

THE PROTECTION OF THE FORESHORE AT DALLAS ROAD, VICTORIA, B.C.

The protection of the foreshore at Dallas Road, Victoria, B.C., has been the object of considerable work on the part of the Public Works Department of the province. Mr. G. M. Duncan, in a paper read before the Canadian Society of Civil Engineers, on November 7th, 1912, describes the work which has been done. The following abstracts are taken from the paper:

For several years the sea had been encroaching upon a part of this roadway, which runs along the coast overlooking the Strait of Fuca, with the consequence that the banks were gradually being eroded. In 1903 the city authorities commenced to build a low concrete wall to form some protection, and they continued building it in sections until it was about 1,500 feet in length in 1906. This wall, which had a height of 6 feet above high water, did not, however, prove of much service against the heavy seas which are prevalent during certain parts of the year. In 1910 the roadway was getting into a serious condition and the city authorities saw they would have to take immediate steps to form some permanent protection. A by-law was passed authorizing the expenditure of \$75,000 which was augmented

in favor of economy proved to be for the latter. It was therefore decided that the wall should be vertical, carried up to the level of the roadway, of a reinforced concrete type without a base plate, with counterforts at 20 feet centres, and with a belt of granite in its face where the wash of the sea was greatest.

The calculations for the strains and areas of steel and concrete were then commenced and the following assumptions made:—

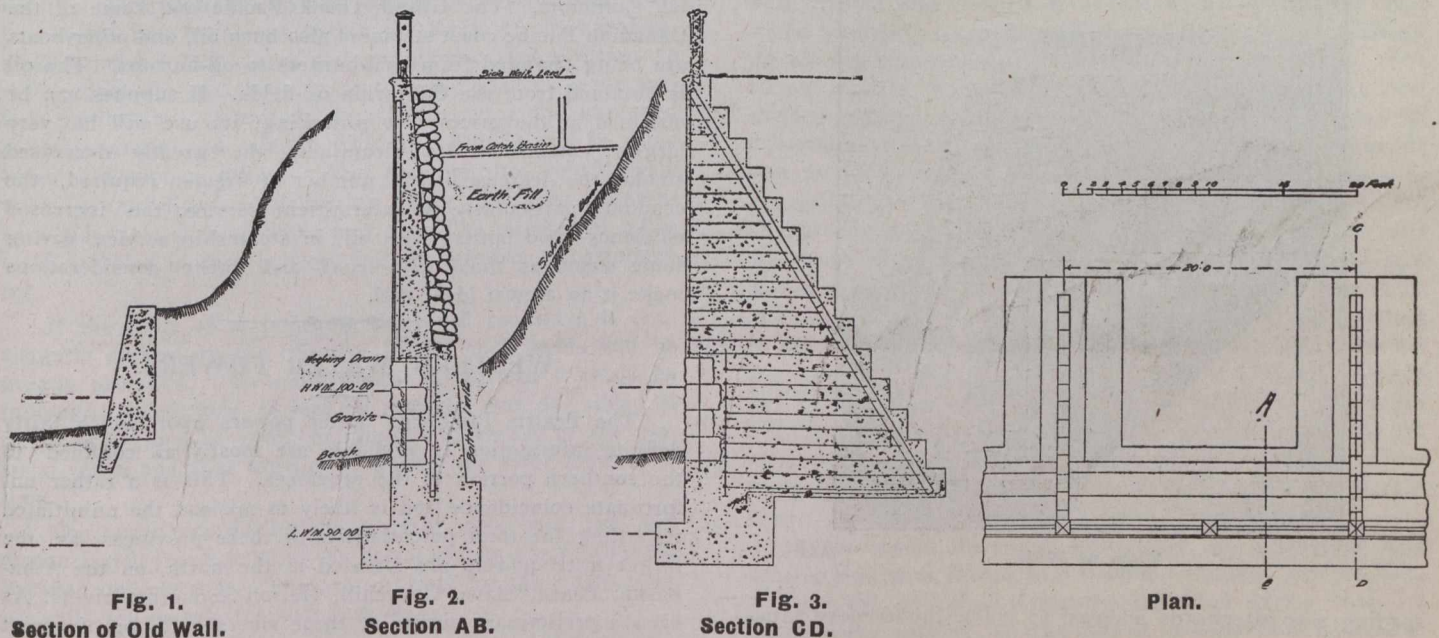
That all steel used would have an elastic limit of 32,000 lbs. per square inch.

That all rods should have a working stress of 12,000 lbs per square inch and be capable of being cold bent, 180 deg. flat on themselves.

These assumptions were subsequently required by specification.

The sketch shows typical sections of the wall and counterforts. The reinforcement in the wall consists of horizontal rods 1 foot apart commencing with 3/4-inch diameter at 2 feet from top of wall and increasing in diameter with the depth of wall. These rods are link jointed and are kept in place between each counterfort by two face plates each 3/8 in. x 4 in. at 6 feet 8-inch centres. To the horizontal rods is wired expanded metal and No. 16, 1-inch mesh

The Dallas Road Sea Wall at Victoria, B.C.



by the sum of \$20,000 from the provincial government for the purpose of erecting more suitable protection works. The city authorities were in favor, and had the intention of building on top of the old wall, a proposal of which the public works engineer did not approve on account of the unstable condition of the foundations and general state of the wall.

After close investigation into the local conditions and a careful study of the various types of walls elsewhere constructed with similar objects, the conclusion was arrived at that protection could be most effectively and economically attained by a vertical wall carried down into solid ground below low water mark, except at its termination where it was anticipated the depth might be materially reduced. Trial sections of a solid and of a reinforced concrete wall were made and it was found that the cost of the former would considerably exceed that of the latter.

A comparison was then made between walls with counterforts 16 feet and 20 feet apart, respectively, and the balance

was at first used for this purpose but No. 10, 3-inch mesh was afterwards substituted on account of the former being found to be too light and the mesh too small.

The counterforts are reinforced in the same manner as the wall with horizontal tie rods hooked into face and back plates. It should be pointed out here that these tie rods and also the horizontal rods in the wall are subject to shearing stress at their connections with the face and back plates of the former and at the link joints of the latter, a point which is very easily overloaded. The back plates consist of 6-inch plates, 3/4-inch and 1/2-inch riveted together.

At each counterfort the horizontal rods in the wall were at first placed between the face plate and the hooks of tie rods, but it was afterwards found that a more secure method was to place them at back of face plate and resting on tie rods of counterfort to which they were securely wired, and this method was adopted throughout the rest of the work. The bottom of all face plates are split and spread, and at