RECENT DEVELOPMENTS IN THE DESIGN AND CONSTRUCTION OF ROAD SURFACES

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(Concluded from last week's issue.)

So far as bituminous macadam when laid in the penetration method is concerned, until the last two years this type of pavement was built in many cases under practically the same specifications for asphalts as for tars. These materials have different characteristics; that is, the asphalt will generally stay fairly well to the surface and quite often in warm weather will bleed up, requiring additional stone surface to take up the excess; on the other hand, the tar has a tendency to work down and, with the subsequent oxidation, to leave no material on the surface which is therefore prone to disintegrate. A number of experiments to alleviate this condition have been tried. One of these was on a road I happened to build and the construction was mainly as follows:

After the proper thickness of stone had been spread it was lightly rolled once to shape it to form to the crown of the road. It was then filled with No. 1 and No. 2 stone in an amount just sufficient to fill the voids. (If, however, the stone used is of such character as will crush under the roller, a smaller amount of No. 1 and No. 2 stone mixed should be used.) The top course was then again rolled, after which the bituminous material (tar), heated to a temperature of between 200 and 300° F., was evenly spread over the surface by the use of an approved pressure distributor, operating under a pressure of 50 lbs. per square inch, or more if necessary. The amount of bituminous material used for this application approximated 1¾ gallons per square yard for a compacted top course 3 inches thick.

The surface was immediately covered with a layer of clean No. 1 and No. 2 broken stone mixed, after which it was again rolled and additional No. 1 and No. 2 broken stone mixed, applied and broomed until the voids in the No. 3 or top-course stone were entirely filled. After this was done, all loose stone was swept from the surface and a seal coat of approximately ½ gallon of bituminous material per square yard was applied by means of an approved pressure distributor. The road was immediately covered with No. 1 broken stone which was spread and broomed and again rolled. The rolling was continued and additional No. 1 stone added until a smooth, uniform and thoroughly compacted surface was produced.

The first road on which this was tried is now two years old and has been under average heavy traffic. The results are exceptionally good, so that all of our penetration work done with tar will be conducted according to the same specification.

Another method that has given good results with this type of pavement and which incurs lower first cost where the local stone is not of good enough quality for top surface, is to place a veneer top of ¾-in. trap rock, or other stone of high quality, on the ordinary top course after the first pour of bituminous material has been made. This course should be from ¾ in. to 1 in. thick and is poured and finished with the usual squeegee course, where under observation it has given uniformly good results and a larger saving is made in using materials for two-thirds of the top course.

Concrete Pavement

In finishing the surface of concrete pavement, the belt has largely taken the place of the finishing machine and also of the floating. It has many advocates because it is cheaper than either of the other methods and at the same time gives a good, smooth, easy riding surface.

Another method of finishing concrete surfaces is by the roller. Its advocates claim that on account of the importance of a proper wet content for concrete the roller, if properly used, will not only give a good finish but also greater strength by taking off the excess water and giving the stiff mixture which it is impracticable to use in most concrete road work. This method, which has been in general use in the city of Macon, Ga., was originally developed to remove any unevenness in the surface.

The concealed type of joint is another method in use to make easier riding qualities over the joints in concrete. It has been impossible always to finish them so as to leave a smooth surface, but when the joints are depressed from an inch to 1½ inches below the pavement this unevenness has been obviated. In Fulton County, Georgia, where the concealed joint has been used, good results have been obtained.

Resurfacing of concrete with 3-in. concrete has been tried with success in Wayne County, Michigan. At the same time this work was done the pavement was widened from 16 to 20 ft. and after a year's wear under average heavy traffic conditions the work is very satisfactory. One interesting feature of this work is that after the old concrete surface had been levelled up it was wet and a mixture of hot Tarvia "A" and "X" poured over it. This spread out in a fine layer and made a joint between the old and the new work. The whole work was resurfaced and while the surface has some cracks no serious ones have developed up to the present time. Milwaukee County, Wisconsin, has also done some of this resurfacing.

Here is another method which saves in cost because it uses in part poor local material and decreases the importation of expensive material: The local material is used in proportions of 1 : 2 : 4 or 1 : 2½ : 5 for the lower 3½ to 4½ ins. of the pavement. On it is placed a top course of concrete 2½ ins. thick composed of trap rock or other tough, durable aggregate in proportions of 1 : 1½ : 3. A fairly dry mix is necessary in this type of construction, but contrary to general expectations the cost of manipulation is increased only to a very slight degree.

Brick, Monolithic

This type of construction has many advocates because full beam action can be developed in a structure of this type. The brick are laid in the green concrete as the work progresses. One successful piece of this class of work is to be found in Paris, Ill.

Another new type of brick construction is that known as the cement sand cushion. The cement sand bed is made of a mixture of one part of cement and four parts of sand which shall be not greater than 1 in. after rolling. The sand and cement must be thoroughly mixed before placing. After the bed has been levelled off in the usual manner, it is rolled with a roller weighing about 300 lbs., after which the brick are laid and rolled. Each day's work has to be fully completed. Before the grout is applied the brick must be thoroughly wet by sprinkling so as to set up the cement sand bed. Then the pavement is grouted as usual. A good example of this can be seen in the entrance to the Pennsylvania Railroad Station in New York City, where the work was laid in 1910 and is in excellent condition to-day under the strain of very heavy and diversified traffic.

There is another tendency in brick surfacing which from an economic standpoint has many advantages. That is the use of 3½-in. or 3-in. brick in place of the ordinary