OF THE STATE, BOUNDED ON THE WEST BY THE NIAGARA RIVER, AND ON THE NORTH BY LAKE ONTARIO, EXPERIENCED AN AVERAGE DEPTH OF 37.5 INCHES OF SNOW DURING THE WINTER OF 1927-28, AND A MEAN TEMPERATURE OF 35.5 DEGREES. THE DATA IN TABLE 5 SHOW THAT \$5,537 WAS EX-PENDED ON SNOW REMOVAL WORK FOR THE ENTIRE SEASON. FORTY-SEVEN PER CENT OF THAT SUM WAS USED FOR THE INSTALLATION AND REMOVAL OF SNOW FENCE AND THE REMAINDER FOR THE WAGES OF LABOR, FOREMEN AND MOTOR DRIVERS, THE SALARY OF SUPERINTENDENTS, ESTI-MATED AMOUNTS FOR OVERHEAD, EQUIPMENT DEPRECIATION, UPKEEP, OR RENTAL, INSURANCE OF LABOR, AND OTHER MISCELLANEOUS ITEMS. WIDENING WORK WAS ACCOMPLISHED BUT THESE COSTS WERE NOT SEGRE-GATED FROM THE OTHER WORK. ALL ROADS WERE PROTECTED FROM DRIFTING WHERE SUCH PROTECTION WAS NECESSARY.

ONONDAGA COUNTY, WHICH INCLUDES THE CITY OF SYRACUSE, IS WELL ORGANIZED FOR THE REMOVAL OF SNOW FROM ITS RURAL ROADS. WITH REGARD TO THE DATA SHOWN IN TABLE 5, 75 PER CENT OF THE ROADS ON THE PROGRAM WERE PROTECTED FROM DRIFTING; 30 PER CENT OF THE WORK REPRESENTED INITIAL OR PATROL CLEARING; AND 70 PER CENT WIDENING ACTIVITIES. THE TOTAL FUNDS EXPENDED COVER THE FOLLOWING ITEMS: \$5,326 FOR THE RENTAL AND REPAIR OF EQUIPMENT, AND ALSO FOR DEPRECIATION, CARRYING CHARGES AND INTEREST ON THE INVESTMENT; \$1,824 FOR THE MANIPULATION OF THE 8 MILES OF SNOW FENCE HANDLED BY THE COUNTY; \$7,367 AS WAGES OF LAEOR, FOREMEN, AND MOTOR DRIVERS; AND \$3,665 FOR SUPPLIES AND OTHER EXPENSES. $\begin{array}{c} \mathbf{x} = \mathbf{x} \\ \mathbf{x} = \mathbf$

1.0.11

WARREN COUNTY IS SITUATED WITHIN RATHER A MOUNTAINOUS TERRITORY LYING ON THE SHORE OF LAKE GEORGE AND EAST AND SOUTH OF THE ADIRONDACK STATE PARK. THE TOTAL COST SHOWN IN TABLE 5 FOR THE SNOW-REMOVAL WORK INCLUDES PERCENTAGES PAID FOR THE INSTALLATION AND REMOVAL OF SNOW FENCE; WAGES OF LABOR, FORE-MEN, AND MOTOR DRIVERS, AND SALARIES OF SUPERINTENDENTS; BUT EXCLUDES EXPENDITURES MADE FOR THE PURCHASE OF EQUIPMENT OR ITS UPKEEP, THE INITIAL COST OF SNOW FENCE, AND AMOUNTS ESTI-MATED FOR OVERHEAD EXPENSE, OR MISCELLANEOUS ITEMS. SIX MILES OF SNOW FENCE WERE PROVIDED WHERE DRIFTING CONDITIONS WERE SERIOUS, AND AN AMPLE WIDTH OF CLEARED ROADWAY WAS MAINTAINED THROUGHOUT THE WINTER.

SNOW-REMOVAL METHODS AND COSTS IN RHODE ISLAND

THE STATE OF RHODE | SLAND EMPLOYS A SNOW-REMOVAL FORCE CONTINUOUSLY THROUGHOUT THE WINTER SO AS TO HAVE PERSONNEL ALWAYS IN READINESS TO OPERATE WHEN THE SNOW HAS FALLEN TO THE REQUIRED DEPTH. THE SNOW-REMOVAL WORK IS IN CHARGE OF A NUMBER OF DISTRICT ENGINEERS, WITH HEADQUARTERS AT PROVIDENCE, WORKING UNDER A MAINTENANCE SUPERINTENDENT WHO REPORTS TO THE CHIEF ENGINEER. THE EQUIPMENT WHEN NOT IN USE IS STORED AT A CENTRAL SHOP OR AT VARIOUS DIVISION SHOPS SCATTERED OVER THE STATE. WHEN THE FALLING SNOW REACHES A DEPTH OF 2 INCHES, EACH FOREMAN NOTIFIES HIS DIVISION ENGINEER THAT HE IS BEGIN-NING OPERATIONS ON HIS SECTION. DURING A STORM EACH DISTRICT ENGINEER REMAINS AT HIS HOME OR OFFICE UNTIL ALL OF HIS FORE-MEN HAVE REPORTED AND THEN GOES INTO THE FIELD TO SUPERVISE THE WORK. WHEN THE STORM ENDS AND THE INITIAL CLEARING IS COM-PLETED, THE FOREMEN TELEPHONE TO THE PRINCIPAL OFFICE THAT THE ROADS IN THEIR RESPECTIVE SECTIONS ARE OPEN. UNDER THIS METHOD OF PROCEDURE, THE DATA INDICATE THAT SNOW REMOVAL COST THE STATE AN AVERAGE OF \$4.55 PER INCH-MILE FOR THE SEASON OF 1927-28. THE MEAN TEMPERATURE FOR THE STATE LAST WINTER WAS ABOUT 44 DEGREES. THE AVERAGE WIDTH OF THE PLOWED CUT, AFTER WIDEN-ING, WAS 24 FEET. APPROXIMATELY 60 PER CENT OF THE COST WAS EXPENDED ON INITIAL CLEARING AND 40 PER CENT ON WIDENING. THE TOTAL COST UPON WHICH THE COST PER INCH-MILE WAS EASED REPRESENTS EXPENDITURES FOR LABOR, FUEL AND OIL, BUT DOES NOT INCLUDE ANY CHARGE FOR EQUIPMENT OR ITS DEPRECIATION, OVERHEAD, OR INSURANCE. ABOUT 80 PER CENT OF THE COST WAS FOR LABOR AND 20 PER CENT FOR FUEL AND OIL.

SNOW-REMOVAL METHODS AND COSTS IN CONNECTICUT

THE STATE OF CONNECTICUT IS DIVIDED INTO ELEVEN REPAIR DISTRICTS EACH IN CHARGE OF A SUPERVISOR OF REPAIRS WHOSE DUTIES INCLUDE THE REMOVAL OF SNOW UNDER THE GENERAL DIRECTION OF THE STATE ENGINEER OF MAINTENANCE. THE STATE CONFINES ITS SNOW-REMOVAL WORK TO THE STATE HIGHWAYS. IN SOME INSTANCES THE TOWNS CLEAR THEIR LOCAL ROADS, BUT DATA ON SUCH WORK ARE NOT INCLUDED IN TABLE 6 WHICH GIVES THE INFORMATION FOR THE STATE WORK ONLY. THE SNOW-REMOVAL EQUIPMENT IS OWNED BY THE STATE AND LOANED TO THE VARIOUS MAINTENANCE DISTRICTS ON A RENTAL BASIS. PLOWS AND TRUCKS ARE ALLOTTED TO EACH DISTRICT, BUT WHEN NOT NEEDED AT THESE LOCATIONS ARE WITHDRAWN AND RE-ALLOTTED TO OTHER DISTRICTS WHERE A HEAVY SNOWFALL HAS OCCURRED.

THE TOTAL COST OF THE WORK FOR THE DIFFERENT DISTRICTS INCLUDES WAGES PAID LAGOR, FOREMEN, AND MOTOR DRIVERS, EQUIP-MENT DEPRECIATION, UPKEEP AND RENTAL, AND OTHER MISCELLANEOUS ITEMS, BUT OMITS COSTS INVOLVING THE PURCHASE OF EQUIPMENT, THE PURCHASE OR HANDLING OF SNOW FENCE, CHARGES FOR SUPERIN-TENDENCE, OR ANY ESTIMATED AMOUNTS FOR OVERHEAD EXPENSE, OR INSURANCE OF LAGOR. BOTH INITIAL AND WIDENING WORK WERE CARRIED ON, BUT NO SEGREGATION OF COST OF THESE ACTIVITIES WAS MADE.

