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PERMANENT STREET BUILDING ON THE PACIFIC COAST

by R.S. Perry

As the subject of road building and maintenance in B.C. is one of too great magnitude to be fully dealt with in a paper of this kind, I have endeavored to confine myself to a discussion of the main points and methods of permanent road building, in Vancouver, with a short reference to some notable works in the neighboring municipalities; and to show, as far as possible, the relative merits of the different kinds of pavement used. The methods, as set forth, may be taken as characteristic of the methods used in the Coast cities.

General introduction and classification

Pavements as used in the west may be divided roughly into two general classes:

(1) Block Pavements, under which head will be considered wood (treated and untreated), stone and vitrified brick blocks.

(2) Sheet Pavements, including asphaltic concrete, sheet asphalt, bitulithic, granitoid and concrete.

Keeping pace in road building, with the rapid development that has marked all business in the west, during the past few years, has made the task of the city and municipal engineering staffs no light one, and the endeavor has been to secure a paving material that shall combine as nearly all the elements of a perfect pavement as possible, at as low a price as is conformable with reliability; always, of course, keeping in mind the fact that repairs cost money.

The principal requirements demanded of such a pavement are: (1) that it shall have an even, hard surface giving a good foothold to horses, (2) be as nearly noiseless as possible, (3) it must be clean and easily kept so, (4) free from dust and sanitary, (5) it must show an even wear and stand up under very heavy traffic, (6) it must show long life under varying climatic conditions and especially during the wet season, (7) it must be easily repaired, when this necessity arises, and must have as low a first cost as is conformable with the above conditions.

Wood blocks

Creosoted wood blocks make a very fine pavement when the materials have been properly treated and the pavement has been properly laid. This pavement embodies nearly all the requirements mentioned above under ordinary circumstances, and until the year 1912 was the class most used for city paving. The policy has been to pave the business streets of the city with wood blocks whenever the grades would permit. On steep grades the lath construction for laying these blocks was used with considerable success. The blocks were separated with laths which left a space of about three-eighths of an inch between them, giving a good grip to horses. This pavement has been extended to other parts of the city outside the business section, on the more important streets where traffic is heavy. It has been used to pave the three big steel bridges spanning False Creek, each of which is about three-quarters of a mile in length, with great success.

When first laid it makes an admirable pavement, for the surface is hard and even and will bear the heaviest traffic, and it gives a good foothold for horses. It is practically dustless and easily cleaned although the expense of maintenance has been found to be higher than for other classes. The chief advantage of wood blocks for business street paving where the traffic is heavy, lies in the fact that it is practically noiseless. In eastern cities where the summers are dry and the streets covered with snow for the greater part of the winter, it makes an admirable pavement, provided that the wood has been chosen with care and is free from sap and large and dead knots, and that it has been carefully treated with a high grade creosote within specified limits. The success of this pavement depends upon these conditions being strictly adhered to.

On the (west) coast where the winter is mild and the rainfall heavy, the conditions most adverse for the success of this kind of pavement, it is gradually being superseded by other classes that have been found to give greater satisfaction. Asphaltic concrete is taking the place of the wood on the level streets and where the grade is not excessive, while vitrified brick blocks have been found to give great satisfaction when used on the heavier grades, and this pavement is taking the place of wood block on these streets. The use of these pavements in place of wood blocks, which were for a time very popular in the city, has come about through the experience of the Vancouver city engineering department, whose officials have made a careful study of pavements and the conditions affecting them. The original specifications of the city for wood blocks were that the wood should be free from all sap, bark, and large and dead knots and that it should be treated with a high grade creosote in conformity with the city laboratory's test, and that the creosote should run at least ten (10) pounds to the cubic foot.

