A "Good Roads" Report

By County Surveyor A. N. Gould in The Marshfield Evening Record

As Coos county is soon to vote on a bond issue of some $440,000 for the construction of permanent main roads throughout the county, it is highly important that the voters throughout the county, before the election is called, inform themselves as much as possible along these lines, with especial regard to what kind of road is to be constructed, how long it will last when properly constructed, the cost of construction and last but not least the cost of maintenance when completed.

As county surveyor, I am of course very much interested in the survey and construction of permanent roads and to thoroughly familiarize myself with the most modern construction of permanent roads, I spent a month in the state of California inspecting at close range, their state highways.

For the information of the members of the Good Roads Association, and anyone who might be interested in the subject, I submit the following brief report:

To begin with, the state of California in 1910 voted a bond issue of eighteen million dollars for the purpose of building two trunk lines of highways practically. the entire length of the state, with numerous branch lines and feeders connecting up all capitals of counties and the main towns, the approximate length of which is 2800 miles. These bonds were to bear four percent interest and must not be sold below par.

The Hon. Frank H. Gould, surveyor general of California and Nevada obtained for me a letter of introduction from Governor Johnson to the highway commission, and I am idebted to the highway engineer, A. B. Fletcher, for most of my information.

For a large portion of the roads the commission has adopted a pavement consisting of Portland cement concrete base of a minimum thickness of 4 inches and 15 feet wide with shoulders at least 3 feet wide on each side of the concrete. The concrete base is covered with a thin coating of asphaltic oil of special quality and stone screenings, forming a bituminous carpet from three-eights to one-half inch in thickness to serve as a wearing surface to protect the concrete. In places where conditions warrant, the thickness of the slab is slightly increased, and where the traffic is extremely heavy the width is increased, in some localities to as wide as 24 feet. The concrete is composed of one part cement, two and one-half parts fine aggregate and 5 parts coarse aggregate, a cubic yard of concrete containing 94 pounds of cement. After the concrete is thoroughly dry it is sprayed with a heavy asphaltic oil at the rate of from one-fourth to one-half gallon per square yard, the oil to be applied by a power spray at a temperature of about 250 degrees farenheit. Upon this stone screenings are spread until all the oil is absorbed, and left until thoroughly set before traffic is admitted.

The cost per mile of this class of construction based upon 100 miles under contract is $7,600, as follows:

Grading, culverts, etc., per mile $1,300.00, equals 17.1 perc.

Four inch concrete base per mile, $5,860.00, 77.1 perc.

Three-eights inch bituminous wearing surface, per mile, $440.00 8.8 perc.

This is equivalent to $6 per cubic yard of concrete for the base and 5 cents per square yard for the wearing surface. Taking this as a basis and supposing we were to build our roads 9 feet wide and 5 inches thick with the same wearing surface, the cost of our road would be as follows:

Five inch concrete base 9 feet wide per mile, $4.400. ⅜ inch wearing surface at 5 cents per square yard, $264, making a total of $4.66 per mile Mr. Fletcher gives the life of this kind of wearing surface as about two years. As our traffic will not be nearly half as great as the traffic in California, it would be safe to say it would last at least three years, without renewal. It would therefore cost $88 per year per mile to renew entirely this wearing surface. However we can expect to build concrete roads here as cheap as they can in California, but assuming that it costs us 20 per cent more which ought to be a safe margin, the cost of the concrete base would be $5,280 per mile or one dollar per lineal foot, and the ⅜ inch wearing surface would cost $316.80, making total of practically $5,600 per mile for a 5 inch base 9 feet wide with a ⅜ inch bituminous wearing surface, and if this surface should require renewal every three years, it would cost $105.60 per mile. Not very steep for keeping a road in condition so you can drive over it any day in the year. At this rate it would cost $1,056 to keep the road between Coquille and Myrtle Point in good condition for a year, while under our present system it costs thousands of dollars, and the road is never in good condition, and is practically impassable during the winter months. Even if the cost of maintenance was several times this amount it would still be a paying proposition.

Practically all of the counties throughout the state have agreed to furnish all necessary right of way through their respective districts free of charge and to build all bridges over 20 feet in span. The right of way in almost all cases has a minimum width of 60 feet and graded to a minimum width of 21 on all roads except in mountainous country, where a minimum width of 16 feet is allowed. A maximum grade of 7 percent is allowed for the mountain roads, but this is allowed only in very mountainous localities. The crown of the concrete roadway is very flat, not being more than 2¾ inches.

