such complex formulas as to make the curves of little use in the field. It was found that curves giving reliable results might be obtained by plotting the cubic yards of concrete in two abutments against a formula which represented a measure of the quantities desired. The variables in this formula are H, height of abutment from bottom of foundation to top of roadway; R, clear width of roadway on superstructure, and W, length of average wing wall. For plain concrete abutments the best results were obtained by using the term $H^2 (R + 2W)$.

Plain concrete abutments for steel bridges are designed with a footing width of one-third of the height over all, and the thickness of the footing is usually from 18 to 24 in. The width of the base of the abutment and wing walls at the top of the footing is made approximately one-quarter of the height of the walls. The back of the abutment wall is vertical and the face of the wall is battered to a top width of from 30 to 39 in. The wing walls are battered on both sides and have a top width of 12 in. Fig. 4 shows the curves from which the yardage of plain concrete abutments for steel bridges may be obtained. When field measurements are made to determine the necessary height of abutments, and the width of roadway is decided upon, it is easy to estimate the length of wing walls which will be required. These figures are then used in the formula and the yardage of concrete is read directly from the curve.

The design of plain concrete abutments for girder bridges is similar to the design for steel bridges, except that the wing walls are battered on the face side only, and the top width of the abutment wall is 18 in. Fig. 4 shows the curve from which quantities for this type of abutment are obtained. Plain concrete abutments for slab bridges differ slightly from the preceding design. The width of footing on the abutment wall is limited only by the safe bearing capacity of the soil, with a minimum of 3 ft. This width may sometimes be less than one-third of the height. This is deemed to be safe on account of the restraining effects of the superstructure. The top width of the abutment wall is 12 inches and the curve for estimating the yardage is shown in Fig. 4.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

The Calgary Branch of the Canadian Society of Civil Engineers will have charge of the entertainment between Banff and Moose Jaw of the eastern members on the proposed trip to the annual conference to be held in Victoria next month. The points of engineering interest to be visited include the Kananaskis Falls hydro-electric development of the Calgary Power Company, the Brooks aqueduct and the Bassano dam of the Canadian Pacific Railway irrigation system. These features in store for those who attend the conference will form a part of the return trip.

Through an arrangement with the Canadian and British Columbia governments the Pacific Great Eastern Railway Company has secured funds to continue construction work on its line between Vancouver, B.C., and Fort George. The line is now in operation out of North Vancouver towards Squamish, and from Squamish to Lillooet, 120 miles. Considerable work has been done between Lillooet and Fort George, and the company expects to have 100 miles additional completed during 1915.

TORONTO SEWAGE DISPOSAL PLANT.

The main sewage disposal plant of the city of Toronto is situated near Morley Avenue, on the eastern water front and about three miles from the central portion of the city. It has provoked many complaints during the past two years owing to the foul odors which at times beset the residents of that section. The city officials ordered an investigation recently, resulting in a preliminary report, prepared by Dr. Chas. J. Hastings, Medical Officer of Health, and Mr. R. C. Harris, Commissioner of Works. The following are the chief observations presented:—

(1) That the tanks were not designed for the storage of sludge.

(2) That if the original intention to discharge the accumulation of sludge into Ashbridge's Bay for reclamation purposes had been carried out, serious consequences would have followed.

(3) That odor was caused by the ebullition of gases in the area in which the sludge had been enclosed.

(4) That the covering of the sludge with lime has proved effective.

(5) That certain experiments for the purpose of improving conditions were made without result.

(6) That to install Imhoff tanks would cost $6,000,000, and without sprinkling filters $3,287,000.

(7) That the opening of a channel through to Ashbridge's Bay will improve conditions.

In regard to these findings it is to be noted that upon the completion of the plant it was deemed advisable to confine the sludge within a definite area, contiguous thereto, and for this purpose a portion of Ashbridge's Bay immediately to the south was enclosed. After considerable sludge had been deposited in this area the ebullition of gases caused odor. In order to minimize this about eighteen months ago the area was divided into comparatively small pockets, which virtually acted as separate digesting lagoons. Sludge was deposited in each of these until filled. In this way the sludge depth was increased, and the superficial area exposed to the atmosphere reduced, thereby retarding the rate of gas ebullition.

Immediately upon the discharge of fresh sludge, the deposit is covered with shavings and lime or bleach spread thereon. This method has proved quite effective and is being continued.

For some time past, according to the report, the officials have been experimenting along other lines, in an endeavor to find means of improving conditions. Electrolytic experiments proved of little value, as did the application of sludge on slate beds. The aeration treatment was tried, but did not answer.

"We have made extensive investigation with different filter media, to find which would permit the highest rate of application of effluent. In North Toronto, we have a brush filter operating at the rate of 5,500,000 Imperial gallons per acre per day, and giving excellent results. The usual rate over stone filters is about 2,000,000 Imperial gallons per acre per day. If this record is fortified by future experience it will materially decrease the cost of filter installation."

The report calls attention to the experiments that are being carried on in various cities in connection with the activated sludge process, which has been described in recent issues of *The Canadian Engineer*, and states that the results are being awaited with great interest.