Until the year 1912 this pavement was considered to be far in advance of any other for paving business streets, and the mileage laid was far greater for this class than for the others. In 1912, however, the recommendations of City Engineer Fellowes were acceded to and 7.757 miles of asphaltic concrete were laid, as against 7.346 miles of wood blocks, and during 1913 and the present year the mileage in favour of asphaltic concrete has been greatly increased. Up to the end of 1912 there had been laid 22.023 miles of creosoted wood blocks and 4.208 miles of untreated cedar blocks, out of a total of 51.466 miles for all classes. The untreated wood blocks

were laid previous to 1911 and were more or less in the way of an experiment, though a costly one to the city, for they were found to be unsanitary and expensive to keep up. A considerable mileage of wood blocks is still being laid in the city but the stringency of the specifications has been increased, and the engineering department is considering the advisability of increasing the amount of creosote required to 15 pounds per cubic foot.

It has been found that after the surface coat of pitch has been worn away, the water (especially during the wet season) slowly seeps into the blocks and drives out the creosote, which forms a greasy coat on the surface of the blocks, very detrimental to motor traffic. This greasy surface during the wet weather has been the cause of many serious motor accidents and many others have been narrowly averted. When the effect of the water has continued for some time, the amount of creosote remaining in the blocks is very small and decay soon sets in, due to the harmful action of the surface liquids. The decay is most rapid around knots and in blocks having a small number of rings to the inch. This matter of the number of rings to the inch is very important, for in blocks where the number of rings per inch is small, say 6 or 8, the crushing effect is much greater than on finely ringed blocks where the number of rings per inch will run as high as 40, and when once decay sets in the action on the softer, fewer ringed blocks is more rapid than on the others.

The wearing away of the softer blocks creates a hollow and the hammering effect of the steel tires soon makes a noticeable depression and it becomes necessary to remove the old blocks and repair the pavement. This trouble might be eliminated by a careful selection of the blocks, whereby only blocks of a uniform number of rings per inch would be used -- that is, all few rings to the inch or all with a large number of rings to the inch -- and a sufficient amount of creosote used to insure a successful resistance to the seepage water. The use of blocks having a uniform number of rings to the inch would insure an even wear to the surface of the pavement but the extra labor and time required to select and inspect these blocks would add so heavily to the cost that it would become prohibitive to use the pavement. As it is the cost of placing the pavement complete, inclusive of all incidental expenses runs close to $5.00 per square yard, so that the pavement is required to have a very long life with little repair expense, to make it economical.

Asphaltic concrete

As stated before this class of pavement is rapidly replacing the wood block pavement as the chief permanent road surface. This pavement was first laid in the city on the recommendation of City Engineer Fellowes, in 1912, and only after a very careful study of the conditions affecting its use, and a comparison of the relative costs of this pavement and the other classes of pavement used. The pavement has been laid on streets of different classes, from those in the residential section, where the traffic has practically no effect on the wearing qualities, to streets in the business section where the traffic is of the heaviest, and it has been found to give the very best satisfaction, wherever used. During the two and one-half years that have elapsed since the first pavement of this kind was laid it has been found to retain its hard even surface under the heaviest traffic that it has been possible to place upon it.

Curbing

In connection with all the different kinds of pavement the same general rule is followed for the curbing. When paving work was first carried out by the city the curbs were almost all cut stone curbs, about 8" wide and often being as much as two feet in depth, which allowed the curb to be run well below the bottom of the concrete base, and still leave a step of about eight inches from the top of the curb to the level of the finished pavement. The reason for the use of stone curbing

was that granite was very easily obtained and worked at a cost that compared very favourably with the cost of other materials for curbing. Now however, the cost of cut stone has increased considerably, while the cost of concrete for this work has decreased in price. The result is that all curbs on the straight stretches of the streets are now made of concrete, molded in place, and cut granite curbs are used only on the curves at the intersection of two streets.

The wear on the straight sections of the curb is not of sufficient importance to warrant the extra cost of using granite curbs, while the wear of the curves is very great, due to the grinding effect of the iron tires of team traffic. Thus the added cost of cut stone on the curves is more than offset by the elimination of renewals to the curb, which are difficult and very costly. Where asphalt pavement is used, and sometimes in connection with other kinds of pavement the practise is to mold the curb and gutter in one section. In 1912, 16.149 miles of curbs were placed.