As a rule the people, town and corporations of the state have been very liberal with the commission. The farmers along the line have donated land for right of way, local banks have bought up large amounts of bonds, companies are furnishing cement, sandstone, etc,, at bedrock prices; the railroad companies of the state have entered into an agreement with the commission to haul all material used for construction at practically 50 per cent of the standard rates. This means a saving of untold thousands of dollars to the commission. Following are the rates agreed upon for hauling all material including contractors equipment.

Stone, gravel and sand one-half cent per ton per mile, with a $6 per car minimum, exclusive of mountain hauls.

Road oil and bituminous rock ¾ cents per ton per mile; minimum $10 car.

Asphalt, 1 cent per ton per mile, whether in tank, car or packages; minimum $10 per car. All other commodities, (a) The lowest of any commercial rate, or (b) one-half of any class rate; minimum $10 per car.

The commission has a contract with one of the largest crushed rock concerns to supply one-half million tons of crushed rock at 45 cents per ton. They also have a contract with various gravel concerns to supply the same at 27½c per ton.

The commission has set a good precedent by standing between the small contractor and the powerful paving concerns who assume to do business uder the so-called patent rights, and announced in no uncertain etrms its intention of defending any and all suits for infringment of said so-called patent rights.

We in Oregon hear and read a great deal of the criticism of the type of construction adopted by the commission, and upon investigation I have found that a great deal of this criticism originates from large paving contracting firms, who claim that the commission should use from 1½ to 2 iches of sheet asphalt for a wearing surface, or something equivalent. Now practically all of such finishings are covered by patent, so that the cost is absolulety prohibitive. Again you will be told that 4 inches of concrete is absolutely insufficient to carry heavy traffic.

I personally examined about 200 miles of the highway and failed to find one single instance where the 4 inch concrete base had failed. I find that the pavement is cracked across the road about every 30 feet due to contraction, but this would have occurred had the pavement been a foot thick. Just as soon as these cracks appear they are filled with a bituminous material, and after the wearing surface is applied these cracks cannot be found on the surface even by a close inspection, and the roadway is left perfectly smooth, while if expansion joints had been used there would be a rough place left, which would make more or less of a jar in riding over it.

I found several places where the concrete that had not received the wearing surface, when it had become pitted to considerable extent. I also found places where the wearing surface was flaking off of the concrete. I took this matter up with the engineer and he told me that they had got a bum job, due to an unfaithful contractor and unskilled inspector at the mixer, and that the traffic was admitted to the pavement before the proper time had elapsed.

To test the strength of the 4 inch concrete base, a test was made on a portion of the highway near Fresno, when the concrete was 35 days old and before any wearing surface was applied. Before the test was made the earth was removed under the concrete for a width of 2 feet and a distance of 4 feet, from the edge back. The test was made with a ten ton roller in which 1-3 of the load is on each rear wheel, the wheels being 20 inches wide. In the first test the roller was run along the concrete, its rear wheel passing over the unsupported concrete 12 inches clear of the edge of the pavement. The second test was the same as the first except that the wheel was 6 inches from the edge of the pavement. The third the roller was stopped and started with the rear wheel on the unsupported concrete 6 inches from the edge of the pavement. There was no noticeable effect on the concrete in any of the tests.

In the fourth test the wheel was passed over the unsupported concrete with its side even with the edge of the pavement, and in the fifth it was made to pass over a block of wood 2x4x8 inches laid flatwise 12 inches from the edge of the pavement and lengthwise with the road. A slight deflection was noticed in the fourth and fifth tests as the roller passed over the opening, but the concrete regained its original position immediately after the passing of the roller. Assuming the weight on the block of wood was 3 1-3 tons, (probably about 4 tons as the roller was loaded with water and wood) the load in the fifth test was equivalent to 1,666 tons per inch of width of bearing, which would be the same as a wagon with 4 wheels with 4 inch tires, carrying a load of 13 tons equally distributed over the four wheels. The heaviest load likely to pass over the road is a 20 ton traction engine. Assuming that the two rear wheels carry 2-3 of the weight, each wheel would carry 13,300 pounds, and if the wheels are only 24 inches wide, the weight per inch of bearing surface would be 550 pounds per inch. Thus the weight used in the test was more than three times as great per inch of width of tire as the heaviest load likely to pass over it. As a final test the block of wood was moved within 6 inches of the edge of the pavement, so that where the steam roller ran up on it it ovrehung the edge of the pavement about 2 inches. In this position the combined weight and the shock due to running the roller on to the block cracked the pavement.

