

struction have been witnessed, and also the final checking up of material, full detail reports are made out showing what material has been constructed during the week, also what other material is under course of construction, and what material has been shipped, also commenting on any errors that may have been discovered and how the same have been remedied, with a report in addition as to what future progress would be expected.

Inasmuch as this material was purchased on a pound price, the inspection company had special representatives at each of the bridge plants, estimating the weights of all material entering into the various bridge members, so as to check up against the actual weights furnished by the bridge company. If the actual weights are in excess of 2%, as allowed by the Dominion Government specifications, such weight is cut down to the estimated weight, made up by the inspection company, based on an allowance of 2%.

INSPECTION OF ERECTION.—As soon as the bridge companies have made shipment of their first carload of material, and the erection gang of the bridge company has arrived at the bridge site, on the order of the bridge engineer, an inspector is immediately dispatched by the inspection company to such site. He supervises the erection of the entire structure from start to finish, seeing that the same is carried out in strict accordance with the requirements of the specifications. As the work progresses, the inspector takes at least three photographs each week, showing the progress that has been made, and also keeps an account of the labor expended in connection with the erection of the particular bridge on which he is engaged. To show that the photographs are taken weekly, a special sign is furnished by the inspection company, on which the name of the structure appears, together with the date on which the photograph was taken. This is embodied in the photograph. Weekly reports are furnished by the inspector, and the bridge engineer is kept advised as to all movement or delays that might occur at the erection site in connection with such structure. On completion of the bridge, the inspection company then reports that the work has been carried on to the satisfaction of its inspector, and such report is forwarded to the bridge engineer, who, himself, or his representative, then makes final inspection of such bridge structure, after which payments for the completed work are made. In all the various departments of inspection at the mills, at the bridge shops, and on erection, only men who have had long experience and training in that particular class of work are engaged.

Throughout all the various courses of construction a private stamp is used, bearing the trade mark of the inspection company, together with a number representing the inspector who has used this particular stamp. This serves as a means of identification, so that the inspector at the shop, and also at the field may see that the material has been inspected and accepted. By this means if any faulty or defective workmanship should show itself, the inspector who passed this particular piece of work can be easily located by the number which he carried affixed to his stamp.

COST AND ESTIMATES.—In the final estimates the actual amounts and cost under the several items are:

Substructure—	
1,757 cu. yds. 1-2-4 Concrete at \$15.00	
6,524 cu. yds. 1-3-5 Concrete at 11.00	
4,597 cu. yds. Excavation at 1.00	
10,534 cu. yds. Excavation at 2.50	
Superstructure—	
Steel 13,991,310 lbs. at 4.68 cts.=\$654,793.31	
Timber 518,041 ft. B.M. at 4.60 cts.== 23,829.89	
	\$678,623.20

Progress estimates were paid monthly on the superstructure according to the following basis:

	Unit.	Rate.
Steel	100 lbs.	\$ 4.68
Timber in floor	M.B.M.	46.00
SCHEDULE FOR MONTHLY ESTIMATES.		
Steel provided	100 lbs.	\$2.00
Steel manufactured	100 lbs.	1.00
Steel delivered at site	100 lbs.	.40
Steel assembled	100 lbs.	.98
Steel riveted	100 lbs.	.15
Steel painted and fully completed	100 lbs.	.15
		\$ 4.68
Timber delivered	M.B.M.	\$40.00
Timber framed and placed	M.B.M.	6.00
		\$46.00

This basis of payment was considered a fair and equitable distribution of cost throughout the different stages of manufacture. It is the result of experience on many bridges previously built by this and other bridge companies on the described method of working and specifications, and the writer believes may fairly be used in other similar cases, as proportionate cost data.

The work was carried out under the general direction of the writer from the Bridge Engineer's Office in Ottawa, W. A. Duff, A.M. Can. Soc. C.E., Assistant Bridge Engineer, having charge of the general design and details. The Dominion Bridge Co., Ltd., Montreal, were the contractors for the steel, which was efficiently carried out, F. P. Shearwood, M. Can. Soc. C.E., having charge of the design for the bridge company.

The design and layout for the erection and the traveller were made under the direction of Jas. Finley, superintendent of erection, who was responsible for the successful carrying out of the erection, also E. W. Nichols, foreman on erection.

The substructure was completed by Powers and Brewer, subcontractors under Willard Kitchen Co. The construction and laying out of this part of the work was performed under the direction of C. O. Foss, M. Can. Soc. C.E., District Engineer. Although the work was prosecuted in all seasons of the year there has been no accident or casualty of any kind.

