

**REPORT OF THE
COMMISSIONER OF
HIGHWAYS OF
MINNESOTA FOR 1920**

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Report of the Commissioner of Highways of Minnesota for 1920 by Anonymous

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REPORT
OF THE
Commissioner of Highways
OF
MINNESOTA
FOR
1920



Minnesota Highway Department

Charles M. Babcock.....Commissioner of Highways
John H. Mullen.....Deputy Commissioner and Chief Engineer

STAFF

J. T. Ellison.....Chief Bridge Engineer
W. F. Rosenwald.....Maintenance Engineer
M. J. Hoffman.....Assistant Maintenance Engineer
O. L. Kipp.....Construction Engineer
R. M. Cooley.....Superintendent of Equipment

S. C. Notestein, Chief Clerk

DIVISION ENGINEERS

C. A. Forbes	C. L. Methven	R. K. Bliler
W. E. Matters		D. W. Webster
C. L. Mott	W. P. Chapman	

Gift of Samuel E. ...

LETTER OF TRANSMITTAL

St. Paul, Minn.

Hon. J. A. O. Preus, Governor of Minnesota, St. Paul, Minn.

Dear Sir: I am transmitting herewith, a report of the activities of the State Highway Department during the calendar year of 1920.

Yours very truly,

A handwritten signature in cursive script, appearing to read "C. B. Babcock".

Commissioner of Highways.

ROAD CONSTRUCTION

Road construction in Minnesota during the years 1919 and 1920 exceeded any previous period in the history of the state and is only exceeded by two other states in the union for the same period. This remarkable amount of work was made possible by action of the legislature at the 1919 session which gave authority to the counties to issue bonds for arterial road construction in connection with federal aid. Further encouragement was given the counties by the legislature in the proposed constitutional amendment which provides for refundment to counties for permanent work on the trunk highways financed by the counties. In considering this volume of work accomplished under the direction of the legislature it is interesting to note a comparison to the work done during the year 1920 by neighboring states as follows:

State.	Brick.	Concrete.	Bituminous.	Stone or Gravel.	Grading.
Towa	7.9	41.7	105.2	255.1
Illinois	28.0	299.0	14.0	6.0	120.0
Michigan	0.4	43.2	17.3	294.4	106.9
Missouri	0.0	18.8	6.2	81.5	204.3
Minnesota	67.0	12.4	832.0	1,120.0
Wisconsin	0.0	103.0	10.0	793.0	653.0
Total	36.3	572.7	59.9	2,112.1	2,459.3

The greater portion of the work in this biennium was done in the year 1920 for the reason that it was rather late in the season for starting work after the legislature had adjourned in 1919. However, our last annual report shows work done in 1919 in the following amount:

	Miles.	Cost.
Grading	1,064	\$3,326,135.40
Gravel surfacing	748	2,048,213.93
Bridges constructed	125	562,344.81

During the year 1920 plans were prepared, checked and approved by the Highway Department for the following mileage of work:

	Miles.
Grading without surfacing	495
Grading and gravel surfacing	850
Gravel surfacing without grading	133
Grading and paving	200
Paving without grading	19

The total amount of grading work planned with or without surfacing amounted to 1,545 miles, which involved the handling of 12,397,326 cubic yards of excavation at an estimated cost of \$7,438,395.60. The total amount of gravel surfacing for which plans were approved during 1920 amounted to 988 miles, involving 1,258,057 cubic yards of gravel at an estimated cost of \$2,964,000.00. The total paving for which plans were completed and approved amounted to 219 miles, involving 2,093,501 square yards of paving at an estimated cost of \$6,603,878.25. The total estimated cost of the work for which plans were approved, including bridges, culverts, and other miscellaneous items, as well as the items mentioned above, was estimated to cost

\$19,733,962.01. Approximately 25 per cent of the work covered by these plans has not yet been placed under contract or started by day labor forces.