THE COST PER INCH-MILE FOR DISTRICT NO. 7 IS HIGH BE-CAUSE THIS DISTRICT LIES IN THE BERKSHIRE HILLS REGION AT THE NORTHWESTERN CORNER OF THE STATE, WHERE HEAVY DRIFTS ARE EN-COUNTERED. FURTHERMORE, ALTHOUGH IT IS ESTIMATED FROM THE UNITED STATES WEATHER BUREAU DATA THAT AN AVERAGE OF 27.6 INCHES OF SNOW FELL OVER THE ENTIRE DISTRICT DURING THE SEASON, THE STATE RECORDS SHOW THAT 63 INCHES OF SNOW FELL IN CERTAIN SECTIONS OF THE DISTRICT.

and the first state of the second state of the

A set of the set of

TABLE 6. - SNOW-REMOVAL DATA - SEASON OF 1927-1928 - FOR THE STATE OF CONNECTICUT

			MON	ENCE		ILES		I	1.5	0.8	0.1	1	1	8.5	1	0.8	0.6	0.2			12.5	
		••	လ လ လ	<u>لد</u>	••	2	••	••	••	• ••	- 44.0	••	•••	••	• •	• •	•••	•••	••	·	••	
			DER					I	I	1	I	I	1	1	1	ł	1	1			1	
			RA								• •											
	••	••	S: S	••	••		••	••	•••	••	••	••	••	••	••	••	••	••	••		••	
			105					1	1	1		1	ŧ	4	-	1	1				2	į
			RAC																			
	••	••	s:T	••	••		••	••	••	••	••	••	••	••	••	• •	••	••	••		• •	
			JOK					17	18	16	13	14	ົ້	32	6	17	15	20			202	
			T R								••			••	••	••						
ENJ	OR	ž	ŝ																			
NG -	ACT	DTA	LOW					1	1	1	1	ł	1	I	1	ł	I	1			1	
С С С	T.	ŭ	Q.	••	••		•••	••	••	••	• •	••	••	••	••	••	֥	••	••		**	
	TOR	۱ دی	100	F	SM																	
	DAG.	ā	DLA	MEN	5			1	1	1	1	1	1	1	1	1	1	I.			1	
	. .		••	••		••	••	à 10	••	••	••	••	••	••	••	••	••	••	••			
	ЧĊ	AFY	SWC					1	1	1	1	t	1	1	1	1	1	ı.			r	-
	TRI	ROT	Ъ																			
	х У	:	•• і ш	•• 	ţŞ,	• •	••	**	••	••	••	••	••	••	••	••	••	••	••		••	+
	# UC	018	DV-	VEN.	LOW			25	25	25	25	25	25	52	25	25	25	25			275	-
	ا	••	ā	••	۵ 	••	••				•••	••					••		••		**	
	OST	ЕR	1 O	ЦЕ					30.	30.0		<u>6</u>	.40	ы. С		9.		.70				1
••	ŏ	u.	4	∑		••		\$						••	••				••		••	
		٩L	Ŧ					062	429	972	088	336	703	019	455	386	335	930			765	
		Tot	000					m,	4	ົບ	m,	6	ъ 2	<u>ю</u>	ъ.	·†	4	ໝື			71,	
••	••	•••		••		••	••	\$ ••	••	••	••	••	••	••	••	••	••	••			••	
		TH	REC			H		-50	32	32	N M	32	35	32	25	32	32	32				
		MIC	LE/			ш Ц		26-	20,-	26-	26-	26-	5 0 0	26-	500	30.	26-	26-				
••	••	••	0:0	••	••	••	••	••	••	•••	••	••	••	••	••	••	••	• •			••	
		DYD	ARE			LΕS		181	192	163	149	185	239	510 510	27	177	150	178			351	
		С.	OLE			Ň															+	
•••	•• 7	1	••	••	••	ŝ	••		••	••	••	••	•• .n	••	•• m	••			••		••	
	1E A I	APER	-UR			RE		6.65	0.	f0.6	5.	0.	3. 0. 0.	37.	30 . 8	5	<u>.</u> 63	57.0				
	2	TEN	AT			DEG		1.1	7	-1	~1	-7	67	C 1	(1)	C 1	(1	C				
1	••• ຟ	M	 _	7-:		ES:	••	ς.	ດ	ö	. 7 .	တံ	ö	.0	5	in.	ö	9	••		••	
AVE	AG	SNO	FAL	132	28	NOL		**	4	5	13	17	17	27	20	53	26	53				
	1	OT:		••	•••		•••	••	••	••	•••	•••	••	••	••	••	••	••	•••		۹LS	
	0	TRI	No						വ	М	4	Q	9	2	ω	თ	10	=			Tor,	

THE FIGURES FOR AVERAGE SNOWFALL, MEAN TEMPERATURE, AND COST PER INCH-MILE ARE APPROXIMATE.

Note:

- 14 -

(

SNOW-REMOVAL METHODS AND COSTS IN WEST VIRGINIA

WEST VIRGINIA REPORTS SNOW-REMOVAL OPERATIONS FOR THE NORTHERN PART OF THE STATE ONLY. WITHIN THIS SECTION ONE OF THE ENGINEERING DIVISIONS, LOCATED IN MOUNTAINOUS TERRITORY, KEPT 27 | MILES OF ITS ROADS CLEAR OF SNOW FOR THE SEASON OF 1927-28 AT AN AVERAGE COST OF 45 CENTS PER INCH-MILE. THE MEAN TEMPERATURE FOR THE WINTER WAS 41.5 DEGREES, AND OPEN ROADS WERE MAINTAINED AT A WIDTH SF 16 FEET. THE WORK WAS DONE WITH 23 TRUCK DISPLACEMENT PLOWS, ONE ROTARY PLOW WITH A TRUCK MOUNT, AND TWO ONE-MAN GRADERS. THE AVERAGE SEASONAL SNOWFALL OVER THE ENTIRE DIVISION WAS 53.2 INCHES, AND \$6,440 WAS THE TOTAL EXPENDITURE FOR ITS REMOVAL. TWENTY-EIGHT PER CENT OF THIS AMOUNT WAS CHARGED AGAINST EQUIPMENT DEPRECIATION; 44 PER CENT WAS FOR THE HIRE OF LABOR, FORENEN, AND MOTOR DRIVERS; 4 PER CENT FOR SALARY OF SUPERINTENDENTS; 6 PER CENT ESTIMATED FOR OVERHEAD EXPENSE; 17 PER CENT FOR EQUIPMENT UP-KEEP, GAS, OIL, TIRE REPAIR AND GARAGE RENT, AND | PER CENT FOR HANDLING SNOW FENCE .

SNOW-REMOVAL METHODS AND COSTS IN ARIZONA

ARIZONA SUBMITTED SNOW-REMOVAL DATA FOR ONLY ONE ENGL-NEERING DIVISION. THIS DIVISION LIES IN THE CENTER OF THE STATE BETWEEN MARICOPA COUNTY ON THE SOUTH AND GRAND CANYON NATIONAL PARK ON THE NORTH. DURING THE WINTER OF 1927-28, THE SNOWFALL AVERAGED 24.8 INCHES AND THE MEAN TEMPERATURE WAS 46.7 DEGREES. THE SECTIONS OF ROAD CLEARED WERE NOT CONTINUOUS BUT WERE SCATTERED OVER THE DIVISION IN AREAS WITH VARIABLE DEPTHS OF SNOWFALL. THE AGGREGATE LENGTH OF ROAD CLEARED EQUALED 146 MILES WITH AN AVERAGE WIDTH OF 18 FEET. THE EQUIPMENT USED CONSISTED OF 3 DISPLACEMENT PLOWS MOUNTED ON TRACTORS, AND 7 GRADERS PULLED BY MOTOR TRUCKS. EIGHTY-FIVE PER CENT OF THE ACTIVITIES WERE CONFINED TO INITIAL CLEARING OR PATROL WORK AND 15 PER CENT TO WIDENING OPERATIONS. THE WORK COST \$2,715, OR AN AVERAGE OF 75 CENTS PER INCH-MILE. THE SUM TOTAL WAS SEGREGATED AS FOLLOWS: 33 PER CENT FOR HIRE OF LABOR, FOREMEN, AND MOTOR DRIVERS; 47 PER CENT FOR EQUIPMENT DEPRECIATION, UPKEEP OR RENTAL; AND 20 PER CENT FOR GAS, OIL AND GREASE. SNOW FENCES AND OTHER DRIFT-PREVENTIVE MEASURES WERE NOT EMPLOYED.

and the second second

- - - - N (23 - C - 1 14.1 ł

an an an Araba 21.1 Set 1 Av • the second second 4.52 • 1

Aver the second 4 - 1 × 1

SNOW-REMOVAL METHODS AND COSTS IN WISCONSIN

WHILE THE SNOW-REMOVAL DATA FOR WISCONSIN ARE SEGRE-GATED INTO THE NINE ENGINEERING DIVISIONS OF THE STATE HIGHWAY COMMISSION, THE WORK IS ACCOMPLISHED BY THE VARIOUS COUNTIES WITHOUT THE FINANCIAL AID OR THE ACTIVE CONTROL OF THE STATE AUTHORITIES. WINTER MAINTENANCE OF THE MAIN HIGHWAYS IS IN CHARGE OF THE RESPECTIVE COUNTY HIGHWAY COMMISSIONS WITH FUNDS PROVIDED BY THE COUNTIES. IN SOME INSTANCES THE TOWNSHIPS CLEAR THEIR ROADS, USING TOWN FUNDS, BUT SUCH ACTIVITIES ARE NOT INCLUDED IN THIS REPORT.