Costs

The total expenditure for paving streets throughout the city (within the city boundaries only) in 1912, amounted to $1,791,383.35, exclusive of the cost of curbs, which amounted to $44,572.97, making a grand total of $1,835,956.32. The first amount, of $1,791,383.35 was divided among the different kinds of pavement, as shown in the table following:

Pavement	**Cost**	**Pavement**	**Cost**
Creosoted wood blocks	$791,707.64	Stone blocks	$70,067.35
Asphaltic mixtures	$615,115.79	Granitoid	$64,154.38
Bitulithic	$133,523.66	Macadam	$25,848.65
Vitrified brick blocks	$ 83,548.00	Concrete	$ 7,417.88

The last sum of $25,848.65 does not properly belong in the appropriation for permanent road work, as Macadamizing is charged to revenue and upkeep. For convenience, and purposes of comparison with the above table, the mileage is given in the following table, of the different kinds of pavement, which were laid during 1912. This year (1912) was a record year for total mileage laid, not only for the City of Vancouver, but for the Dominion. In this year there were laid 485,391 square yards, or 20.810 miles of pavements divided among the different kinds as shown below:

Pavement	**Mileage**	**Yardage**	**Pavement**	**Mileage**	**Yardage**
Creosoted wood blocks	7.346	189,875	Bitulithic	1.183	22,682
Asphaltic mixtures	8.876	174,079	Granitoid	0.605	17,834
Stone blocks	1.285	55,359	Concrete	0.245	2,870
Vitrified brick blocks	1.270	22,692			

Cleaning

A step taken in 1913 by the city that has proven most successful, and which has been followed by several large cities on the continent was the purchase of two 800-gallon motor street flushers, at a cost of between $7000 and $8000 each. They were the first of the kind in America and their success in Vancouver has led to the purchase of four by Chicago, and the Locomobile people, by whom the motor truck was specially built, state that they have had inquiries from several large cities where the purchase of one or more of these trucks is contemplated. The flushers were specially built to the specifications of the Vancouver City Engineering Department, all parts except the motor truck being manufactured in the city.

These flushers are designed with four flushing nozzles so that the whole of the widest street in the city can be cleaned at one trip. These nozzles are separately adjustable, so that one, two, three or four can be used at once and with a variable force to suit the conditions of the street. The force of water is adjusted to clean all refuse to the gutter, which greatly facilitates the work of the sweepers. The machines are equipped with high power, heavy duty engines, and can travel with sufficient speed to cover the whole city a sufficient number of times to keep the streets always clean, thus greatly aiding the work of the sweepers. To do this it has been necessary to work the machines both day and night. They are used for cleaning only, lighter horse carts being used to lay the dust on Macadam and earth streets. The sprinkling cart now recommended for use on these streets is the single horse cart, as these have been found to be more economical than the two horse carts, which have nearly all been turned into oiling carts.

Oiling

A paper on the road building of Vancouver would not be complete without mention being made of this very important method of road treatment, by oiling the surface with crude oil. While it does not properly come under the head of permanent roadway construction, yet during the past two years it has come to have such an important place in the building of the city streets that it may almost be looked upon as such. During the year 1913 there were 31 miles of streets treated with oil, and already for 1914 (June) mileage is over 40 miles.

The cost of treating the streets with oil is very low and compared to the benefits derived it is the cheapest and most efficient method of putting them in satisfactory shape. The efforts of the Engineering Department have been directed to securing the best results obtainable from a cold oil of asphaltic base, running by gravity, and a most satisfactory condition has been reached. The oil used has a very high percentage of asphalt -- as high a percentage as possible and still have sufficient fluidity to run freely under the action of gravity -- and this asphalt mixes with the sand, with which the street is first sprinkled, forming a highly protective covering for the roadway surface. The use of oil improves the sanitary condition of the street greatly and does away with flies and other insects. A benefit that has been noted where the streets are oiled, is the great decrease of pulmonary trouble of residents on these streets.

An average taken over twenty streets in the City shows a very low cost for treatment in this manner. The oil costs 3 4/7 cents a gallon; one gallon will cover 3.79 square yards, the cost of sanding and oiling amounts to only .0218 cents per square yard, sweeping and pumping the oil add .002 cents per square yard, so that the total cost per square yard is less than two cents.

