

THE OBSERVER

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MACADAM AND CONCRETE.

(From a bulletin issued by the University of Oregon, written by a road expert, and being a review of a booklet on good roads just issued by the Eugene school.)

Relative Cost of Macadam and Concrete Roads.

In considering the relative cost of macadam and concrete roads, it is sufficient to consider those two items which are different in the two cases. The cost of grading, drainage, shaping and rolling the roadbed, and in fact all costs up to the point of placing the road material, should be the same for macadam as for concrete, and these costs will therefore not figure in the comparison.

Cost of Macadam.

The cost of macadam varies of course within certain limits, just as the cost of anything else varies, depending on local conditions.

The very wide variation sometimes reported are generally due to two causes: The very low costs are for inferior construction which would not comply with standard specifications; the very high costs are generally due to incompetent management, though of course unusual conditions sometimes prevail. However, the cost of standard construction under normal conditions and competent management is fairly well known, and the following typical cases may be cited:

In Massachusetts, in 1907, the average of 54 contracts figures out 54.7 cents per square yard for macadam,

6 inches thick, compacted in place. This was for roads on which local stone was used; where imported trap rock was used, the cost was from 10 to 15 cents greater per square yard. In New York, Mr. H. A. Van Alstyne, who was state engineer, at the time New York began her recent good roads campaign, estimated that 57 cents per square yard was a fair cost for macadam 6 inches thick and an average haul of two miles; this with crushed stone at 85 cents per cubic yard, common labor at \$1.50 per 8-hour day, and team and driver at \$4 to \$4.50 per day. This figure (57 cents) does not include the contractor's profit, which was estimated at 20 per cent. Where sand was used as a binder in the lower half, the cost was somewhat less. In New Jersey, in 1908, the average cost of 146 miles of macadam was 65 cents per square yard, including contractor's profit, which would make 54.2 cents per square yard, if profit be figured at 20 per cent of the cost. In Lane county, Oregon, last year, 5 miles of excellent macadam were laid at a cost of 51.3 cents per square yard for the macadam alone. This figure does not include interest and depreciation on machinery. H. P. Gillette ("Handbook of Cost Data") works out an itemized cost of macadam in great detail for an ideal case. If freight charges on materials be omitted, then for a two-mile haul, Mr. Gillette's estimate would be 55.5 cents per square yard for 6-inch thickness, with crushed stone at 75 cents per cubic yard, labor at \$1.50 per 10-hour day, and team and driver at \$3.50 per day.

In many cases the cost of macadam has materially exceeded the figures quoted above, and there are few if any cases where the cost has been materially less, except where inferior construction was used, and inferior construction is generally not worth its cost, however small. On the whole, it seems fairly evident that standard macadam, 6 inches thick, cannot be laid under average conditions for

much less than 54 cents per square yard. It must be remembered that this is for the macadam alone, not including grading, drainage, or any of the preliminary operations.

As to the cost of upkeep of macadam roads, this varies widely of course with different conditions as to amount and character of traffic. The intensity of traffic is constantly increasing, and it will be well for the people of Oregon to have an eye to the future, bearing in mind what has already happened in other places. A correspondent of the magazine "Good Roads" stated in the issue of Dec. 7, 1912, that macadam roads in Dallas county, Texas, cost \$600 per mile per annum for maintenance. This would amount to 6.82 cents per square yard per annum for a 15-foot road.

In speaking before the International Road congress in 1910, L. Mazerolle, engineer of bridges and roads, Paris, stated that the cost of maintaining macadam roads reaches 36 cents per square yard per year in certain instances.

At the same meeting, Mr. Austin B. Fletcher, then with the Massachusetts Highway commission, now Highway engineer of California, stated that the maintenance charge of the state highways in Massachusetts, has increased from 11.4 cents to 5.7 cents per square yard per annum in the last three years, that is from 1907 to 1910. During that time Massachusetts' improved highways were mainly macadam.

W. P. Judson, ("Roads and Pavements") states that "in Paris the annual cost of maintenance of suburban macadamized streets having light traffic is about one-third the original cost of building them. In some cases, of extra heavy city traffic, the annual care cost one-third more than the original building." That is to say, under light suburban traffic, a macadam road has to be rebuilt every three years, and under heavy traffic every nine months.

In examining the reports of numerous state highway commissions, the writer found many instances where the cost of maintaining macadam roads is tabulated at \$1000 per mile per annum, or more, and \$500 or over is a frequent figure.

In an address delivered at Chicago last summer, Mr. Logan W. Page, director of the United States office of public roads, made the following statement: "Figures collected by the office of public roads relative to the cost of maintenance of plain macadam and bituminous macadam pavements under fairly heavy traffic conditions indicate that these pavements when properly maintained, entail an annual absolute maintenance charge of approximately \$450 per mile per annum for plain macadam, and possibly from \$800 to \$1000 a mile for annum for bituminous macadam, for 15 foot surfaces. These figures have led me to believe that we must seek a more permanent form of pavements for country road surfaces." These figures, collected by the United States office of public roads make the cost of maintenance per square yard 5.11 cents per annum for ordinary standard macadam, and about double this for bituminous macadam.

This is what Oregon is coming to in the next few years, in the matter of maintaining macadam roads, if the state makes the progress for which all loyal citizens are hoping. Maintenance costs published only a few years ago, now appear ludicrous. Five years ago Massachusetts highway commission thought they would be able to maintain their roads indefinitely at a cost of 2.25 cents per square yard per annum, but within three years the cost had soared to 5.7 cents, and now the attempt to maintain macadam roads has been practically abandoned, and all sorts of surfaces, patented and otherwise, are being tried out in the hope of saving some of the millions of dollars which the state has put into macadam roads.

In New York, the experience has been the same, and so nearly everywhere throughout this country and Europe. The cases cited are merely typical of what is happening generally, where the people are progressive enough to utilize roads. But there is no thought anywhere that the right of the people to use the roads for which they have paid shall be curtailed. On the other hand, the people are calling for more and better roads and are insisting the roads must be made to serve. The state of New

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