As may be seen in Table 7, the roads of all divisions, With the possible exception of those in Division 9, where light Snowfall was reported during the past winter, were protected FROM drifts with generous sections of snow fence. Likewise, With the exception of Division 5 and the other divisions shown Blank under the caption "Width cleared", more or less widening Work was accomplished. For Division 3, 25 per cent of the total cost was for widening activities; Division 4, 35 per cent; Division 7, 60 per cent; and in Division 8, 26 per cent of the cost covered this class of work.

DIVISIONS 3, 4 AND 8 REPORT THAT THEIR TOTAL COST FOR SNOW-REMOVAL WORK INCLUDES PURCHASE OF EQUIPMENT IN THE PROPOR-TIONS OF 25, 30, AND 15 PER CENT RESPECTIVELY. DIVISION 7 RE-PORTS THAT THEIR TOTAL COST DID NOT INCLUDE THE PURCHASE OF EQUIPMENT AND THE REMAINING DIVISIONS MADE NO REPORT CONCERN-ING THIS ITEM. DIVISION 3 SUPPLIED THE INFORMATION THAT THE COST OF SUPERINTENDENCE IS PAID FROM GENERAL COUNTY FUNDS, AND DIVISION 7 STATES THAT AMOUNTS PAID SUPERINTENDENTS AND ESTI-MATED CHARGES FOR OVERHEAD ARE NOT INCLUDED IN THE TOTAL COST OF SNOW-REMOVAL WORK; BUT THE OTHER DIVISION REPORTS GENERALLY INDICATED THAT THEIR RESPECTIVE TOTALS INCLUDED THE SALARY OF SUPERINTENDENTS. FOR ALL THE DIVISIONS REPORTING, INCLUDING 3 AND 7, THE TOTAL COST INCLUDED, AS A RULE, AMOUNTS FOR THE PURCHASE AND HANDLING OF SNOW FENCE; WAGES PAID LABOR, FOREMEN, AND MOTOR DRIVERS; ESTIMATED PERCENTAGE FOR OVERHEAD EXPENSE; EQUIPMENT DEPRECIATION, UPKEEP, OR RENTAL; INSURANCE OF LABOR; AND OTHER MISCELLANEOUS ITEMS.

5.8

TABLE 7.- SNOW-REMOVAL DATA - SEASON OF 1927-1928 - FOR THE STATE OF WISCONSIN

			>	ш		S		0	0	ო	m	м	۰t	ر س	10	(0		4	-
			SNOV	EN0		MILE		й	б Ю	ö	4	ö	വ്	ŭ T	õ	¢		22)
	•••	••	ເ ເ ເ ເ ເ ເ ເ เ เ เ เ เ เ เ เ เ เ เ เ เ		••	••	••	••	••	••	••	••	••	••	••	••	••	•	•
			RADE					40	1	ł	ഗ	ഗ	1	1	ы	1		6.5))
	•••	••	S:S	••	••	••	••	••	••	••	••	••	••	••	••	••	••	•	•
			RACTOR					20 20	5	13	11	12	15	21	16	1		135)) -
	••	••	5:1	••	••		••	••	••	••	• •	••	••	••	••	••	••	•	•
			RUCK					30	с† 17	30	24	21	16	16	14	1		195)) -
	н.	 ≻		••	••	••	••	••	••	••	••	••	••	••	••	••	••	•	•
MENT	RACTO	SOTAR'	PLOWS					-	1		ł	1	1	വ	1	1		4	
U I P	R:T	••		••	••		••	••	••	••	••	••	••	••	••	••	••	•	•
0' L!	RACTO	018-	LACE-	MENT	PLOWS			ი -	5	10	თ	വ	15	<u>1</u>	4	ଧ		112	
	ا	 ≻	0. ••	••		••	••	••	••	••	••	••	••	••	••	••		••	•
	TRUCK	ROTARY	PLOWS					ł	I	1	1	1	1	I	1	1			
	•••	•••		••		••	••	••	••	••	••	••	••	••	••	••	••	••	•
	T RUCK	-S Q	PLACE	MENT	PLOWS			ົ້	54	32	24	7	10	10	4			181	
	OST :	ы В В В В В В В В В В В В В В В В В В В	HOZ	1 L E :	••	••	••	0.34:	0.72:	0.66:	0.69:	0.58:	0.39:	0.64:	0.47:	0.43:	••		
	0	••		Σ	••	••	••); \$(ö		;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;				:	••	 m	
		DTAL	OST					19,800	39,276	30,000	77,763	45,000	52,485	30,000	33,876	5,000		9 2, 996	
		Ĕ	Ö					÷	0			7	1,2,3	w	0			4	
		Ι	C L			F	••		•••		•••	-	•••	••		•••			
		WI DT	CLEAR			Ш Ц		18	ł	-	N N	10	1	N N	ଯ	1			
	••	••	 С Ш	••	••	 თ	••	•••	0		 0		 0	ы м	•• 0	 	••	••	
		ROAD	CLEAR			WILE		2,56	3,00	* 2,10	2,40	1,50	2,14	*1 ,53	1,82	42		17,49	
	••	1	••	••	••	S	••	••	~	* .	••	•••	••	*	•••	••		••	
	MEAN	LEMPER	ATURE			EGREE		37.0	38.1	33.6	33.7	33.6	30.6	29.0	28.0	37.8			
- H H H	с. П	L: -MO	STLL:	327-:		HES:		2.9:	5. 5. 5.	7.5:	.7.4:	1.9.	ດ. ດ.	1.1:	3.3:	7.4:	••	••	
:AV	∢	NS:	<u>ل</u> د	.10		NON .		ດນ ••	сл ••	വ ••	•• 4	2 		•••	: 7	ດ ••		თ	
		-1110	SION	.ov					വ	ы	4	വ	(0	2	8	S		OTAL	

NOTE: THE FIGURES FOR AVERAGE SNOWFALL, MEAN TEMPERATURE, AND COST PER INCH-MILE ARE APPROXIMATE.

* INCLUDES COUNTY ROADS OTHER THAN TRUNK HIGHWAYS.

- 17 -

a a second and a second a second as

and the second second second second second second second

and a second s A second second

and a second second

and the second second

entra de la companya de la

and the second second

and a second second

and the second second second second second

ALTHOUGH THE COST PER INCH-MILE, AS SHOWN BY TABLE 7, VARIES TO SOME EXTENT IN THE DIFFERENT DISTRICTS, THE FIGURES ARE REASONABLY UNIFORM, WHEN THE DIFFERENT LOCAL CONDITIONS ARE TAKEN INTO CONSIDERATION. THE SIMILARITY IN THE FIGURES IS ALSO VERY CLOSE IN VIEW OF THE FACT THAT NO SCIENTIFIC COST ACCOUNTING METHODSWERE USED.

GENERAL SNOW-REMOVAL STATISTICS

THE ATTACHED TABLE OF GENERAL STATISTICS SHOWS THE KIND OF MILEAGE CLEARED AND TOTAL COST OF SNOW-REMOVAL WORK TOGETHER WITH THE EQUIPMENT USED DURING THE WINTER OF 1927-28 IN THE 36 STATES WITHIN THE HEAVY-SNOWFALL AREA. THE DATA WERE COL-LECTED FROM THE STATE HIGHWAY DEPARTMENTS, WITH ONE OR TWO EX-CEPTIONS WHERE THE COUNTIES FURNISHED THE INFORMATION. IT SHOULD BE BORNE IN MIND THAT THE DATA INCLUDE THE WORK DONE BY THE STATES AND THE ONE OR TWO COUNTIES MENTIONED, ON THEIR MAIN HIGHWAYS, BUT DO NOT INCLUDE SIMILAR WORK DONE BY THE VARIOUS COUNTIES AND TOWNSHIPS ON THEIR LOCAL ROADS, OR SNOW-REMOVAL OPERATIONS CARRIED ON BY MUNICIPALITIES, TRANSPORTATION COMPANIES, PUBLIC INSTITUTIONS AND DIVERS BUSINESS AGENCIES.

