

800 cu. yd. Its performance from April 1st, 1910, to March 31st, 1911, was as follows:

Hours worked	862.5
Cubic yards excavated	924,800
Average cubic yards per hour	1,072
Average cubic yards per day of 9 hours, including all delays	3,000
Maintenance cost	\$37,948.10
Repairs cost	8,835.58
Total cost	46,783.68
Cost per cubic yard	\$0.0505

The Grand Trunk Pacific dock at the foot of Madison Street, Seattle, is a recent structure. It is 625 ft. long, 128 ft. wide, and is supported entirely on creosoted piles, the length of the bearing piles varying from 55 to 90 ft., with bracing piles as long as 110 ft. The bents are 10 ft. apart, and the piles in the bents are spaced from 6 ft. centres at the inner end to 3 ft. at the centre. The capping and floor systems are of very thorough construction, and the dock appears to have thorough stability, notwithstanding the great depth of water in which it stands.

The main shed is 90 ft. wide, with a platform 8 ft. wide on the south side and 16 ft. on the north, the latter carrying a railroad track. There are five adjustable slips on each side and one at the outer end worked by worm gear. The fender piles are of tight-bark fir and are driven two at every bent and fastened to 12 by 12-in. stringers with 3/4-in. straps. At the outer end they are spaced 3 ft. apart, and clusters of seven piles are driven at the outer corners. The timber used in construction was 241,775 lin. ft. of creosoted piling, 71,000 ft. B.M. of creosoted bracing, and 1,113,000 ft. B.M. of other lumber. In its finish, offices, equipment, and general lay-out,

it is the best example of dock construction on Puget Sound. The second of the docks selected for a brief description here is the Great Northern dock at Vancouver, B.C. It was designed by A. W. Münster, M. Am. Soc. C.E. The pier is 450 ft. long by 293 ft. wide, with a berthing space of 30-ft. depth at low water on each side, and with two sheds, 403 by 102 ft. Between the buildings is a space 41 ft. wide. The distinctive feature of the structure is a cantilever platform supported on cylindrical concrete piers, which themselves rest on a sandstone ledge. These piers are 4.5 ft. in diameter, with a base enlarged to 10 ft. The foundation is carried down into the hardpan or sandstone ledge to a minimum depth of 3 ft. below the bottom of the slip. The piers will have an average height of 52 ft. On top of them will be placed a longitudinal concrete girder, 3 ft. wide and about 7 ft. in depth, which will carry the transverse girders forming the immediate support of the floor slab, which are placed 12.5 ft. centre to centre. The transverse girders are from 2 to 3 ft. wide, 6 ft. deep, and 51 ft. long. They will project 16.5 ft. beyond the line of the piers and, acting as a cantilever, will carry corresponding parts of the front platform. The inner end of these girders will rest on a line of 16-in. concrete piles driven to refusal and stayed in position before the rock embankment is placed. The floor slab is to be 7 in. thick. The concrete platform and beams have been designed for a distributed load of 500 lb. per sq. ft. The railroad track running the length of the platform is placed centrally over the longitudinal girders. The reinforced concrete construction supporting the track is proportioned to carry a 100-ton switch engine. Tie-rods encased in concrete will anchor the concrete platform firmly to the embankment.

The warehouse buildings are of wooden construction covered with galvanized iron. The roof is to be carried on

Comparative Costs to Ship and Cargo in Pacific Coast Ports.

	SAN DIEGO.		LOS ANGELES.		SAN FRANCISCO.		PORTLAND.		PUGET SOUND.		VANCOUVER, B. C.	
	Rate.	Amt.	Rate.	Amt.	Rate.	Amt.	Rate.	Amt.	Rate.	Amt.	Rate.	Amt.
Pilotage (in) ..	{ \$3 per ft. draft..... 3 cents per ton..... }	\$270	{ \$1 per ft. draft..... 1 cent per ton..... }	\$90	{ \$3 per ft. draft..... 3 cents per ton..... }	\$270.00	{ \$4.50 per ft. draft..... 3 cents per ton..... }	\$315	\$125 to \$175.....	\$150	{ \$1 per ft. draft..... 1 cent per ton..... }	\$90
Water, survey and misc. (estimated).....		50		50		50.00		50		50		50
Dockage, per day.....	{ \$2 plus 3/4 cent for each ton over 200..... }	385	{ For ship over 1 200 tons. }	\$14.75	{ Discharging: \$4 plus 1/4c. for each ton over 200. Loading: 1/2 of above... }	427.50	None	0	None	0	None	0
Stevedoring, per ton.....	40 cents.....	9 600	40 Cents.....	9 600	40 cents.....	9 600.00	40 cents.....	9 600	40 cents.....	9 600	40 cents.....	9 600
Handling, per ton.....	Included in "wharfage."		41.8 cents (av.) ..	10 032	25 cents.....	6 000.00	{ Included in "wharfage."		{ Included in "wharfage"		{ Included in "wharfage."	
Dock rental, per linear ft. per month.....	0		0		45 cents.....	225.00		0		0		0
Wharfage, per linear ft. per month.....	50 cents.....	12 000	6 1/2 cents (av.) ..	1 560	5 cents (24 hrs.)..	1 200.00	50 cents.....	12 000	50 cents (120 hrs.)	12 000	50 cents.....	12 000
Wharf storage, per linear ft. per month.....					5 cents (48 hrs.)..				{ 25 cents per ton per mo. or frac. mo. }	0		
Pilotage (out) ..	Same as "in" ..	270	Same as "in" ..	90	Same as "in" ..	270.00	Same as "in" ..	315	{ Included in charge for "in" pilotage..... }	0	Same as "in" ..	90
		\$22 475		\$21 599		\$18 042.50		\$22 280		\$21 800		\$21 830
Cost paid by ship.....		\$875		\$407		\$1 242.00		\$ 680		\$200		\$230
Cost paid by cargo.....		21 600		21 192		16 800.50		21 600		21 600		21 600

This table is the result of a comparative study of the rates in the different ports with a view of determining the relative tax on commerce in each. In order to arrive at a condensed approximation of the cost of terminal charges and a comparison of the principal Pacific Coast ports, a purely hypothetical case has been assumed of a 6 000 net ton register ship, 30-ft. draft, discharging and loading cargoes of 12 000 tons of miscellaneous freight, the ship remaining in port 12 days. It is admitted that the assumption is not typical of ordinary occurrences, but it is apparent that, because of the complex and diversified tariffs, as well as lack of uniformity in freight staples, it is well-nigh impossible to obtain averages except through an assumption that is somewhat strained. The cost of stevedoring has been taken at the uniform rate of 40 cents per short ton at all the ports. This is not strictly true, but the labor unions may be relied on to equalize the cost by dictating the labor wage and the length of a day's work. Small miscellaneous items like water, etc., are insignificant, and have been lumped in the table at \$50 per voyage. The charge for handling is a variable sum. The attempt has been made to arrive at an equitable average for each port. The dock rental, in San Francisco, for lines having regular assignment, is 45 cents per month per linear foot of dock rental. A 500-ft. space will amount to \$225 per month. A monthly sailing for the case docketer will make the rental \$225 per voyage.