PROGRESS OF ERECTION LITTLE SALMON RIVER VIADUCT.				
	No. of Days.	Erected to Bent No.	Tons.	Aver. per day Tons.
1910.				
To July 30	48	112 1/4	
July 30 to Aug. 6	6	47	87 1/4	13 1/2
Aug. 6 to Aug. 12	5	44	355	71
Aug. 12 to Aug. 18	5	43	60 1/2	12.1
Aug. 18 to Aug. 19	1	42	128 1/2	128 1/2
Aug. 19 to Aug. 23	3	41	101 1/2	32
Aug. 23 to Aug. 24	1	40	129 1/2	129 1/2
Aug. 24 to Aug. 26	2	39	102 1/2	51.1
Aug. 26 to Aug. 29	2	38	132 1/2	66.1
Aug. 29 to Sept. 16	5	35	436	*87.2
Sept. 16 to Sept. 24	7	33	298 1/2	42.6
Sept. 24 to Oct. 4	8	30	441 1/2	55.2
Oct. 4 to Oct. 11	6	28	351 1/2	58.5
Oct. 11 to Oct. 17	5	27	172 1/2	34.5
Oct. 17 to Oct. 22	5	25	328	65.6
Oct. 27 to Oct. 28	5	23	324 1/2	64.9
Oct. 28 to Nov. 2	4	22	162	40.5
Nov. 2 to Nov. 5	3	21	152 1/2	51
Nov. 5 to Nov. 12	7	19	320 1/2	45.9
Nov. 12 to Nov. 16	3	18	308 1/2	103
Nov. 16 to Nov. 18	1	17	152	152
Nov. 18 to Nov. 20	2	16	159	79.5
Nov. 20 to Nov. 23	3	15	152	50.3
Nov. 23 to Nov. 28	4	14	156 1/2	39.2
Nov. 28 to Dec. 2	4	13	150	37.5
Dec. 2 to Dec. 7	4	12	155	39
Dec. 7 to Dec. 12	4	11	148	37
Dec. 12 to Dec. 16	4	9	311 1/2	78
Dec. 16 to Dec. 21	4	8	154	†38.5
Jan. 5, 1911, to Jan. 11	6	7	147	26 1/2
Jan. 11 to Jan. 16	4	6	153	38 1/2
Jan. 16 to Jan. 22	5	5	146	29.2
Jan. 22 to Jan. 25	3	4	146	48.6
Jan. 25 to Jan. 28	3	3	118 1/2	39.5
Jan. 28 to Feb. 2	4	2	132 1/2	33
Feb. 2 to Feb. 7	5	1	98	20
Feb. 7 to Feb. 8	1	End	93 1/4	93 1/4
	144		7,042.5	48.9

*Held up 11 days by broken gear in traveller.

†Shut down for holidays.

The foregoing paper was read before the Canadian Society of Civil Engineers recently.

C. P. R. Observation Cars on the Austrian State Railways.

The Canadian Pacific Ry. has made a contract with the Austrian Government for the supply and operation of ten observation cars on the more picturesque sections of the Austrian State Railways, through the Austrian Alps. Switzerland is also interested in the new project, as arrangements have been made whereby the cars will run through to Zurich, on the main line to Vienna through that point. The service to be introduced would seem to be meeting with great popularity, for it has already been suggested in the Hungarian Parliament that pressure be brought to bear at Vienna so that this service may be extended to include Budapest, the capital of that part of the dual empire.

When it was decided that an observation car service would be a desirable adjunct to the service in the Tyrolean sections of the state railways, consideration was given to the designers that were considered the most capable of undertaking such an installation. The result was that the C.P.R., on account of its varied experience in the handling of observation traffic through the Rocky and Selkirk Mountains, was considered the best fitted to undertake such a task.

While the cars will be altered slightly to meet local conditions, they will follow very closely in design the standard platform observation cars that have met with such success on the C.P.R., the principal difference being that they are to have platforms at each end, as on these Austrian lines there are no ready means of turning cars of the length contemplated. In width and height the cars will be somewhat smaller than the standards on which they are being modelled, necessitated by the smaller clearance lines followed on the Continent. In length, they measure 22 1/2 metres (74 ft.), making what are said to be the longest 4-wheel truck cars in Europe. The seating capacity per car is to be 32, which may be used by either first or second class passengers for the additional fare of 5 kronen (\$1). This price will include the use of a stenographer and typewriter, and an interpreter capable of speaking in the principal languages of cosmopolitan intercourse, and in addition, the cars are to be equipped with medicine chests.

The cars are being built at the Nesselssdorf works in Austria, from designs worked out in the C.P.R. mechanical department at Montreal, under the supervision of H. H. Vaughan, Assistant to the Vice President, who was in Vienna last year making final arrangements for the construction of the cars to meet the local conditions under which they are to be operated.

The service to be given this summer will comprise three lines—Zurich to Innsbruck, Vienna to Innsbruck, and Salzburg to Trieste. These three lines, as well as any to be added in the future under the present arrangement, are to be operated from the new C.P.R. offices in Vienna, under the supervision of G. McL. Brown, European Manager, C.P.R., in London.

Grain Shipments by Rail.

The following shipments of grain from Fort William and Port Arthur, Ont., were made during the close of navigation from Dec. 1, 1911, to Apr. 30, 1912.

	Bush.
Wheat	14,020,912
Oats	6,131,679
Barley	245,977
Flax	1,302,987
Rye	3,421
Total	21,704,976