THE AVERAGE COST PER MILE FOR SNOW REMOVAL, WHICH HAS BEEN GIVEN IN PREVIOUS YEARS, HAS BEEN OMITTED FROM THIS TABLE.

THE ATTACHED MAP SHOWS THE AVAILABLE DATA WITH REGARD TO THE LOCATION OF THE MAIN ROADS WHICH WERE KEPT OPEN FOR WINTER TRAFFIC DURING THE SNOW SEASON OF 1927-28. THE INFOR-MATION FOR MAINE WAS NOT RECEIVED IN TIME TO BE SHOWN ON THIS MAP.

1....

1. The second se

UNITED STATES DEPARTMENT OF AGRIDULTURE SUREAU OF PUBLIC ROADS - DIVISION OF CONSTRUCTION

SHOW REMOVAL DATA - WINTER 1927-28

•		I TOTAL MILEARE	I AND	MAR. 1			8404	REMOVAL E	QU I PMENT	- Wowren 1927-	-28			BHOW REM	TAL		
		STALE ROADS	AVERADE A	HAUALI	CONTROL I	Teunx	PLORE	TRADTOR P		MIBOELLANE		1	MIFEVOEI 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	AVERAGE	<u>(/</u>		a Roman - Andreas - Andrea
	8 T A T E	IFED.AID ROADE/ IBURFACED WITH I DRAYEL OR	IPERIOG OF	YR8.1	REMOVAL S		1	0.000	l Boron	TRUCKS	r	ENOR	1 OF 1 ROADE 1 WITH 1	PROM TALL	TOTAL 0007	STATE	1 R 2 M A R K 8 1
		I HIGHER TYPES 10F PAYEMENT AS 10F JAN. 1,1928	I SECTIONS I STATE	1 0/ 1 1 1		NENT TYPE	ITTPE I	NENT TTPE	TTPE	ARD TRACTORS	DRADERS	1927-29	I BHOW I REMOVEDI	BEOTIONS	REMOVAL	1	
		1 1 1	1 1 1 Інонке				1 1		1			2 2 M25.68		INOMES	1	5 5	
(MAINE	1 1,491	1 174.4 TO 1	31.9	ETATE AND I	54	1 - 1 1 - 1	107	3	110 TRAOTORS 54 TRUCKS	4	12	3,1251	87.4	\$ 60,550	IMA INE I	DATA GOVERS WORK DONE UNDER SNOW RENDVAL
	NEW HAMPSHER	1 2,071	1 165.1 TO	94.0	E BTATE AND I	42	: - : : - :	146	1 2	42 TRUDKE 148 7RADT ORB	4	: 38 :	1,500	61 .7	\$ 65,933	NEW HAMPSHIRE	2 GATA ESTEMATED FROM ANALYSES OF PETURNS 1 FROM 8 OUT OF 10 ENGEREERENG DEVESSONS
TES	VERMONT	1 2,245	1 183.6 TO 1	110.8	Townsmires	t 6: 1	: - : : - :	66 1	1 1 - 1 1	TRUCKS 36 TRADTORS	1 1 15 1	: - : -	1,692	88.9	36,014	чининт Т	
STA	MABBAOHUSETTI	1,565	1 145-4 TO	81 . 8	BTATE	1 1 178 1	1 - 1	80	1 - 1 - 1	I 175 TRUCHE I 20 TRACTORE	: : -	: 10 :	1,3791 1,3791	\$7.8	151,853	S IMAGEAGHUSETTE I	TOTAL COST ENDLUDED FERCAL YEAR ENDENS
NTIC	RHODE IBLAND	t 479	1 124-1 TO	47.0	1 18747 6 1	1 1 73	1 - 1 - 1	1 1 1	1 1 9 1	I 73 TRUCKE 10 TRACTORE	1 1 - 1	1 2	490	16-4	35,790	IRHODE IBLANG	r f
TLA	JONNEOTIOUT	1,951	1 140.3 TO	78.8	E 1 STATE 1	1 1 275	1 1 -	: 1 -	1 1 - 1	1 1 202 TRUCKS 1 7 TRACTORS	: - : -	1 1 13 1	1 1,9511 1 1,9511	23.0	1 1 T1,765 1	I Commentique I	a 4 2
THA	NEW YORK	10,204	1 128.8 TD 1	141.4		1 1 294 1	1 3	1 204 1	1 29	1 292 7 RUCKS 1 185 TRACTORS	1 38 1	t t 661 t	1 8,6561 1 8,6561	69.4	1 540,010 1	г 1New York 1	3 3 DATA BROLUDES BOTH COUNTY AND TOWN WORK 1 BUT FOR ONLY 28 RURAL COUNTIES DUT OF 57
NOR	NEW JERBET	1,659	1 114.4 TO	54.4	STATE AND	1 1 170	: - :	: 151	1 1 4 1	1 1 170 TRUCKS 1 6 TRACTONS	1 1 32	1 1 12	1 8991 1 8991	20.6	1 1 139,204	I INCR JERBEY I	: 2 Data odvers State work only :
	PENNBYLTANIA	8,827	24.7 10	92.2	1 187475	595	-	1 96	1 1 21 1	1 1 595 TRUCKS 1 116 78407088	1 1 65 1	a 1 308	1 8,413 1 8,413	44.8	1 2 840,638	I Pennovevansa I	I I ACCITIONAL EQUIPMENT - 1 COMDINATION MOLLY C BOARD AND RDTARY RECHT 1 SHOW LOADER
ATES	JELARARE	1 629	1 18.7 10	22.9	187ATE AND	8 1 31	-	1 1 8	-	1 1 31 TRUCKS 1 5 TRACTORS	: : -	1 3	8 600 1 1	17.1	t t 8,766 t	I I DELAKARE I	2 2 SHOW REMOVAL GATA GOVERS STATE ROWK GHLV. 2 ADDITIONAL \$15,000 EXPENDED BY GOUNTSES.
C ST/	MANYLAND	2,619	13.9 10	69.4	1 1 87 ATE 1	1 89	i -	1 1 -	1 3	1 1 89 TRUDKE 1 3 TRADTORE	1 2 8	1 1 1T	1 2,5951 1 2,5951	40.0	1 1 110,000	I ŞMARTLANQ Ş	I * 1
TNA	¥190148A	3,099	: 7.3 TO	33.4	I STATE AND	1 40	-	1 15	1	1 1 T5 7RUCKE 1 50 TRADTORE	t 1 70	1 4	\$,250	11.9	4,000	I IVERGINIA	1 1 DATA INCLUCES STATE WORK ONLY
ATL	WEST VIRGINI	AT 2,210	1 8.2 10	101.0	I STATE AND	31	1 1 -	1 1 4	1	1 1 36 7 RUOKE 1 6 TRACTORE	1 31	-	1 962	51.0	7,439	I IWERT VERGINIA	A CATA ODTERS STATE RORK ONLY AND BUT INRUE
0	0410	1 9,896	: :18.2 TO	34.8	I STATE AND	1 256	1 3	6	1 3	1 1 475 7 RUCKE 1 835 TRADICES	321	1 49	8,247	18.6	1 132,216	1 10H20	
	INDEANA	4,349	113.6 70	81.3	1 187 ATE AND	1 1 41	-	2	-	1 805' TRUCKS	1 259	-	2,636	1 1 1 7.4	19,668	1 11408ANA	I EQUERMENT ENGLADES ALSO MANY LOCALLY SUB.Y
	ILLINOIS	1 5.069	1 111.8 TO	38.4	I ISTATE	1 1 1 47	4	1 9	-	1 283 7RUDK8	1 100	4	1 2,593	1 13.1	184,198	I I LLENDIB	I TOTAL GOST GOTERS GALENDAR YEAR 1927
TES	MIGHIEAM	t t t 6,017	: 138.5 70	121.4	I I DRA 3TA 76	1 1 489	1	1 70	1 55	1 417 Тяџока 1 417 Тяџока	t 1 -	1 261	: : 6,683	1 1 1 82.0	1 871,116	t t Madical via	1 1 1
STA.	WISCONSEN	1 1 1 8,600	1 1 124.9 TO	T8.3	BLOOML B BOOUNTSEE &	1 1 1 181	-	: : 112	1 4	1 120 TRACTOR	1 1 1 59	1 1 1 554	1 1 1 17,495	1 1 53.4	1 1 1 492,998	s s sWeboonsen	S DATA ENGLUCES WORK ON DOUNTY ROADE OTHER
RAL	MINNEPOTA	1 1 1 8,265	1 124.0 To	. 54.4	1 ISTATE AND	1 1 1 112	1	t 1 49	: : 12	1 1 1 111 7 RUOKE	1 1 1 13	1 1 472	1 1 8,839	1 1 52.3	1 1 604,965	а а амамиквота	I THAN TRUNK NEOHRATE FOR SOME LOGALITEES
ENT	1044	: 1 1 4,442	1 1 181.2 TO	38.1	ILOCAL I IÑTATE AND	1 1 1 143	1 1 1 6	1 1 1 35	1 8	1 91 TRACTON	1 1 1 213	1 898	1 1 7,091	1 1 ED.1	1 1 1 285,914	t t t lowa	2 GPEN AT TOTAL COST OF \$500,000 2 1
H C	Nzesoves	: : : 3,913	з 1 1 8.7 то	34.2	10 00MT 168 1 187ATE	1 1 1 10	1 1 1 -	1 1 1 6	-	1 66 TRUCKS	8 1 30	1 1 1 56	1 1 1 2,500	1 1 1 8.9	1 8 8 64,000	s Systemoria	T T I COST THOLUDES \$49,000 EXPENDED ON PURCHAUL
IORT	NONTH DANOTA	1 1,728	і 1 125.0 то	45.2	I LÜTATE	1 1 1 1	1 1 1 -	8 1 1 5	1 1 1 3	1 40 TRACTOR	1 1 1 1	1 1 1 136	1 365	: 1 : 31.5	1 1 1 8,399	1 1 SNDRTH DAKOTA	I OF SHOW PLOWS, SHOW FENDE, ETC. I I SH. WFALL LIGHT HORTH HALF OF STATE
2	BOUTH DANOT	: 2,875	: : :18.T TO	97.7	I ISTATE AND	1 32	1 1 1 -	1 1 1 24	1 1 1 7	1 8 78407081 1 1 60 780088	1 500	1 1 1 75	1 2=0 2 3,500	1 1 1 45-9	1 100 1 82,729	S SOUTH DAKOTA	T T T T T T T T T T T T T T T T T T T
	NEBRADKA	1 3,208	а а а 4.0 то	72.4	1000WT 8 68 8 187 ATE	1 1 1 10	1 1 1 -	1 1 1 16	1 1 1 1	1 50 TRACTOR: 1 1 67 TRUCKS	1 1 1 212	1 1 307	1 3.488	1 1 1 17.3	: 1 1 63,697	1 1 2NEORABKA	: WITH GATA ESTINATED : : Total dost sucludes purchase of shuw fence
	Kangag	1 1,221	: 1 1 8.8 TO	89.2	t t tDourftess	1	1 1 1 N		1	1 136 TRAGTOR	1	1	1	1 12.0	8 8 1 N	1 8. 1Канаав	I AND EQUIPMENT
	HONTANA	1 1.075	: 1 :18.5 то	270.9	1 1 187475 480	1 1 1 N	i 1	1 1 1 N	i 	1 1 1 1	1	i i iExtem	1	1 68.8	1	I I INONTANA	I I I NO DEFINITE BHOR HEHOVAL PROGETUM UNICIO-
	Wyontea	1,033	1 1 1 9.2 TO	219.7	BTATE	1	1	1 3	-	1 1 1 10 Тяџска	1 1 1 8	t 81VE t t 10	1 1 1 100	1 84.5	1 1 1 13,397	1 1 IWT GMII #96	1 TAKEN 1 1
	COLONADO	1 3,671	1 1 112.8 TO	276.8	1 8 18TATE AND	1 1	1 2	1	1 1	1 10 7 RADTOR	1 2	I B ING DAT	1 4,493	1 100.8	1 1 8 85,094	I I ICOLORADO	I I I MILEAGE NO TOTAL COST INCLUDES STATE AND
S	NEW MEATOO	1 1.793	1 1 1 5.3 70	138.4	838 THUOOI 1 3 TATE	1 1 1 10	1 2	1 10	1	1 1 1 276 7 muone	1 1 1 8	1	1 1.137	1 32.3	1 1 1 3,894	t 1 1NEW MEXEOD	I GOUNTY RORK; EQUIPMENT STATE OWNED ONLY I I MILEAGE INCLUDES OUPLICATION AN ROME AN
rate	ARIZONA	1 1 1,466	1 1 1 0.4 TO	83.0	1 1 1 87 AT 6	1	1 1 1 -	1 1 1 3	1 1 1 -	1 180 TRACTOR 8 1 7 TRUCKS	1 7	1	1 146	t t 1 14-8	1 2.718	t IARIZONA	I STANDES I I DATA DOVERS DNS ENGINEERING DIVISION ON I
LS Z	UTari	1	1 1 1 5.0 TD	155.1	1 1 187 ATE	1 1 1 36	1 1	1 19	1	1 3 7RADTOR 2 1 36 7RUORE	1 18	1	1 2.250	1	1 122 350	t t tiltam	
TER	NEVADA	1 1.309	1 1 1 D.A TO	87.0	I I IBTATE	1	1	1	1	в 17 7ялотоя 1 1 18 7енона			1	1 22.0	1	1 I	1 \$40,000 POR PURCHABE OF EQUIPMENT
WES	DIAND	1 2,105	1 1.0 70	207.0	1 1 1 STATE	1	1 2	1	1 1 1 B	1 10 TRACTOR	1 19	1	1 1.080	1	1 30 249	1 1 1 2 1 Dates	PARKE. NO DATA ATAILABLE FOR OTHER ROADS
	BARILMETON	2,870	1 3.8 70	252.3	: : BTATE AND	1 69	1	1 1 1 B	1	1 16 TRAGTOR	1 27		1 2 201	1 1 1 64-7	1		1 CATA COTTO CATA COTTO
	Orgnow	: 3.410	1 1.4.70	338.4	100UNTIES	1 50	1	1	1	I TT TRACTOR		1	1 2 000	1 1 1 54 0	1 120.000	177.4824 9749 TON 8 8	I UATA GOTERE STATE WORK ONLY
-	Gaussian	1	:	793.0	1 1	:	1	1	1	1 21 IRAGYON		1	1 2,000	1	130,000 8 8	1 URCE (H	1 3 1
	C OVETA DEMIN	I	1		1	1		1 1 1	1	2 14 TRACTOR	10		1 5480	73.3 1	1 19,150 1 3	ICAL BFORMER I	1 1 3
	TOTAL	1 120,041	1		:	1 3,383	1 24	: 1,093	1 182	15,230 TRUCKS	1 2,078	1 3,63	1111,646	1 1 8	1 185,043,779 1	8 8 9	1 1 1

