

THE REAL PAVEMENT

By CHAS. A. MULLEN, C.E.

The real pavement is the artificial foundation for the wearing surface which is laid upon the properly graded, drained and rolled subgrade or natural foundation. Just as the real floor in your house is the floor-boards and not the rugs and carpets, so is the real pavement the artificial foundation and not the pavement wearing surface.

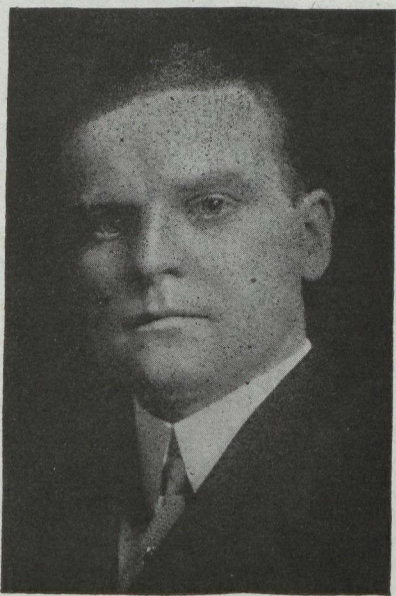
The carpets and rugs, and the pavement wearing surface, both wear out after a time, and must be renewed; but we expect something reasonably approximating permanence in our floorings and in our pavement foundations.

In paying for the real pavement, the artificial foundation, depreciation may be charged off very slowly, and bonds logically issued for a long term of years; but in paying for the pavement carpet or wearing surface, depreciation is much quicker and bonds for the purpose of paying for them should be short term securities.

Types of Foundation.

When it comes to artificial foundations, I am rather a strong advocate of portland cement concrete of standard construction, no fads and fancies allowed; but in some cases bituminous concrete may be used to great advantage.

In other cases where, the traffic is very destructive, a combination of both types has been suggested, a slab of hydraulic concrete on the bottom to supply the rigidity and a covering of bituminous concrete above that to take the shock, and then the pavement wearing surface to take the wear.



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Old macadam, old granite or slag block, and other types of pavements used as foundations for asphalt surfaces; and broken stone alone, properly placed and compressed, is frequently used as a foundation where the traffic is not too heavy for this type of work to stand up.

Types of Surfaces

Pavement surfaces are divided into two classes; the small unit block or brick surface class, including granite block, slag block, wood block, vitrified brick, asphalt block, and others; and the bituminous sheet layer surface class, the bitumen being the cementing material, tar or asphalt, which holds grains of fine dust and sand and crushed stone or gravel together in the sheet layer that you find so pleasant to ride over on a city street.

This latter class may be divided in two ways; in accordance with the nature of the bitumen used, tar or asphalt, or in accordance with the nature of the mineral particles which the tar or asphalt hold together.

Tar is used for macadam road work very extensively, but is seldom used for the higher types of city street surfaces; while the fine mixtures of dust, sand and small stone-chip aggregates are used more for heavy traffic and the coarser stem aggregates more for light traffic.

The standard sheet asphalt wearing surface mixture is

about 12 per cent Asphalt-cement, 16 per cent pulverised mineral dust and the remaining 72 per cent specially graded sand.

Pavement Maintenance

We construct a pavement once, but we maintain it for ever. That is, we rather expect to maintain it that long. Therefore, the maintenance problem is really a larger one than that of construction, and construction may truly be said to be merely incident to the beginning of maintenance and a part thereof. There is really no definite line of demarcation between the two.

Many items enter into this maintenance problem; not the least of which, is the current rate of four to six per cent on the municipal dollar. Whether that municipal dollar is a borrowed one, or the city's own dollar, makes no difference. It is worth so much rental per year either way.

This means that if a city can lay one pavement one dollar per square yard cheaper than another, and can maintain it for not more than the annual current interest rate above the amount for which it can maintain another pavement, these pavements are equally economical.

This fact should cut out the laying of many of the higher priced pavements, such as wood block and vitrified brick, and limit the use of granite block to where it is most needed on very heavy traffic streets and steep grades which carry heavy weight traffic.

ONTARIO HYDRO-ELECTRIC FINANCES

In a letter to the Montreal Gazette, Mr. J. E. Middleton, of Toronto, explains very clearly the splendid position of Ontario's Hydro-Electric as a public owned public utility. The letter in part says:

"I take the liberty of submitting a few facts relating to "Hydro" operation in the twelve municipalities which signed the first contract for energy with the Hydro-Electric Power Commission of Ontario. To-day 236 municipalities have entered the co-operative union, but the twelve pioneers have had the longest and most varied experience. They are Toronto, London, Stratford, Guelph, St. Thomas, Woodstock, Kitchener, Preston, Hespeler, Waterloo, New Hamburg, and Ingersoll.

"The capital outlay of the twelve of their transforming stations and distributing plants was \$13,360,822. Series debentures, some for twenty years, some for a thirty-year period, were issued to provide the money and power was first available early in 1912.

"The eight-year period, which ended on December 31st last, was unique in the history of industry, and finance. From normal times the world plunged into war, and then struggled through reconstruction. The cost of labor and materials rose to unprecedented heights. With inflation, came business uncertainty and class unrest. In most of the municipalities named a large munitions business was built up during the war. It ended with the armistice. Until the factories were readjusted to peace-business, the sales of power were greatly affected. The variation in consumption reached 80,000 horse power.

"Despite these things and in the face of periodical reductions in the rates, as provided for in the contract, eight of the twelve municipalities, after eight years of operation have accumulated reserves and liquid assets sufficient to wipe out every dollar of outstanding liability. One more has almost reached that happy position. The other three, Toronto, London and Stratford, had a very heavy capital outlay, due to their large population and the great area to be served. But these have provided for 54 per cent of their total debt, while only 26 per cent of the lifetime of the debentures has elapsed.

"Taking the twelve jointly the balance of liability is \$11,432,267. The reserves and surplus accumulated to meet the obligation reach \$5,550,769. Each municipality has paid from revenue the interest and sinking fund on its own plant, and its just proportion of the interest and sinking fund on the generating and transmission system controlled by the commission. It has paid also operating and maintenance charges, despite advancing costs, and has set aside a depreciation charge sufficient to renew the plant in twenty years. The surplus, after all these charges have been met, reaches the sum of \$1,231,175.

"Not one cent of municipal or provincial taxation to aid in carrying any Hydro-Electric system or plant. In view of these facts and figures the people of Ontario perhaps may be pardoned for their continued and unflinching support of the Hydro-Electric enterprise."