

In proper grading of the smaller constituents about as above a close firm pavement is secured, less care being necessary for the larger sizes, provided also, of course, that a good asphaltic cement is used.

These bituminous pavements will cost from 95 to 90 cents per square yard, not including the concrete base, and are not intended for streets upon which the traffic is heavy. It may be intense that in having a large amount of light or rapidly moving vehicles with occasional teaming of coal or building material, and still be an excellent pavement, but it will not stand the traffic on business streets in cities.

Street asphalt pavements are laid only in the larger cities in Ontario on account of the skill required in properly mixing at the plant. Another reason is that such a plant is necessary. The refined asphalt is softened with a heavy mineral oil in the proportions of about eighty-one to eighty-six parts by weight to nineteen to fourteen parts of flux, and this forms the asphaltic cement. This cement forms from $9\frac{1}{2}$ to $11\frac{1}{2}$ parts by weight of the asphaltic mixture which forms the wearing surface. Between the wearing surface and the concrete base is placed a binder of $\frac{1}{2}$ to 1" stone which holds the surface to the base.

A few years ago several cities in the United States, and one or two cities here, including Hamilton, laid pavements without the binder course, roughening the concrete base instead. While it was successful on some streets with very little traffic it failed on well-travelled streets by rolling on the base. It was found almost impossible to get a roughened base without projecting stones too deeply into the surface mixture, and as a consequence much of the base was made too smooth with the resultant rolling under traffic. In earlier pavements an open binder was used, but recently a binder much closer is used.

The asphalt surface is principally graded sand; in fact about 90 per cent. of the surface mixture with a small percentage of stone dust and mixed with the asphalt somewhat less than will fill the voids to prevent rolling. The surface must be hard enough to prevent caulking by horses, and soft enough to prevent cracking in winter which is between comparatively small limits in this climate. For about two years the asphalt surface becomes about 5 per cent. harder each year so that in repairing a penetration much less should be used for the new material.

In grading the sand we have followed the following standard as closely as possible usually by mixing sand from two or more different places:—

Passing 200 mesh	0%
" 100 "	12%
" 80 "	12%
" 50 "	26%
" 40 "	11%
" 30 "	16%
" 20 "	12%
" 10 "	8%
" 8 "	3%
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		100%

200 mesh sand does not pack well, and is therefore, not so desirable as 200 mesh limestone dust, as it tends to make the pavement mush in hot weather.

The grading given above is somewhat coarser than usual, but it has been found that this mixture gives a richer mixture with the same amount of bitumen, and will also lessen the drying out of the pavement.

The mixture should reach the work at a temperature not less than 28 per cent., and spread with hot rakes for a depth of 3" to give a compressed surface of 2". This requires also some skill and care to obtain good results.

The asphalt pavements will cost, including binder, but not the base from 65 to 80 cents per square yard. It will stand up under heavy traffic better than any of the asphalt concrete mixtures (including the proprietary ones). It requires a certain amount of traffic to keep in condition, and for business streets it is better than the asphalt concrete mixtures that depend on the stone in them for their strength, which on account of the size is apt to move about losing the inherent stability of the pavement.

Asphalt block is composed generally of 77 per cent. crushed gneiss, 10 per cent. limestone dust, and 13 per cent. asphaltic cement put in moulds, subjected to a pressure of from two to three tons per square inch, after which it is slowly cooled in water, all of which is done at the factory. Their only advantage over sheet asphalt is that the blocks can be laid by unskilled labor, but there are few cases where sheet or concrete asphalt is not preferable, especially on account of its high cost of about 2.70 per square yard without the base.

Vitrified brick pavements have been used extensively in some of the larger cities in Ontario, but in the case of Hamilton it is no longer used for pavements, except alleyways, where it replaced concrete. A vitrified brick pavement is not so slippery as asphalt, is durable under moderate traffic, and requires no special plant for laying. The reason for the re-action against the brick pavements in some of the cities is that the people prefer wooden block as being much quieter and lacking the peculiar roaring noise produced by the passage of light wagons. Much credit has also been thrown upon the use of brick by the careless and ill-judged manner in which some manufacturers have sent out irregular or imperfectly burned brick, along with the laying by inexperienced city foremen; a brick that is too hard being just as bad as one too soft upon the bricks surrounding. One drawback is that a street paved with brick and grouted cannot be travelled upon for a week or two after being laid without injuring the joints, and this is almost impossible to prevent upon some streets with the consequence that the flushers afterwards take it out and leave the edges of the brick unprotected, which under traffic causes the edges to chip off. The pavement is laid on a concrete foundation usually with a two-inch cushion of sand to take up an unevenness of the brick and to spread the pressure on the base.

The brick pavement is well laid under good specifications will give as good satisfaction under moderate traffic as asphalt block, while the cost is much less, being about \$1.55 without the base.

Stone block pavements are only desirable for steep grades on streets of large cities where the heaviest traffic exists. There is no such traffic in any city of moderate size, so that in Ontario there are very few places where it would be necessary. It is a difficult pavement to keep clean, is extremely noisy, and about the most expensive pavement that can be laid.