· ASTERISK INDICATES INFORMATION NOT ATAILABLE. ** DOUBLE ASTERISK INDICATES DATA ESTIMATED.

NOTEST THE ABOVE DATA IS COMPILED FROM REPORTS BY THE STATES IN ANSWER TO QUESTIONNAIRED SUBNITED BY THE U. S. SUMEAU OF PUBLID ROADS. SHOWFALL FIGURES COMPILED FROM U. S. BEATHER BUREAU RECORDS.

THE NUMBER OF DESPLACEMENT FLOWS, ROTATION, AND OTHER EQUIRMENT LISTED, INCLUDE THOSE REPORTED AS UNDER THE ODVITED, OF TABIOUS STATES AND COUNTIES, OUT DOES NOT EROLUDE THOSE OWNED BY NUMEROUS OTHER GOLITIES OF WICH WE HAVE NO SWEDMATER, AND ALSO BY TOWNERIPS, MUNICIPALITIES, TAMBORITATION COMPALIES AND SITERS BUEINESS ASCHOLES.





UNITES BRATES DEMATHENT OF ADRIGUTORE BUREAU OF PUBLIC ROADS

4 1

۹

1 h

-8.2

CURRENT COMPITION OF FEDERAL AID ROAD WORK As Or Serremets 30, 1928.