A large portion of the highway has not been covered with the wearing surface yet, but the engineer told me that the commission was at the preset time contemplating the purchase of four spraying plants, with the intention of applying the wearing surface themselves instead of by contract, as has been done in the past, claiming that they could do it cheaper and be absolutely sure of a good job, as this is a very particular operation. These plants will cost about $20,000 apiece, but they are something that the commission will have to have anyway to maintain the wearing surface after the roads are built.

The life of the wearing surface is not at all certain, but depends upon the manner in which it is applied and the quality of the oil. I saw one portion that was flaking off already after a use of less than a year, but portions that have been in use nearly a year and from close inspection, seem to be just as good as when applied when the road was completed.

Portions of the highway have been subjected to the most severe climatic conditions that have occurred in California in half a century, being twice inundated by flood waters during the present winter, and as far as one can see appear to be in the same condition as before, with the exception that in some places the earth shoulders have been washed away, leaving the edges of the concrete exposed and unsupported.

The commission has established a laboratory for testing all materials that go to make the road, and any material that does not come up to their standard is rejected.

In conclusion I wish to say that I took great pains to inquire into and examining into all of the elements of construction, and spared myself no expense in examining the different portions of the road. and my judgment is that we would make no mistake in adopting a similar type of construction for our own roads, as I think that the knowledge gained in California by actual experience in the most modern methods of road construction should be of great benefit to us or any other commuity.

The highway engineer in charge is acknowledged to be one of the best highway engineers in the world, and in this great undertaking I think the state is to be congratulated upon the acquisition of such a man.

The Seat of Authority.

It is an unwritten law on shipboard and especially on men-of-war that the quarterdeck is for the exclusive use of officers, and all good seamen remember it in spite of their ambitions. It once happened that an ancient mariner, a "five striper," while on shore leave captured a mule. Not without difficulty, he mounted the animal and perched himself as near the tail as possible. The mule objected in every way

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known to a mule and in ways several and unexpected.

"Jack, sit more amidships," called out an engineer officer who happened past. "You'll ride easier."

"Captain," grinned the old salt, "this is the first craft I ever commanded, and it's a pity if I can't stay on the quarterdeck."

A Telephone Opiate.

The elder's wife was seriously ill, and the doctor advised rest and quiet. But the lady was very devoted to church work and worried herself into hysteria because she could not attend services and hear her favorite pastor preach.

"She must not leave the house," warned the doctor, "but you can easily arrange to have her hear the sermon by telephone."

The elder grasped the suggestion and made the necessary arrangements for transmitting the sermon into his wife's room.

At noon on the Sabbath the doctor called and asked, "How did it work?"

"Fine," declared the elder, rubbing his hands gleefully. "Ten minutes after the sermon began she fell sound asleep."—Philadelphia Ledger.

An Extraordinary Projectile.

A child's struggles with the intricate facts of history are sometimes almost as serious a matter to him as the battles of which he reads. The results, however, are not always without humor, as a story in Everybody's Magazine shows.

A small boy handed in the following in an examination paper in United States history:

"General Braddock was killed in the Revolutionary war. He had three horses shot under him, and a fourth went through his clothes."

Moss Bread.

A kind of bread is made along the Columbia river by the Indians from a moss that grows on the spruce fir tree. This moss is prepared by placing it in heaps, sprinkling it with water and permitting it to ferment. Then it is rolled into balls as big as a man's head, and these are baked in pits.

Dangerous.

"I am thinking of touring in South Africa next season," remarked the comedian.

"Take my advice and don't," replied the villain. "An ostrich egg weighs from two to three pounds."—London Tit-Bits.

Facts For Millionaires.

A billion in Great Britain is a million of millions, 1,000,000,000,000. In France and the United States a billion is a thousand millions, 1,000,000,000.—Boston Globe.

He Was the Goat.

The first time William Randolph Hearst ever made a public speech was when he was nominated for congress in New York some years ago.

He was nervous about it and spoke to Timothy D. Sullivan.

"Sullivan," he said, "that convention of yours is going to nominate me for congress, and I suppose I've got to make a speech to the delegates. I never made a public speech in my life, and I'm nervous. What shall I do?"

"It's simple enough," Sullivan replied. "The thing to do is to pick out one man in the crowd and talk to him just as if you would talk to him if he was alone with you in a room. Select one man and make your speech to him and forget that there is any one else in the audience."

Sullivan was curious to see how Hearst would make out and sent one of his men down to watch the proceedings and report. The man came back.

"How did Hearst do?" Sullivan asked.

"Well," said the scout, "he lost one good vote. He talked all the time to one man in the crowd, and that fellow got mad and nervous and left the hall, cursing Hearst for making a goat of him!"—Saturday Evening Post.