The above article was excerpted from a summer thesis written in 1914 by Rolf Perry, who at that time was an applied science student at McGill University. Mr. Perry began work at the Forest Products Laboratory in Vancouver soon after its inception in 1919 and served as director for a number of years. He was involved in much of the pioneering wood science research in western Canada which created many applications for B.C.'s wood products, in turn stimulating the forest industry. In reading about street construction techniques of earlier times we are reminded both of the importance of forest products and the ways in which they were and are put to use. This essay provides an interesting glimpse into Vancouver's past and was kindly provided by FHABC member Rick Woods of Victoria - a grandson of Mr. Perry.

AWARDS OF MERIT FOR 1994

The FHABC presents annual awards of merit in recognition of major contributions to furthering an awareness of B.C.'s forest heritage. For 1994 the awards went to Dr. Richard Rajala for his *The Legacy and the Challenge: a century of the forest industry at Cowichan Lake* and to Robert Swanson for his *Whistle Punks and Widow Makers: tales of the B.C. woods.*

Richard Rajala grew up in the Hillcrest Lumber Company's village at Mesachie Lake and once worked in the mill at Honeymoon Bay. Earning a Master's Degree in History at the University of Victoria, his thesis garnered him the Governor General's Gold Medal. Having recently received his doctorate from York University, Mr. Rajala teaches history at the University of Victoria.

The Legacy and the Challenge is available from Crown Publications, Munro's Books and the Royal B.C. Museum bookshop in Victoria. It may also be ordered directly from the Lake Cowichan Heritage Advisory Committee for $12.95 + 91 cents tax = $13.86 (Box 860, Lake Cowichan, B.C. V0R 2G0 (604) 749-6681. It will be reviewed in the next issue of this newsletter.

Mr. Rajala also received the Theodore C. Blegen Award from the Forest History Society of North Carolina for the best article published in a journal other than *Forest & Conservation History.* He won the award for his paper entitled "The Forest as Factory: technological change and worker control in the west coast logging industry, 1880 - 1930" published in the Fall 1993 issue of *Labour/Le Travail*.

Born in Reading, England in 1905, Robert Swanson came to Canada as an infant. After earning his steam engineer's ticket at the age of 17, he worked in the woods and went on to study engineering. Swanson also made sound recordings of logging equipment, designed and manufactured steam whistles and air horns, and worked on the locomotive at the B.C. Forest Museum as well as the Royal Hudson. The air horns that play the first notes of "O Canada" each day at noon from Canada Place in Vancouver were designed and made by Swanson.

Exposed to logging operations and camps as a safety inspector in the 1940s and 1950s, Robert Swanson also authored several books of poetry (*Rhymes of a Western Logger* - 1942, *Rhymes of a Lumberjack* - 1943, *Bunkhouse Ballads* - 1945 and *Rhymes of a Haywire Hooker* - 1953). These were collectively re-released as *Rhymes of a Western Logger* in 1992. Sadly, Robert Swanson passed away in October of last year, a short while after receiving our award.

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MEMBERSHIP RENEWALS

This is the last issue for 1994. Renewal notices will be sent with the next newsletter to those members who will need to pay their dues for 1995 and beyond. For new members who joined in the fall of 1994 their memberships automatically extend to the end of 1995.

This newsletter is the official organ of the Forest History Association of British Columbia. It is distributed at no charge to members of the association, libraries, archives and museums. Items on forest history topics, descriptions of current projects, requests for information, book reviews, letters, comments and suggestions are welcomed. Please submit newsletter material and send changes of address to the Editor: Mr. John Parminter, # 1 - 949 Pemberton Road, Victoria, B.C. V8S 3R5. Phone 595-0374.

Membership in the association is $7.00 yearly, or $30 for five years. Please send dues to the Treasurer: Mr. Edo Nyland, 8793 Forest Park Drive, Sidney, B.C. V8L 4E8. Phone 656-9276. The President, Dr. Bob DeBoo, can be reached c/o Silviculture Branch, Ministry of Forests, 990 Fort Street, Victoria, B.C. V8W 3E7. Phone 387-1071.