

# Brick Roads and Streets

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It has long been recognized that the bridge engineer should design for each site a bridge or bridges best suited to that location, but although this has been true of the bridge engineer yet the road engineer has been expected to construct on a given highway a pavement irrespective of conditions.

That will not be so in the future. Each section of a highway requires careful designing and over-designing should be avoided as well as under-designing. Not only must the pavement engineer design a road suited to the weight and intensity of the traffic, but regard must be had to cost, and the value that will accrue to the community.

No arbitrary tabulation can be made which will be a sufficient guide to use in determining when a brick pavement is desirable. A road to-day may have a traffic of 200 vehicles per hour, but if this road were improved the traffic would more than double, so in selecting a pavement the engineer must use his imagination and estimating the probable traffic under improved conditions.

We would offer, however, this suggestion that when the traffic amounts to; or is likely to amount to in the near future, 200 iron tire or hard rubber tire vehicles carrying from 500 pounds per inch of tire or upwards pass a given point per hour then one would be well advised to use brick or a concrete base.

Of course there are other conditions than volume of traffic.

It will often be advisable to pave lands and court yards where the weight of load amounts to 1,000 pounds per inch of tire, or sandy hills, etc.

In York County we have paved three hills with brick. The hills have a grade of 9 per cent, yet no complaints have been made in reference to poor traction.

Two of these hills have been paved since 1912, and as yet not one cent has been paid for repairs or maintenance.

The road was paved 16 feet wide at a cost of \$24,000 per mile.

The same hills would have cost \$10,500 per mile to build with macadam and would have cost \$400.00 per mile to repair and oil.

When it is decided that brick should be used, the following specifications will be found satisfactory.

## Specifications for Brick Pavement With Concrete Foundations.

**PREPARING SUB-GRADE.**—The sub-grade is to be formed to the levels and cambers shown on sections; where the ground is soft or otherwise unsuitable it shall be removed and refilled with gravel, broken stone or other approved material, the whole sub-grade shall then be thoroughly rolled with a roller weighing at least eight tons, any depressions discovered after this rolling shall be filled with approved material and re-rolled until brought to the proper levels and camber.

**FILLING** in embankments must be applied in layers of four inches in thickness and each layer thoroughly rolled.

**TILE DRAINS** shall be placed beyond the edge of the concrete or in such places as shall be directed by the Engineer.

**CONCRETE FOUNDATION.**—When the sub-grade has been completed a layer of Portland Cement Concrete, five inches thick shall be placed.

**THE BROKEN STONE** for the concrete shall be hard quality limestone, free from all refuse and foreign matter, with no fragment larger than will pass, in its longest dimensions, through a 2½-inch ring, and not smaller than half an inch in its longest dimensions.

**THE SAND** is to be clean, sharp sand, and free from clay or other injurious material, and to be thoroughly dry when first mixed with the cement.

**THE CEMENT** used shall be an approved brand of Portland Cement, and will be submitted to the tests approved and recommended by the Canadian Society of Civil Engineers, and any cement failing to comply with these requirements, shall be rejected. All cement used in this work shall be properly protected from moisture until used.

**THE WATER** used for mixing the concrete shall be reasonably clean, free from oil, sulphuric acid and strong alkalies. The cement and sand are to be first thoroughly mixed in a dry state until the whole mass shows an even shade, sufficient water shall be added to produce a plastic mass, fluid enough to settle in place without tamping, but not so thin that water will show on the surface. The broken

stone must be damped before being added to this mixture, the whole mass to be thoroughly mixed or turned over at least three times, so that every fragment is coated with cement mixture.

**THE CONCRETE** shall be so proportioned that the cement shall overfill the voids in the sand by at least 5 per cent, and the mortar shall over-fill the voids in the stone or gravel by at least 10 per cent. The proportion shall not exceed one part of cement to eight parts of the other materials. When the voids are not determined the concrete shall have the proportions of one part of cement to three parts of sand and five parts of stone. A sack of cement (94 pounds) shall be considered to have a volume of one cubic foot.

The concrete shall be laid while fresh and within twenty minutes after it has been laid it shall be struck off with a template and as soon as practical trowelled sufficiently to bring the finer particles to the surface and then broomed. When the surface is finished, it shall be kept wet for seven days. Care should be taken that the sub-grade is kept moist while this concrete is being put in place. The whole of the concrete must be thoroughly tamped and no re-tamping will be permitted. No concrete shall be laid when the temperature at any time during the day or night falls below 35 degrees above zero Fahrenheit.

Expansion joints shall be provided at each curb line, and at points as later specified by the Engineer across the roadway. The transverse joints shall not exceed three-quarter (¾) of an inch in width, and the longitudinal joints shall be one inch in width. These joints shall extend the entire depth of the pavement, and shall be filled with bituminous paving cement; great care shall be taken to fill these joints flush with the surface of the pavement and that no dirt, etc., be left in the joints.

After 24 or 30 feet of the pavement is laid, every part shall be rammed with a heavy rammer, a plank laid on the surface parallel to the curb to receive the blows of the rammer, or a steam roller not to exceed five tons may be used. When a self-propelled roller is used it shall first be passed slowly back and forth parallel with the curb until the bricks are firmly imbedded in the sand cushion, the pavement shall then be rolled the entire width of the street transversely at an angle of 45 degrees to the curb, repeating the rolling in like manner in the opposite direction. All broken or injured brick must be taken up and replaced with satisfactory ones which must be brought to true surface by tamping.

**SAND CUSHION.**—On the concrete foundation shall be spread a ¾-inch cushion of clean sand, free from loam and foreign matter, and sufficiently fine so that it will pass through a one-quarter (¼) inch mesh; the sand must be spread by means of a template made to conform to the true curvature of the street cross sections, the compression to be done with a hand roller weighing from three hundred to four hundred pounds.

**BRICK PAVING.**—The bricks used for paving shall be sound, well-burnt paving bricks, showing at least one fairly straight face, free from cracks and excessive laminations, preferably made from shale. They shall be not less than 2½ in. x 4 in. x 8 in., or more than 3¼ in. x 4 in. x 9 in., and shall not vary one-fourth (¼) of an inch in width or depth or more than one-half of an inch in length. The brick shall be reasonably perfect in shape, free from marked warpings or distortion. The brick shall be carefully laid on edge, with the best edge uppermost, as compactly as possible, in straight course across the street, with the length of the bricks at right angles to the axis of the street. Whole bricks only shall be used, except in starting and finishing courses, all fractional batting to be next to the curbs.

**FILLER.**—The filler shall be composed of one part of clean sharp, fine sand and one part of Portland Cement, thoroughly mixed dry in small quantities, water is then to be added until a mixture is of the consistency of thin cream, which shall be kept in constant motion until all used up. The filler shall be poured into the joints until it appears on the surface.

The sides and edges of the bricks shall be thoroughly wet by sprinkling before the filler is applied. Care shall be taken that the joints are free from sand, etc., before the filler is applied. After the filler has hardened, a half-inch coating of sand shall be spread over the whole surface of the pavement; in dry weather this coating shall be kept damp by sprinkling for three days.