CEMENT CONCRETE ROADS.*

Concrete is not a new material, having been employed centuries ago by ancient civilizations, and it is somewhat notable that their use of concrete was largely in association with highway construction. So durable have been some of the old Roman roads that they are still in use in Southern Europe, and are believed by the more ignorant peasantry to be of supernatural origin.

The modern use of concrete in highway work includes many details. It is largely used for pavement foundations, sidewalks, bridges and culverts, bridge abutments and retaining walls, bridge floors, curbs and gutters, man-holes, catch-basins, hand-rails, and other special features.

Concrete has become the recognized foundation for asphalt, brick and other high-class pavements for streets of towns and cities, and for the foundation of brick pavements for country roads. Its use as a paving material for the surface of the street or road has, however, been looked upon with considerable uncertainty, although in a number of cases, some degree of courage has been shown in carrying on this class of work.

Windsor has been the principal place in Ontario to adopt this type of paving, and reports as to its merits have, to the present, been favorable. Experimental blocks have been laid in Brantford, Chatham, Toronto, and other cities.

Recently the good roads movement in the United States has led, in some degree, to the adoption of concrete for country road construction for main highways radiating from large cities. The requirements of traffic have led to the adoption of a type of roadway consisting of a central concrete pavement from 10 to 18 feet wide. On each side of this are gravel or macadam shoulders, making a road of the desired width, usually from 24 to 30 feet from outside to outside of gutters. The cost has varied according to local conditions, but including shoulders, drainage and culverts, has been approximately $1.35 a square yard of concrete.

Concrete pavements are laid in much the same way as concrete sidewalks. The sub-grade is excavated and rolled. This should be carefully done, so that the monolithic pavement will have a base of uniform strength. If the sub-soil is of sand or gravel, the concrete may be laid directly on it, but if it is clay or other impervious soil, it should have a layer, three or four inches thick, of gravel, cinders, broken stone or other strong and porous material. The sub-grade should have the same camber or crown as the finished roadway is to have. If a town street, curbs are laid first; but if a country road, curbs are not used, the surface being merged into the gravel or macadam shoulders.

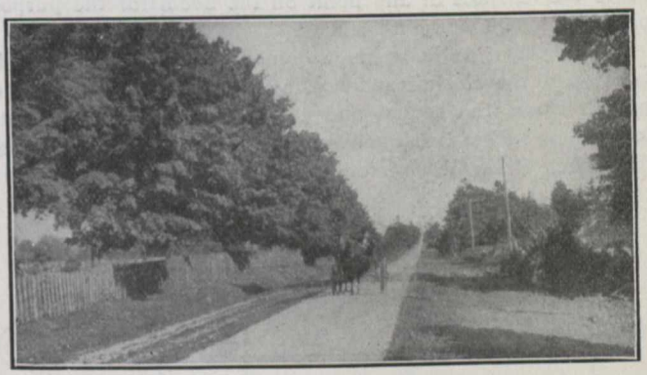
Over the sub-grade the concrete base is spread to a depth varying with the amount of traffic, usually four or six inches. The mixture should be proportioned for greatest density, but common practice employs a 1:3:7 mixture of cement, sand and broken stone; or a 1:8 mixture of cement and gravel. The base should be immediately covered with a wearing surface 1½ or 2 inches thick of strong mortar or concrete.

At intervals of about twenty or twenty-five feet there should be expansion joints across the roadway, about 1½-inch wide; and at the curb similar longitudinal joints, to be filled with pitch or asphalt.

To reach good results, the greatest care must be taken in particulars now well known in paving and general concrete construction. As with any form of road construction the drainage should be ample. The surface coat should be immediately spread on the base before the latter has commenced to harden, so that union will be complete. A well rolled and uniform foundation will prevent much cracking. The mixing of the concrete should be thorough, as imperfect mixing is the cause of a vast amount of poor concrete. The surface should be protected from the sun in the usual way with straw, sand, burlap, and should be kept moist until it is fully hardened. As a rule, a concrete road or pavement should not be opened for traffic in less than ten days or two weeks.

A perfect pavement, meeting all desirable conditions of cost, durability and service rendered has not yet been found; and as requirements in many cases are of an opposite character, it is not probable that an ideal pavement for universal use will ever be invented. The more important qualities usually sought in a pavement or road material are that it should be:

(1) Low in first cost.
(2) Easily and cheaply maintained.
(3) Smooth and hard, so as to offer least resistance to traction.
(4) Easily cleaned.
(5) Noiseless.
(6) Not dust-producing and not muddy.
(7) Non-absorbent and sanitary.



In Wentworth County, on the Dundas and Waterloo Road, Built in 1909.

(8) Such as to give a good foothold for horses.
(9) Comfortable for those driving on it.
(10) Neither glaring nor hot.

The principal objections to concrete as a material for roads and pavements have been that the surface is too hard and glassy to give a proper foothold for horses; that it is rigid and therefore hard on the feet of horses; that it reflects heat and has an unpleasant glare; that expansion joints chip at the angles and under constant traffic deepen to holes; that cracks due to defective construction and to uneven foundations are difficult to repair, and, like expansion joints, chip at the corners.

On the other hand, it has been recognized that were these difficulties overcome, concrete has certain merits. It is low in first cost, as compared with other high-class pavements, and is one of the cheapest materials yet available for a permanent pavement or roadway.

Attention has recently been drawn to concrete pavements which have been treated with a surface painting of tar over which a thin layer of fine gravel is spread, just sufficient to be saturated and held by the tar.

In appearance these pavements resemble sheet asphalt, the tar and sand coating overcoming the glare and reflection of heat. The tar and sand fills the expansion and depressions, serving as a wearing surface. The expansion joints disappear from view and do not chip at the corners. The tar-sand coating deadens the noise of traffic, makes the pave-

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