

ROAD MAINTENANCE AND COST.

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SCIENTIFIC road maintenance is not only the mere continuance of an existing form of road surface by the most approved methods, but should mean the providing of a road surface which is best suited for the traffic it is called upon to bear having regard to (a) cost of maintenance and cleansing, (b) economy in regard to wear and tear on the traffic using same, (c) noiselessness, and (d) hygienic qualities.

At the present time the road surfaces most generally in use may be classified as follows: (1) Macadam water consolidated; (2) macadam tar-bound or pitch-grouted; (3) sett paving on existing foundations; (4) sett paving on concrete foundations; (5) natural asphalts on concrete foundations; (6) wood blocks (hard) on concrete foundations; (7) wood blocks (soft) on concrete foundations.

To secure efficient road maintenance the quality of the various materials used and workmanship employed must be carefully determined, and, along with a systematic inspection, records should be kept of the intensity of the traffic, wear and tear and costs, in order to ensure good work and ascertain the relative merits of various methods adopted.

In dealing with the maintenance of a road the first essential is that the road, including the foundation, shall be sufficiently substantial to support the traffic passing over it, and where such is not the case, either in patches or over considerable lengths, it will be found to tend to ultimate economy to go to considerable expense, either in strengthening the roadway generally or renewing the foundations.

Water-consolidated macadam roads, which, at the present time, form by far the greater percentage of the road surfaces of the country, have, on account of the growth of motor traffic of all kinds, proved themselves to be, in spite of the greatest care being exercised in the selection of the material and skilful workmanship, in many cases altogether unsuitable. In several cases the cost of maintenance has increased during the last eight years as much as 100 per cent., and along with this increase the nuisance arising from dust has become almost intolerable.

In selecting the stone for repair work the greatest care must be taken to obtain a thoroughly hard and tough material, and it has been the practice of the author for some years to test mechanically the stone from various quarries in a form of "rattles" machine. The stone submitted for testing, after being broken to a standard size, is carefully weighed and placed inside the machine. The number of revolutions per minute is uniformly regulated, and an automatic recorder indicates the number of revolutions during the period of the test. The stone is afterwards removed from the cylinder and again weighed, and the percentage of loss due to wear and tear ascertained. This machine has been found to be of the greatest value in determining the wearing qualities of various stones.

After every care has been taken to determine the wearing quality of the stone to be used in the maintenance of roads, there is yet one condition which must be carefully observed, especially in the case of road surfacing, in

order to obtain entirely satisfactory results—it is, ensuring that the material used over a given surface is of a uniform quality. The indiscriminate use of two or more stones of different qualities, even when relatively good, both in paved streets and macadam roads, will be found to produce very disastrous results. On macadam roads in particular the traffic will very soon find out the spots where the softer material is situated. Where the surface begins to wear down below the harder material surface water will gather, slightly at first and gradually increasing, with the result that the crust of the road is softened, and the less hard material is subjected to the disintegrating effects of the weather to a far greater degree than the other parts of the road, thereby causing further damage, and, in combination with the traffic, the wear goes on daily in an increasing ratio, and the general surface of the road rapidly becomes a series of hills and hollows.

Before recoating a macadam road the custom is to scarify the surface of the old road crust. After gathering all loose material to the side, a coat of about 3 in. of new metal is carefully spread, and before being rolled the old material from the side of the road is uniformly scattered over the new stone. This coat is rolled dry until all the stones are firmly bedded in position, and is then lightly sprinkled with water. A coating of $\frac{1}{2}$ -in. screenings or chippings is then spread, the screenings having been first damped. This coat is then watered sufficiently to allow the roller to work over the same without picking up the material, and from time to time additional water is sprinkled until the binding material has gradually worked its way into the interstices. Two men are employed in front of each roller lightly brushing the $\frac{1}{2}$ -in. chippings so that the surface is uniformly fed with the fine stone. It is found that the screenings being damped before use find their way more uniformly between the stones, and that the fine material is not washed through the new stone, but helps to close the road crust along with the coarser chippings.

The author is of opinion that in many cases the quantity of water used in consolidating a macadam road is considerably overdone. In wet weather on flat roads little or no water is necessary. In Ireland in the driest of summer weather not more than $3\frac{1}{2}$ gallons of water per square yard of road surface is required. The average quantity of water used last year on upwards of 220,000 sq. yds. was somewhat over 400,000 gallons, and works out at 1.84 gallons per square yard. A final coat of gravel, about $\frac{1}{8}$ in. in depth, greatly assists in finishing the road surface, and protects a new road from the effects of traffic.

In the North of Ireland, on account of the variable climate, tar-spraying has not met with any considerable success. The greatest difficulty has been found in carrying out the work during suitable weather, and in many cases the mud arising in the winter from roads which have been thus tarred has given a great amount of trouble.

Except where very heavy traffic exists, on a properly maintained ordinary macadam road a general patching of the surface should never be necessary, and where, owing to exceptional circumstances, such repairs have to be undertaken, the work should only be done during wet weather. The method found most satisfactory has been to slightly rough the surface of the road requiring such repair, and to make use of stone of $1\frac{1}{2}$ -in. gauge, blinding the new surface with a sufficient coating of $\frac{1}{2}$ -in. chippings from which the stone dust has not been extracted. These are carefully packed by the surfaceman, and

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