P. B. B. E. RECOMMENDED FOR APPROVAL	P. B. & E. RECOMMENDED FOR APPROVAL	P. B. S. REDOMMENDED FOR APPROVAL	E. REDOMMENDED FOR APPROVAL	SNDED FOR APPROVAL							PROJECT AGREEN	ENTE EXECUT		Finat. Immed	te tour Ma of		Pato To	
WE FEDERAL ALD NOT YET UNCE CONSTRUCTION UNCER CONSTR	Not Yet UNDER CONSTRUCTION UNDER CONSTR	VOCR CONSTRUCTION UNDER CONSTR	RUCTION UNDER CONSTR	UNDER CONSTR		INCT FOR		NOT TET UND	CR LONSTRUC	NO LON							GTATES	GTATE
NEW PROJECTS FERERAL AIO MILLEADE FERERAL AIO MITH	FEDERAL AID MILEADE FEDERAL AID MITH	MILEADE FEOGRALAIO MI INITIAL GTADE ALLOTTED INITIA	A 0 E FEOERAL AIO MI	FEDERAL AIO MI	NIT I	2 3	A G E Stage	FEDERAL ALO	MILE INITIAL	a a c Braac	FEOGNAL AIO ALLOTTEO	N I L E	A G E BTAGE	FEDERAL AIO ALLOTTEO	NITIAL	67 AGE	FISCAL YEAR	
31,366,041.03 5 57,423.28 6.8 3 330.210.05 53.6 2,705,390.04 6.60.087 0 1.7 3.5.377 2.4 1,715,590.24 6.585.7 1.7 2.6 2.4 2.4	\$ 57,423.28 6.8 \$ 330.210.05 59.6 \$ 626.57 11.7 335.37 22.4 \$ 6.265.77 .3 .3 23.4	6.8 \$ 330,210,05 11.7 35,326,39 2.4 2.5 2.4 2.4 2.4 2.4 2.4	6.8 \$ 330.210.05 11.7 36.353.72 2.4 .3 208,506.09 21.4	\$ 330,210.05 59.6 36,353.72 2.4 208,806.09 21.4	2.4 2.4 2.4		1.8				2.307.063.93 1,110,752.16 1,944,194.54	264.9 59.0 148.1	37.9	1,690,438.67 884.759.42 348.100.68	168.7 63.4 82.3	24.8 6.8 6.8	656.553.75 607,881.47 336.029.20	ALLENIA ARIZONA ARIZANEAE
2.491.346.58 86,672.26 13.4 833,016.39 32.9 2.051.105 177.130.04 11.8 647.784.77 23.1	86,672.26 13.4 803,016.99 32.9 177,130.04 11.8 647,784.71 23.1	13.4 603,016.99 32.9 11.8 547,754.71 23.1	603,016.39 32.9 647,754.71 23.1	603,016.99 32.9 547,754.71 23.1	1.12		1.8	208,073.24 54,471.34 39,975.00	11.6 8.4 2.7		2.843,157.35 2.182.696.91 607,411.53	129.0 169.9 34.2	8.7 23.6	695,827.83 621,736,15 759,896,08	39.8 45.7 23.8	9.	603, 929, 80 503, 250, 05 203, 922, 09	CAL IFORNIA COLONADO CONNECTIOUT
154.577.22 40.600.00 2.7 1.212.500.30 17.54.70.00 13.9 17.506.30 17.54.70.00 13.50 4.6 173.485.47 4.0	40.800.00 2.7 263.730.00 18.0 171.406.83 19.9 4.6 173.485.47 4.0	2.7 18.0 19.9 4.6 173.485.47 4.0	4.6 173,485.47 4.0	179,485.47	4.0		20.6	186.429.74	19.0	3.8	178,886.54 1,418.070.87 2,456,950.88	13.0 94.6 237.2	2.1 6.5 41.8	21,064.29 288,552.60 131,376.16	12.0 24.7	1.9	48,288.94 393,468.44 521,557.77	OELAWARE FLORIDA GEORGIA
78, 136, 97 61, 236, 54 11.4 160, 213, 39 19.1 11, 560, 17 68, 131, 39 46, 55 71, 666, 67 1164, 55	61,285.94 11.4 150,213.38 19.1 684,381.99 46.6 2,084,096.87 154.5 372,510.00 24.4 162,000.00 11.4	11.4 150.213.38 19.1 46.6 2.084,096.87 154.5 24.4 152,000.00 11.4	150.213.38 19.1 2.084,096.87 154.5 162.000.00 11.4	19.1 2.084,096.87 154.5 11.4	19.1 164.5 11.4		8.7	42,619,65	6.2		1,358.097.17 7,921.568.92 4.284,660.07	140.7 631.1 270.6	48.8	230,690.48 1.128,566.52 1.757,236.30	34.0 77.8 122.9		527.786.50 1.877,154.96 816.084.97	CAND ILLINOIS INDIANA
171.313.77 213.300.52 223.300.52 285.991.82 71.5 71.5 71.5 71.5 71.5 71.5 71.5 71.5	976.721.80 174.2 4.3 304.080.57 44.6 536.198.82 71.5 4.3	174.2 4.3 304.080.57 44.5 71.5 520.377.03 47.1	4.3 304.080.57 44.6 520.377.03 47.1	304.080.57 44.6 520.377.03 47.1	44.6 47.1		12.0	231.211.62 67.267.17	3.7	36.0	2,700,754.69 1.819,879.96 2.001,336.07	92.7 242.9 178.1	160.2	908.898.68 1.970.611.96 1.031.366.05	50.4 229.1 78.2	20.5 .4 16.6	154.284.55 698.063.50 318,145.40	lowa Kangas Kentucky
18. 13. 25.000.00 .1 357.248.15 5.4 965.071 201,655.43 16.4 201,444.62 130.5 31.571.23 201,655.43 16.4 201,444.62 130.5	25,000.00 .1 357,236.15 5.4 209,659.43 16.4 270,144.62 19.5 16,4 116,4 116,4 116,4	.1 357.238.15 5.4 16.4 270,144.62 19.5 181.945.00 12.2	357,238,15 270,144,62 181,945,00 12,2	357,238,15 5.4 270,144.62 19.5 181,945.00 12.2	5.4 19.5 12.2			127.206.00	1.11		2.067,207.29 444,599.96 608,830.00	192.9 29.7 58.1	7.2	129.913.41 288.436.11	7.9 22.8		292.332.09 219,456.41	LOUISIANA Maine Marvlano
1,603,439,75 66,750,00 4,4 52,667,19 30,7 276,195 394,640,00 21,2 6,5 84,007,00 53,7 122,75,21	56, 750, 00 4, 4 523, 867, 19 30, 7 394, 690, 00 21, 2 6, 5 848, 807, 00 53, 7	4.4 5.523,867.19 30.7 21.2 6.5 848,607.00 53.7 285,716.22 15.8	6.5 848,807.00 55.7 285,716.22 15.8	523, 867.19 30.7 848, 507.00 53.7 285, 716.22 15.8	30.7 53.7 15.8		19.8	118,000.00	6.8		860.608.05 4.985.036.08 1,788.600.00	63.8 304.1 261.0	71.6	534,246.30 516,340.72 250.500.00	31.4 30.8 37.1	19.0	447.873.90 1.232.976.07 1.390.556.09	MABBACHUBETTS MICHIGAN MINNEGOTA
565.065.45 13.972.61 3.3 565.565.77 23.1 88.8.71 23.1 88.8.71 23.1 4.961.40 24.9 3.3 3.9 789.90111 25.0 25.0 4.969.7315	13.972.61 3.3 566.586.77 29.1 442.061.40 28.8 3.9 789.990.11 59.0	3.3 566.588.77 29.1 28.8 3.9 789.990.11 59.0 28.9 3.9 260,183.51 25.4	566.586.77 29.1 3.9 788,990.11 59.0 250,183.51 25.4	566,586,77 29.1 789,990,11 59.0 250,183.51 25.4	1.0.4 8.28 8		17.2	34,280.00 416,568,56	2.3 81.7	4.1	1,658,982.16 1,763.783.14 1,949.329.32	155.3 115.4 258.9	30.9 40.9 13.4	762, 121.07 641, 499.12 1.703, 844.12	101.2 63.1 219.4	9.0 3.5	350, 721.53 712.056.29 678.667.56	MISSISSIPPI MISSOURI MONTANA
