LOW COST IMPROVED ROADS IN WISCONSIN

N M Isabella,
Division Engineer, Wisconsin Highway Commission

Mr Connor's report on the Investigation of Low Cost Improved Roads presents an excellent summary of the progress made thus far in his study of the work on this type of road as carried on in the various states There is necessarily a wide variation in the types, methods of construction, and of maintenance due to the differences in locality, materials, climatic and soil conditions, and traffic

Statistics show that there are approximately 3,000,000 miles of rural highways in the United States, and of this total, approximately 575,000 miles are surfaced The state highway systems which are the main or through roads in the country constitute approximately 300,000 miles; in other words, about 10 per cent of the total rural highway mileage in the United States Approximately 170,000 miles of the state highway systems are surfaced with various types of surfacing from the ordinary sand-clay road up to durable pavements, such as concrete, brick and others Although it is true that the greatest amount of traffic is handled over the state highway systems, it is also true that the secondary or county highway systems and the local town roads deserve considerable attention in our scheme of transportation Figures collected from the several states indicate that well over a billion dollars is expended annually on highways in the United States This is a large sum of money; but when one considers the relatively small amount of work that is turned out, it will take a long time to secure a complete system of durable pavements on the main highways of this country It therefore follows that in order to render highway service and to keep pace with transportation requirements, it is necessary that goodly sums of money be expended on medium or low type improved roads It is believed that most of the states recognize this fact and that many of them have instituted programs of improvement to embody not only the high type durable pavements but to build also other types which will take care of traffic for a number of years until such time as funds can be made available for building the higher type According to Mr. Connor's report, the surfaced mileage of the country is divided as follows: Sand clay 13 6 per cent, gravel 52 2 per cent, water-bound macadam 12 9 per cent, surface treated macadam and gravel 5 7 per cent, all other types, which included the remainder of the lower types and the high types, such as cement concrete, bituminous concrete, brick, etc, 15 6 per

cent. The figures further show that the high type surfaces, such as cement concrete, brick, bituminous concrete, etc, constitute less than 10 per cent of the total surfaced mileage The percentage outlined above can be carried down to the separate states with some variations, of course, but in general the figures show that the high type pavement constitutes a very small percentage of the total surfaced highway mileage

Wisconsin, recognizing this fact, adopted a policy several years ago whereby it would work toward a system of highways of the high types and at the same time provide temporary surfacing on the gaps which could not be immediately financed In developing the state highway system, which at the present time comprises 10,300 miles, every effort has been made to give through highway service by surfacing a large mileage of roads with comparatively thin layers of gravel, shale, disintegrated granite, sand clay, mine tailings, bog ore, and top soil in localities where these materials were available These surfacings have been laid in depths of from 2 inches to 10 inches and at a cost of from $1000 to $6000 or $8000 per mile the work being done largely under gang maintenance operations. Attention was directed first to those places having poor alignment, bad grades, and dangerous railroad crossings These were given first consideration. Where temporary surfacings were placed, only such grading as was necessary to provide a safe highway, was done At the same time a moderate mileage of pavement and full depth gravel and macadam roads were also built Through this plan rapid progress has been made and relatively adequate highway service rendered.

When the state highway system was adopted in 1918, the surfacing consisted of the following types: Concrete or equivalent 2 4 per cent, gravel, shale, etc., 36.2 per cent, earth roads 61.4 per cent. In ten years time, through the policy adopted, the percentages have changed as follows: Concrete or equivalent 30 per cent, gravel, macadam, shale, etc, 51 per cent, and earth roads 19 per cent During the same period records show that traffic has increased from an average of 609 vehicles per day in 1919 to approximately 2300 vehicles per day in 1927. The above figures are the average for about 75 traffic stations at various points in the state for the years noted. Traffic has multiplied by about 378 per cent It has increased not only in numbers but in weight. Similar conditions prevail in other states

With this rapid expansion in highway transportation comes a demand for better and safer highways, and it rests with the highway

officials to provide highway service in so far as funds will permit, and, if necessary, to help work out a plan whereby adequate highways may be financed.

Referring again to the figures quoted, it will be noted that highway service must be rendered to the motor vehicle owner to a large degree over gravel and other low cost roads; and, in rendering this service, it must be kept in mind that a gravel or other type of low original cost road, may become very costly under heavy traffic, both to the builder and to the user of the highway, through excessive maintenance costs, wear and tear on motor vehicles and increased operating costs. Tests conducted by several organizations indicate that gasoline consumption and tire wear are minimized where the road is surfaced with a smooth top, such as concrete or bituminous mixtures. For this reason a gravel road may be made to serve the same purpose as a paved road for a limited time by bituminous surface treatment, as has been done in several of the states and as discussed in Mr. Connor's report.

Since 1923, Wisconsin has treated several hundred miles of gravel road by the mixing methods and these have given very good service The original cost varied from $900 to $1400 per mile The average maintenance cost over a four year period has been about $600 per mile. This work was done on roads that carried traffic up to 6000 vehicles per day maximum in summer and an average daily traffic for the year of 1375 Using the method of computing service value as given in Mr. Connor's report, it can be seen that this type of road has rendered economical service.

The prevention of dust is a problem that must be faced in all states. The use of road oils, calcium chloride, tars and asphalts to reduce the dust nuisance is fast growing. Their use not only makes the highway safer, but it conserves material, is more sanitary, and increases the capacity of the highway.

In some localities surfacing materials are very scarce and expensive to use Some of the states are experimenting with subgrade treatments to develop a road that will require less surfacing materials than the standard depth roads. Wisconsin tried an experiment of this nature on S. T. H , No. 13, south of Wisconsin Rapids, in 1927 The length of the road was twenty miles and it had a clay surfacing. This was oiled with a light oil using ¾ to 1 gallon per square yard in 2 and 3 applications, one-half gallon being used in first application and ¼ gallon on second application and ¼ gallon on third

application were used Two hundred fifty cubic yards of gravel per mile was then placed on the road and this material was spread to a width of 20 feet The cost of this treatment including gravel was $2400 per mile It is too early to give any authoritative statement as to the service value of this type

Experience has shown in Wisconsin, and it is believed in other states, that a low cost improved road such as mentioned in this discussion, when properly built and followed up with adequate maintenance, can be strengthened to carry increased traffic economically and safely.

A comparatively small mileage of our main highways will be paved each year with high type surface, but finances will not permit the building, within a few years, of all primary or state systems of highways with a durable pavement. Meanwhile we must adequately take care of highway traffic in the best possible manner within the means at hand