

(3.) A groin on west beach, length 400ft., in a direction due south; thus converging towards outer end of mole.

(4.) A bridge across the Turanganui River to get access to the town.

The depth below low-water spring-tides (as shown by soundings along proposed line) of the outer 600ft. or so of the mole thus provided for, was, and is still, from 16ft. to 26ft., but an additional depth of 3ft. or 4ft. was anticipated to be probable by river scouring away the sand. The estimated cost of these works was as follows:—

Timber wharf and viaduct	...	Length, 1,580ft.	...	£	7,500
Railway to quarry, surveys, blockyard, buildings, and plant	...	...	...	35,200	
Sea-mole	...	" 2,150ft.	...	123,800	
					158,500
Groin on west beach	...	" 400ft.	...	4,000	
Bridge over Turanganui River	...	...	...	5,000	
Total	...	...	...	£175,000	

Extent and Cost of Works constructed.

A loan of £200,000 was floated by the Harbour Board early in November, 1885, but by conditions of loan £25,000 of this amount is held by trustees towards a sinking fund, leaving only £175,000 really available for work. The existing design was finally adopted in December, 1885, and work commenced in April, 1886. The breakwater—concrete portion—however, was not started till June, 1887. It had reached to a distance of 400ft. in July, 1888, and was completed to extent of 1,100ft., as it now stands, and there terminated, in April, 1890.

The amount of loan actually available for works, as above mentioned, was originally £175,000, but, by Act of 1887, the Board was precluded from spending more than £65,000 of that amount. This £65,000 was subsequently, by Act of 1888, increased by £40,000, making in all £105,000. The remaining £70,000 is vested in trustees, and could not be made available for further works without the consent of Parliament and the ratepayers.

The following table shows extent and cost of works constructed, including, in each case, a due proportion of the cost (£4,400) of floating loan, and law-expenses:—

Timber wharf and viaduct	...	Length, 1,580ft.	...	£	6,135
Railway to quarry, surveys, blockyard, buildings, and plant	...	...	...	36,283	
Sea-mole	...	" 1,100ft.	...	48,821	
					85,104
Training-wall, in lieu of groin on west beach (only partially completed)	...	" 530ft.	...	1,690	
Total	...	...	...	£92,929	

The wharf and viaduct above referred to, for the greater part of its length, is backed on east side by the natural bank of the river, or by a sand embankment formed against it, and, where not so, it is close-planked on east side, so that none of it is open for the sea to work through.

In addition to the cost of the works above described, there has been an expenditure of £6,851 on materials in hand, available for further works, making total expenditure £99,780. If to that amount there be added £5,220, cash in hand, it makes up the £105,000 authorised, as above mentioned, to be expended by the Board.

The 1,100ft. of concrete mole above described as completed, terminates at a point where there were soundings of from 12ft. to 14ft. at low water before mole was constructed, and there is still that depth of water at its extreme end, and at its east side, but a sandspit has been formed along its west or harbour side, which had reduced the depth available for navigation, in August last, to from 2ft. to 3ft. at low water. As against this, the normal depth on original bar, before works were commenced, is stated to have been from 3ft. to 4ft. at low water.

The works so far constructed seem, therefore, to have been rather detrimental than otherwise. They have had the effect of throwing the bar further out, and, consequently, into a heavier sea, with the additional danger of having to navigate a very narrow channel close to a solid mole; while, at the same time, the depth of water is rather less than it was originally. It is true, I believe, that the depth has been temporarily increased by freshes in the river since I have seen it; but this is a contingency of all such cases, works or no works, and is stated to have occurred similarly at Gisborne, before any works were constructed.

Remarks on Alteration of Design.

I think it is much to be regretted that, at any rate, the principle indicated in Sir John Coode's design was not adhered to—namely, an open viaduct reaching for some considerable distance from the shore-line, with a more or less enclosed basin at the end of it.

Briefly stated, this principle means simply taking a hint from nature.

A solid projection of any moderate length, reaching from a sand or shingle coast-line into the sea, where there is no large river or tidal basin to maintain deep water alongside it, has generally got a beach or shoal water at its sides and end; but a rocky island may exist, and frequently does exist, at a short distance from the shore, with deep water all round it.

The form of harbour most approved in modern engineering practice, for open sea coasts, in the absence of a large river or tidal basin, is therefore to construct what is practically a hollow island,