Plans were prepared sufficiently in advance during the early part of 1920 so that a large amount of work was placed under contract during the early part of the season. In fact, by the first of June it became apparent that it would not be possible to place under contract all of the work which had been contemplated by the counties, and for which plans were being rapidly completed. A questionnaire was therefore sent to all the highway engineers in the state, requesting information as to the status of the uncompleted contracts in each county and the amount of the various types of road building equipment actually in service, and the date on which any of it would be released for additional work. The information secured by this questionnaire confirmed the opinion of the department that the amount of work already placed under contract was more than sufficient to keep all of the available equipment busy for the remainder of the season, and it was therefore determined to issue an order to abandon further lettings of road work except where it could be shown that equipment was available for the construction of the project or where the work was of an unusually urgent nature.

A tabulation of the data received on this questionnaire revealed the fact that the number of men and the quantity of equipment and stock actually engaged in highway construction in the state comprised the following totals:

Men employed	6,092
Steam shovels	36
Locomotives	26
Dump cars	281
Lineal feet of track	38,523
Elevating graders	145
Blade graders	363
Wheel scrapers	1,158
Slip scrapers	1,011
Presoes	526
Dump wagons	1,460
Mixers	69
Finishing machines	30
Motor trucks	466
Trailer wagons	91
Tractors	138
Loading bins	57
Belt loaders	31
Derricks	14
Drag lines	23
Screens	26
Horses and mules	6,212
Pile drivers	18
Pumps	44
Lineal feet pipe	13,600
Asphaltic heating plants	2
Steam rollers	2

The total volume of work which the foregoing equipment were able to complete during the season of 1920 is shown in detail in this report, but it is interesting to note that following are the totals of the various items of work completed:

GRADING—1,120.9 miles, comprising 3,400,849 cubic yards of excavation, costing \$5,737,016.36, the average cost per cubic yard for the grading being 61c, which includes the cost of overhaul, loose and solid rock excavation.

GRAVELING—831.69 miles, comprising 1,023,992 cubic yards of graveling costing \$2,481,700.82. This is an average of 1,230 cubic yards of gravel per mile, costing \$2.42 per cubic yard.

PAVING—12.39 miles of asphaltic concrete, comprising 107,546 square yards of paving costing \$325,699.08. Also 66.98 miles of Portland Cement concrete, comprising 714,361 square yards of paving costing \$3,228,616.50.

CLEARING AND GRUBBING—3,275.18 acres, costing \$240,540.29.

GUARD RAIL—265,555 lineal feet or 39.0 miles, costing \$134,529.33, which is an average cost of \$3,449.48 per mile.
 TILE DRAIN—613,841 lineal feet or 116 miles, costing \$186,915.42, which is an average cost of \$1,611.34 per mile.
 PORTABLE CULBERTS—153,923 lineal feet, costing \$332,102.87.
 MONOLITHIC CULVERTS—335 containing 7,064.81 cubic yards of concrete, costing \$326,112.98.
 BRIDGES—198, costing \$1,716,797.91.
 TOTAL COST OF CONSTRUCTION—Completed on state roads in the year 1920, including miscellaneous items not enumerated above, \$14,405,031.06.
 STATE AID—\$1,256,202.20, paid on 1920 construction.
 FEDERAL AID—\$2,711,620.00, paid on 1920 construction.

The progress which has been made by Minnesota in federal aid construction during the past year has been noteworthy. The Bureau of Public Roads issues a monthly report, showing among other things, the status of the various states relative to the number of miles and the estimated cost of federal aid work placed under construction, and the total value of the work completed with the amount of federal aid payments made on such completed work. During the year Minnesota stood high in all of these items, and the last report dated December 31, 1920, a reproduction of which will be found (see chart) on page ??, shows Minnesota occupying third place in practically all of these items, the states of Illinois and Pennsylvania being the only two which show a larger total of federal aid received for complete construction.

An analysis of our detailed report on federal aid construction shows the following totals:

Total length of projects under agreement, miles.....	1,576.2
Estimated cost of such project.....	\$18,732,000.00
Allotment of federal aid to these projects.....	6,633,410.32
Value of the work on these projects during 1920.....	9,666,011.00
Total value of work done to date.....	12,710,155.87

On this completed work the various counties of the state have received a total of \$3,675,112.85, of which \$2,711,620.00 was received during 1920.

