

## USE BY RAILROADS OF CONCRETE PILES.

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piling for bridge bents. Several of the western railroads have used concrete piling to a considerable extent and found it to be good and permanent construction.

In many cases, concrete piling has been used for supporting small abutments, where placed on embankments, as this type of construction is more economical on account of the saving in the cost of expensive high abutments.

## CREOSOTED WOOD BLOCK PAVEMENTS.\*

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FOR fifty or sixty years before wood blocks were subject to treatment many pavements were laid in the United States and Canada for roadways and sidewalks. In this country mostly round cedar blocks were used, although the north sidewalk of King Street East, Toronto, Ont., was paved with a patented block, known as the Nicholson pavement. These pavements, while satisfactory for a year or two, soon decayed, and in a comparatively short time were removed. In most of these pavements little care was taken in laying or in the preparation of the foundation, which was generally plank laid upon the natural ground. After years of repeated failures attention was directed to the use of preservatives, which, in the first experiments made, consisted in placing thoroughly dried blocks in a bath of creosote heated to a temperature of about 210° F., until about three pounds per cubic foot of creosote was absorbed. While these pavements were fairly successful, it was soon realized that the best results could not be secured by dipping the blocks, and the blocks were then treated with creosote under pressure until they absorbed from ten to twelve pounds of oil per cubic foot. Such a pavement, laid in Indianapolis in 1898, gave such good results that city engineers began to appreciate the possibilities of treated wooden blocks and better results were obtained.

On Tremont Street, in Boston, a wood block pavement, treated with creosote-resinate process, composed of one-half creosote oil and one-half resin, was laid in 1898. The writer saw this pavement last October, and it was still in good condition after sixteen years of heavy traffic.

A small piece of similarly treated wood block was laid on the west side of Yonge Street, at Front Street, opposite the head office of the Bank of Montreal, in 1896, and was still in good condition when taken up for a new pavement about two years ago. The writer also examined such pavements in New York on Church and Warren Streets after they had been in use for nine years under the heaviest kind of traffic, and they were still in good condition. In the city of Hamilton probably more treated wood block pavements have been laid than in any other city in Canada, and the first pavements laid in 1909 are as good as when laid, and, although subject to the heaviest traffic in that manufacturing city, have not to date cost a cent for maintenance.

These examples, which I have mentioned, are but a few of the numerous examples showing permanence and suitability of this form of pavement for streets carrying heavy traffic.

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I may say that it has also been laid on residential streets, where the residents assume its greater cost as compared to asphalt for the added comfort through its quietness under traffic.

The wood principally used has been long-leaf (yellow) Southern pine, which from experience has been found to give excellent results. Most specifications now, however, admit Norway pine and tamarac and white birch as a result of experimental pavements laid in Minneapolis, which showed the suitability of these woods. No doubt other species of wood make satisfactory pavements, but on account of the incomplete knowledge of their value city engineers, as a rule, prefer a wood that has proved satisfactory.

The blocks are from three to four inches wide and vary in depth from three to four and one-half inches, with a length of from five to ten inches. As for all timber specifications, the blocks should be sound, free from large or loose knots, shakes, worm-holes and other similar defects. As to the proportion of sap and heart wood, the present specifications are not very rigid, as experience has shown that treated blocks having both sapwood and heartwood do not vary in their wearing qualities.

The preservative used is a creosote oil having a specific gravity of from 1.08 to 1.14, containing a percentage of tar, free from carbon. Coal tar oils are used in preference to water gas creosote, as sufficient experiments have not yet been carried out with the water gas creosote to determine its relative value.

The writer has been corresponding with a number of city engineers with a view of obtaining opinion as to the most satisfactory amount of treatment required per cubic foot of block, according to the experience of each city, and in replies from twenty cities in the United States has ascertained that six of these cities use 16 pounds, two of them 18 pounds, and twelve of them 20 pounds, depending to some extent on local conditions.

**Laying the Pavement.**—The base for wood block pavements should be of concrete, from five to six inches deep, having the crown parallel to the finished crown on the blocks. An uneven or irregular base is detrimental to any pavement, as it is liable to cause a depression in the surface to hold water, which the repeated impacts of wagon wheels is certain to increase, giving an uneven surface. Upon this concrete base is placed either a sand or mortar cushion. This cushion is usually one inch deep, and has its surface struck by templates to a surface parallel to the contour of the finished pavement. Where sand is used, the sand is such that it will all pass through a quarter-inch screen, besides being clean. If a mortar cushion be used, some engineers use a proportion of one of cement to three of clean sand, to which sufficient water is added to insure the proper setting of the cement. Other engineers obtain good results by mixing and placing the cement and sand dry. This cushion is simply a means of securing a uniform surface for the blocks to rest upon and distribute the load. Alongside or between street car tracks, however, or on grades, sand cushions are apt to become uneven or flow, caused by the vibration of the rails, or by water getting in alongside the rails, so that under these circumstances a concrete cushion should be used. Away from the car tracks the question of whether a sand or mortar cushion should be used is a matter of opinion. Sand gives a better cushioning effect and the blocks do not have to be rolled so soon after laying as when a mortar cushion is used.

English and French practice does away with this cushion altogether, but the concrete base is finished off