1,828,529.55 151.505.06 14.9 18.8 57.927.05 145,405 159,944.03 20.3 27.6 107.36776 5.5	151.506.06 14.9 18.8 57.927.05 158,984.03 20.3 27.8 27.8 .4 82.238.26 5.5	14.9 18.8 57.927.05 20.3 27.8 107.356.78 .4 80.239.26 62.239.26 5.5	18.8 57.927.05 27.8 107.356.76 .4 62.298.26 5.5	57.927.05 107.356.78 .4 62.298.26 5.5	ين. ه بې		14.1	34,800.74 24,135.00	1.8	23.1	2,332,349.12 721,785.68 266,499.26	461.8 96.7 18.9	101.1 26.3	1.654.718.90 635,443.02 288,886.32	360.6 74.7 17.2	136.9 68.5	460,489.91 286,864.56 12,778.96	NEBRABKA Nevada New Hampswire
B6, 755, 54 124, 005, 00 8.3 607, 106, 00 33.4 440, 520, 51 117, 200, 00 7.5 234, 435, 90 31.5 3, 451, 300, 55 117, 200, 00 7.5 234, 435, 90 31.5	124,005-00 8.3 507,106.00 33.8 187,387,31 10.4 238,435,90 31.5 112,200.00 7.5 238,435,90 31.5	8.3 607.106.00 33.8 10.4 238.435.90 31.5 7.5	607,106.00 33.8 238,435.90 31.5	507,106.00 33.8 238,435.90 31.5	33.8 31.5			5.480.35 1,197.105.00	.3 79.9		347,097.35 1.788.472.03 7.354.627.50	25.1 175.8 481.2	9 9	284,610.00 1.719.984.17 967,907.50	19.0 139.1 49.2		172,670.23 438,913.74 787,456.39	NEW JENBEY NEW MEXICO NEW YORK
614.095.71 276.073.30 25.8 7.2 530.655.01 23.0 1.343,582 10170.24 20.5 4.1 514.24 25.5 25.7 1.554,611.166 1.053,600.00 20.0 3.8 3.8 32.355.00 67.3	276,073.30 25.8 7.2 530,675.01 23.0 181,710.94 69.6 41.6 164,999.62 25.7 1.039,870.00 50.0 9.8 332,335.00 57.9	25.8 7.2 530.675.01 23.0 69.6 41.6 164,999.62 26.7 50.0 9.8 932.395.00 67.3	7.2 630,675.01 23.0 41.6 164,999.62 26.7 9.8 932,395.00 67.9	630,675.01 23.0 164,999.82 26.7 932,395.00 67.9	23.0 25.7 67.9		12.4 47.6 .1	126.777.31 35,476.04	56.7	38.0 2.9	616.139.02 1.304.576.65 4,099.283.86	70.4 529.3 241.1	13.0 122.5 6.9	510.268.43 1.038.950.63 1.076.962.28	24.5 301.4 79.7	160.0	275,909.74 447,674.54 1,128,050.43	NORTH CAROLIVA North Carota Ohio
131.632.75 408.499.79 50.7 12.4 543.050.20 44.5 1231.75 408.493.78 50.7 12.4 543.050.24 44.5 198.635.76 845.433.48 236.23 231.500.24 44.5	408.493.79 50.7 12.4 543.050.20 44.5 7,534.53 1.0 31.050.54 44.5 457.483.34 23.6 281.820.92 19.3	50.7 12.4 543,050.20 44.5 1.0 31,050.54 44.5 29.6 281,420.92 19.3	12.4 543.050.20 44.5 31.050.54 19.3 281.620.92 19.3	543.050.20 31.050.54 281.820.92 18.3	44.5		14.3	99,154,80 111,496.98	13.1 6.6		1.317.309.91 662.002.03 4.025.039.50	136.0 28.8 247.3		1,035.772.49 404,196.03 2.252.542.87	188.9 27.3 136.6	12.8 9.2	493.240.90 79.451.71 685,968.96	OKLAHOMA Oregon Pennsylvania
683,494-19 64,262,1776,59 262,1776,59 49,688,67 21.0 3.0 3.0 3.7,283,67 3.3	48,653.67 21.0 3.0 37,283.67 .3	21.0 3.0 37,283.67 1.3	3.0 37,283.67 1.3	146.000.00 1.3 37,283.67 .3	<u>.</u> г.		23.3	43.974.55 139,637.37	1.6 86.8	12.3	234.446.26 1.657.073.44 1.703.880.02	14.7 189.3 619.1	100.0	66.585.00 797.233.84 742.218.54	4.4 93.4 212.1	46.6 75.7	240.602.30 368,737.82 633.758.50	PHODE IELANO South Camolina South Dakota
205,447.33 2-40,379,31 6.6 18.7 1,772,678,60 64.5 2.460,347,33 2.240,374,24.3 2.240,347,159 2.240,344,247,159 22.6 6.1 1,732,734,544 3.5	240.378.31 6.6 18.7 1,782.678.60 64.5 2.234.284.38 284.9 111.3 1,738,703.67 55.1 266.471.09 28.8 8.9 83.234.64 3.5	6.6 18.7 1,752,676.60 64.5 284.9 111.3 1,738,703.67 55.1 28.8 8.9 83.234.64 3.5	18.7 1,752,678.60 84.5 111.3 1,738,703.67 55.1 8.9 83.234.64 3.6	1,728,578,60 64.5 1,738,703,67 55.1 83,234,64 3.6	64.5 55.1 3.6		49.6 42.3 4.0	271.521.87 249,945.72 63,906.37	59.8 10.3	26.0 1.6 1.0	1,002.310.88 2.614,168.28 1.079,433.37	86.0 184.6 83.9	148.9 6.3	1.568.627.06 2.258.138.79 689.782.39	104.6 208.1 49.5	23.8 77.3 5.6	160.114.05 949.507.35 284.806.88	TENNESSEE Texas Utan
42,653.63 16,755.00 1.1 1.1 1.604.44 150.512.74 19.7 134,982.21 12.6 445,549.03 113,800.00 11.1 65,600.00 5.5	16.725.00 1.1 134.982.21 12.6 150.612.74 19.7 134.982.21 12.6 113.600.00 11.1 65.800.00 6.5	1.1 19.7 11.1 134.982.21 12.6 65.800.00 5.5	134.982.21 12.6 65.800.00 6.5	134.982.21 65.800.00 6.5	12.6 6.5			55,000.00 17,809.82 330,166.27	8.3 13.9 11.8	6.0	384,026.29 1,295,864.66 1,100.975.25	23.6 102.8 73.2	21.6	259,501.44 516,318.20 406,600.00	17.7 32.8 47.4		87.138.67 306.693.82	VERNONT VIRGINIA Washimatow
248,905.80 237,670.88 13.3 9.9 170.337.36 14.6 1.38,707.36 131,600.00 14.8 451,131.51 42.3 7,971.18 19,260.00 9.4 7,971.16 42.3 1.066,499.69 19.860.00 9.4 7,971.16 12.8	237,570,68 13.3 9.9 170,937.36 14.6 213,680.00 14.8 4.6 4.6 4.6 4.6 4.6 4.6 4.6 4.6 4.6 4.6	13.3 9.9 170.337.36 14.6 14.8 551,131.51 42.3 9.4 12.8	9.9 110.937.36 14.6 451,131.51 42.3 74,073.19 12.2	170.937.36 14.6 451,131.51 42.3 74,079.19 12.2	14.6 42.3 12.2		2.5	71,027.58 57,501.20	2.4		861.174.28 2.275,830.78 1.235.802.09	70.8 191.3 206.4	15.6	1,120,482.08 1.366,777.55 342,557.42 60,383.43	109.6 97.0 54.1 3.2	4.0 18.8 31.5	374,959.87 42.749.89 606.278.25 42.847.39	WEST VIROINIA WISCONSIN WYONING Наталі
33,870,696.46 11.410,184.78 1.156.6 304.3 17,450,225.64 1,134.6	11.410.184.78 1.156.6 304.3 17,450.225.54 1,134.6	1.156.6 304.3 17,450,226.64 1,134.8	304.3 17,450,225.54 1,134.8	17,450,225.54 1,134.8	,134.6		334.7	4,440.878.17	615.7	152.8	91.298,521.24	8.292.2	1,164.2	39.160,516.66	4,004.5	8.187	22.463.711.11	TOTAL6