The state aid work completed during the year on which no federal aid was received amounts to the difference between the cost of the total construction, or \$14,405,091.06, and the total value of the federal aid construction during 1920, which is \$9,666,011.00. This gives a total value of state aid construction jobs of \$4,439,080.06.

The 1920 construction includes the following jobs which deserve special mention:

Federal Aid Project No. 125, which is a grading and gravel surfacing job in Wabasha county near Wabasha, consisting of 1.51 miles of continuously ascending grade, most of which is 5 per cent. This job provides for the elimination of a narrow winding road, containing numerous steep pitches and sharp turns. The construction is laid out so as to provide an improvement of a permanent nature, on which a pavement of any desired type may suitably be placed. The cost of this work on account of the rock excavation encountered amounted to \$71,250.87. A picture is being included in this report which shows the nature of the construction on the new road, and the old road which has now been abandoned.

Federal Aid Project No. 148, which is a grading and gravel surfacing job in Hennepin and Dakota counties, 9.83 miles in length. The notable part of this project consists of the heavy grading in connection with the Minnesota River crossing. The fill across the bottom averages approximately

15 feet in height, and contains 366,129 cubic yards of material which is obtained from large cuts at each end of the fill. A picture showing a portion of this work is included in this report.

Federal Aid Project No. 127, which is a grading and gravel surfacing job in Stevens county, near Morris, 17.46 miles in length. The gravel surfacing for this project was obtained from a pit located near one end of the project, and the maximum haul from this pit to the other end was approximately 18 miles. A portion of this project was not ready for gravel surfacing, but 15 miles of the subgrade was finished, and the contract for gravel surfacing that portion was let early in the fall. The contractor used a fleet of 45 trucks, and in spite of the fact that the haul averaged approximately 10 miles, completed the gravel surfacing of the 15 miles in five (5) weeks' time. It was found much more economical to haul by truck, even at the length of haul, rather than ship the material 40 or 50 miles by train and haul from the nearest sidings, from which the average haul would have been only $2\frac{1}{2}$ miles.

Lac qui Parle county deserves special mention in that they have gravel surfaced the greatest mileage of state roads during the year. Our detailed report shows that they have surfaced 72.99 miles with 71,168 cubic yards of gravel, at a cost of \$162,046.44. A large amount of this work was completed under contract with large trucks operating during the months of January, February and March, while the roads were frozen. After the spring breakup very little gravel surfacing was done with these large trucks, as it was found that the roads over which these trucks hauled were damaged excessively by the hard tires and heavy loads. The engineer therefore made arrangements for graveling during the remainder of the season with light trucks equipped with pneumatic tires. The result obtained with this equipment during the summer months was very gratifying, both from a standpoint of low cost of hauling as well as low cost of road maintenance in connection with the hauling.

During the season, 17 paving contracts were under construction, in which various methods and types of equipment were used. The high records for progress were made on three projects, namely, Project No. 114, Sherburne county; Project No. 107, Watonwan county, and Project No. 64, Rice county.

On the first of these projects a central mixing plant was used, which was equipped with a six-bag mixer. The average pavement laid on this contract was 870 square yards per day, with a maximum of 2,196 square yards laid in an actual running time of slightly less than ten hours. The plant was so equipped that the mixer discharged in eight seconds, and the time for charging the mixer was not over five seconds. It is therefore apparent that this equipment was capable under perfect conditions, of delivering an even greater yardage during a ten-hour day.

On the second of these a central proportioning plant was used, the material being hauled from this plant with 2- and $2\frac{1}{2}$ -ton trucks equipped with pneumatic tires and an ordinary dump body divided into two compartments. A four-bag paving mixer was used on this work, and the average output per day was 681 square yards. The maximum output was 1,658 square yards. The subgrade on this project was in a very satisfactory