CAPPING SPECIMENS FOR COMPRESSION TESTS OF CONCRETE

CONTRIBUTED BY F. H. JACKSON OF THE DIVISION OF TESTS (NOT FOR RELEASE)

A RECENT INSPECTION OF A NUMBER OF CONCRETE TESTING LABORATORIES BY THE WRITER HAS INDICATED THAT THE METHOD OF CAPPING SPECIMENS FOR COMPRESSION TESTS IS NOT SO WELL STAN-DARDIZED AS IS DESIRABLE.

NUMEROUS TESTS, MADE IN THE LABORATORY OF THE PORTLAND CEMENT ASSOCIATION FOR THE PURPOSE OF DETERMINING THE EFFECT OF END CONDITION OF CYLINDERS UPON THE RESULTS OF COMPRESSION TESTS, INDICATE THAT NOT ONLY THE SMOOTHNESS OF THE CAP BUT THE CHARACTER OF THE CAPPING MATERIAL HAS QUITE AN INFLUENCE UPON THE RESULTS OFTAINED.

THESE STUDIES HAVE BEEN PUBLISHED AS BULLETIN 14, OF THE STRUCTURAL MATERIALS RESEARCH LABORATORY, ENTITLED, "EFFECT OF END CONDITION OF CYLINDER ON COMPRESSIVE STRENGTH OF CONCRETE", AND COPIES OF THIS PUBLICATION MAY BE OBTAINED FROM THE PORTLAND CEMENT ASSOCIATION, 33 WEST GRAND AVENUE, CHICAGO. AMONG THE CONCLUSIONS BEARING ON THIS PARTICULAR PHASE OF THE SUBJECT, THERE MAY BE MENTIONED THE FOLLOWING:

WHEN TESTED WITHOUT BEDDING, THE STRENGTHS OBTAINED VARIED FROM ABOUT 80 TO 95 PER CENT OF THE STANDARD METHOD, DE-PENDING UPON THE RICHNESS OF THE CONCRETE. WITH ALL TYPES OF SHEET MATERIALS BETWEEN THE TOP OF THE CYLINDER AND THE SPHER-ICAL BEARING BLOCK, THE STRENGTHS WERE LESS 'N ALL CASES THAN FOR THE STANDARD METHOD OF CAPPING.

> 1.- FOR BEAVER BOARD THE STRENGTHS OBTAINED VARIED FROM ABOUT 90 TO 100 PER CENT OF THE STANDARD METHOD, DEPENDING UPON THE RICHNESS OF THE CONCRETE.

2.- FOR WHITE PINE BOARD, MILL BOARD AND LEATHER, THE STRENGTHS WERE LESS THAN FOR BEAVER BOARD.

3.- FOR OTHER SHEET MATERIALS, SUCH AS BLOTTING PAPER, SHEET LEAD, AND RUBBER, THE STRENGTHS WERE LESS THAN WHERE NO BEDDING AT ALL WAS USED.

.

......

THIS MATTER IS CALLED PARTICULARLY TO THE ATTENTION OF THE MATERIALS ENGINEERS, DUE TO THE FACT THAT CERTAIN LAB-ORATORIES ARE STILL USING BLOTTING PAPER, BEAVER BOARD, AND OTHER SHEET MATERIALS OF A SIMILAR NATURE FOR CAPPING SPECI-MENS IN LIEU OF THE STANDARD METHOD AS OUTLINED IN A.S.T.M. STANDARD METHOD OF TEST C 39-27, WHICH REQUIRES A NEAT CEMENT CAP.

THE TESTS ABOVE REFERRED TO, HOWEVER, INDICATE THAT PLASTER OF PARIS OR MIXTURES OF PLASTER OF PARIS AND CEMENT GAVE ESSENTIALLY THE SAME RESULTS AS THE STANDARD METHOD OF CAPPING. THE BUREAU ACCORDINGLY WOULD APPROVE EITHER CEMENT OR PLASTER CAPS OR A COMBINATION THEREOF BUT WOULD NOT CON-SIDER AS GOOD PRACTICE THE USE OF ANY SHEET MATERIAL SUCH AS CARDBOARD OR BLOTTING PAPER.

- 23 -

2+* 1 * I

GRADER OUTTING EDGES STANDARDIZED BY THE MISSISSIPPI VALLEY STATE HIGHWAY ASSOCIATION

COMPILED FROM A REPORT SUBMITTED BY G. L. CAMPEN OF DISTRICT 5

STANDARD SPECIFICATIONS FOR CUTTING EDGES OF BLADE GRADERS WERE ADOPTED BY THE MISSISSIPPI VALLEY STATE HIGHWAY ASSOCIATION AT A MEETING OF THE COMMITTEE ON THE STANDARDI-ZATION OF CUTTING EDGES, HELD IN THE MAYFAIR HOTEL IN ST. LOUIS, MO., ON SEPTEMBER 4, 1928. THERE WERE PRESENT AT THIS MEETING THE CHAIRMAN - W. H. ROOT, ENGINEER OF MAINTENANCE OF THE IOWA STATE HIGHWAY COMMISSION - W. F. ROSENWALD, ENGINEER OF MAINTENANCE OF THE MINNESOTA DEPARTMENT OF HIGHWAYS; C. P. OWENS, ENGINEER OF MAINTENANCE OF THE MISSOURI STATE HIGHWAY COMMISSION; GEORGE L. CAMPEN, OF THE BUREAU; N. M. KEISER OF THE AUSTIN WESTERN MANUFACTURING COMPANY, CHICAGO, ILL.; J. A. HANRATTY OF THE RUSSEL GRADER MANUFAC-TURING COMPANY, MINNEAPOLIS, MINN.; U. G. SMITH OF THE GALLION MANUFACTURING COMPANY, GALLION, OHIO; W. R. ADAMS OF THE ADAMS GRADER COMPANY OF INDIANAPOLIS, IND.; O. W. SCHMIDT OF THE CASWELL GRADER COMPANY OF KANSAS CITY, MO.; AND W. N. PATTON OF THE EMPIRE PLOW WORKS OF CLEVELAND, OHIO.

AT THE REQUEST OF THE CHAIRMAN, MR. ROSENWALD EXPLAINED THAT THE MEETING WAS CALLED FOR THE PURPOSE OF ADOPTING UNI-FORM STANDARDS FOR THE CUTTING EDGES OF ROAD GRADERS. THE SPEAKER STATED THAT THE VARIOUS STATES WITHIN THE ASSOCIATION FOUND IT BURDENSOME TO CARRY A LARGE STOCK OF CUTTING EDGES SIMPLY BECAUSE THE BLADES WERE NOT MADE INTERCHANGEABLE FOR THE VARIOUS MAKES OF MACHINES. HE PROPOSED A STANDARD SIZE AND SPACING OF SOTH THE MOLD BOARDS AND THE CUTTING EDGES SO THAT A 6, 8, 10, OR 12-FOOT BLADE WOULD FIT ANY OF THE COR-RESPONDING SIZES OF MOLD BOARDS MANUFACTURED BY THE VARIOUS COMPANIES. IN RESPONSE TO THEIR QUESTION AS TO WHETHER THIS STANDARDIZATION WOULD BE MADE TO INCLUDE THE BLADES AND MA-CHINES USED BY COUNTIES AND LOCAL AUTHORITIES, THE MANUFAC-URERS WERE INFORMED THAT THE RECOMMENDATIONS OF THE COMMITTEE WERE INTENDED TO APPLY ONLY TO EQUIPMENT PURCHASED BY THE STATE HIGHWAY DEPARTMENTS IN THE MISSISSIPPI VALLEY STATE HIGHWAY ASSOCIATION. MR. ROOT INTERPOSED, HOWEVER, THAT PRO-VIDED THE MANUFACTURERS IN ATTENDANCE EXPRESSED THEIR APPROV-AL OF THE PROPOSAL, THE MATTER WOULD BE SUBMITTED AT AN EARLY

and the second 1.2.3 11 1 1 A State 1.9.8 10.00 1.121.12 11

. . .

DATE TO THE EXECUTIVE COMMITTEE OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS THROUGH MR. F. R. WHITE OF IOWA AND MR. C. M. BAECOCK OF MINNESOTA, BOTH MEMBERS OF THE COMMITTEE. MR. ROOT EXPRESSED THE BELIEF THAT THE A.A.S.H.O. COMMITTEE TO WHICH THE PROPOSAL WOULD BE REFERRED WOULD BE FAVORABLE TO BRINGING THE SUBJECT BEFORE THE ENTIRE MEMBER-SHIP OF THE ASSOCIATION BUT HE EXPLAINED THAT IT WOULD BE NECESSARY FOR THE STATE HIGHWAY DEPARTMENTS TO SIGNIFY THEIR ACCEPTANCE BY LETTER BALLOT BEFORE THE PROPOSAL COULD BE FOR-MALLY ADOPTED.

AFTER SOME DISCUSSION BY THE MANUFACTURERS, WHICH EROUGHT OUT THE NEED FOR SLIGHT CHANGES IN THE PLAN SHOWING THE PUNCHING OF THE MOLD BOARD AND CUTTING EDGES, AS SUBMIT-TED BY MR. ROSENWALD, THE MANUFACTURERS AGREED TO COMPLY WITH THE REQUIREMENTS SET FORTH BY THE COMMITTEE. SHOULD THE PRO-POSAL BE ADOPTED BY THE MEMBERS OF THE A.A.S.H.O., THE MANU-FACTURERS AGREED TO STAMP EACH CUTTING EDGE WITH THE LETTERS "S.H." INDICATING THAT THE BLADE SO MARKED WAS INTENDED TO BE USED BY A STATE HIGHWAY DEPARTMENT.

MR. C. P. OWENS OF MISSOURI, WHO ACTED AS SECRETARY OF THE COMMITTEE, IS TO PREPARE A FULL REPORT OF THE MEETING.