port of which they will have just reason to be proud, and with this feeling paramount, their efforts are bound to prove successful.

The greater part of the dockage in the Twin Cities port is provided by the different elevator companies, who have provided excellent facilities for the speedy loading of grain-carrying steamers. The government elevator at Port Arthur, now in course of erection by the Barnett McQueen Company, for whom E. D. Casseday is chief engineer, is a notable example of this, and it is the purpose of this article to deal with the elevator dock now under construction, and of which the writer of this article was the designer.

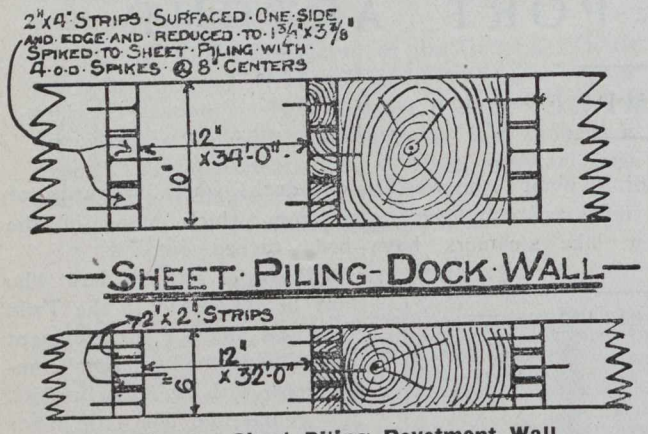


Fig. 2.—Sheet Piling Revetment Wall.

Fig. 1 shows the layout of the dock, which consists of concrete dock walls of 10 and 12 feet widths, and revetment walls of the lengths shown on the layout plan. It would, perhaps, be advisable to consider these different type walls separately, and this we will proceed to do.

Concrete Dock Walls.—A double row of piling was first driven with the centre line of the outer row, 2 feet 8 inches in from the outside of the face line of the concrete dock face, the piles being spaced 5 feet 4 inches centre to centre in both directions, and afterwards cut off at elevation 600.0, the level of mean low-water, Thunder Bay, on which the dock wall abuts. To the outside of the outer line of piles a 10-inch by 12-inch fir wale streak was bolted, the top of the wale streak being flush with the cut-off elevation of the piles. The bolting was accomplished by means of 1-inch diameter by 27-inch machine bolts at each pile-bearing. Outside of this wale streak sheet piling 10 inches by 12 inches by 34 feet was driven, every second pile being bolted to the wale streak with a ⅝-inch diameter by 24-inch machine bolt. To the sheet piling, and with the top level with the top of the sheet piling, wale streak and piles, a 12-inch by 25-pound channel iron was bolted by means of ¾-inch diameter by 27-inch machine bolts at 3 feet on centres.

The sheet piling was jetted and tapped into position, and sharpened at the bottom ends in order to ensure close driving, and form a perfectly sand-tight bulkhead. The sheet piling was furthermore tongued and grooved by building on to the edges 1¾-inch by 3⅜-inch strips of timber, obtained by surfacing one side and edge of 2-inch by 4-inch strips. The strips were spiked to the 10-inch by 12-inch sheet piling with 4 o.d. wire spikes spaced at 8 inches on centres. This construction is illustrated in Fig. 2.

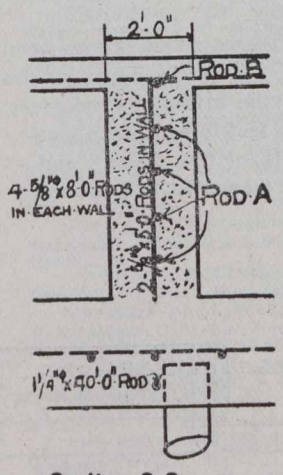
The 12-inch by 25-pound channel iron, to which reference has already been made, was punched to receive the ¾-inch diameter by 27-inch machine bolts, and also for 1¼-inch diameter anchor rods, spaced 5 feet 4 inches on centres. These anchor rods were attached to the channel by means of heavy nuts, and had a length of 40 feet with a 12-inch thread at each end. The anchor rods were passed through an anchor log held in position by means of spur piles, and attached to same by heavy nuts and washers.

A second line of anchor rods, 1¼-inch diameter by 58 feet, placed 10 feet 8 inches on centres, connected the previously mentioned anchor log, and a second anchor log held in position by the outer row of piles, forming a trestle required in connection with the general elevator construction. These anchor rods were furnished, as in the case of the 40-foot anchor rods, with heavy nuts and washers. Spur piles were cut off at elevation 602.0.

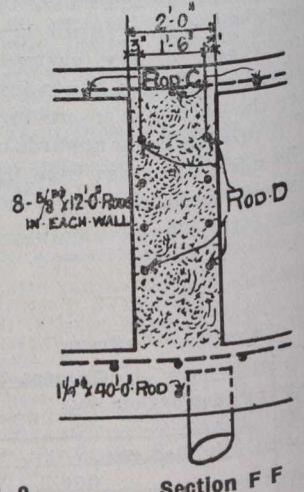
At the outer corner of the dock wall a timber crib 48 feet by 48 feet, divided into 16 compartments by means of tie walls, was placed. The crib was built of 12-inch by 12-inch timbers, the outer walls solid and the inner walls half open. The timbers in the outer walls were halved at the corners, thus forming perfectly strong joints, whilst the inside timbers, instead of resting one upon the other, as in the outer walls, were placed to cross one another at the junction points. Fig. 8 shows the method of construction. After being built, the crib, which, it should be noted, was 23 feet in depth, was sunk to a depth of 24 feet below mean low-water datum, the elevation of the top of the crib thus being 599.0. The exterior walls were made sand-tight by having 1-inch by 6-inch battens nailed along the joints, on the inside of the walls, whilst the crib at the outer corner was cut off at an angle of 45 degrees. After the crib was sunk in place, it was filled with sand and gravel to the top, or elevation 599.0.

With the piling, sheet piling, channel and crib in position the next stage in construction was the building of the reinforced concrete dock wall.

The dock wall, as previously stated, is built in 10 and 12-foot cross sectional widths. Starting at the inshore end, adjoining a 20-foot return end, the 10-foot section is carried for a length of 406 feet 3 inches. At this point the width of the wall is increased to 12 feet, in order to join up with the



Section C C



Section F F

Fig. 9.

building line of the working house, which is 12 feet from the face of the dock wall. This 12-foot section continues along the frontage of the working house, drier house and boiler house, for a distance of 300 feet 8 inches. From this point the 10-foot section is carried to the crib, where, at the outshore end, it is increased to a solid mass of concrete with a face radius of 33 feet. The plans and sections clearly show the methods of construction pursued. The inshore end at the return corner was similarly strengthened by a solid block of concrete, less in bulk, naturally, than was required for the outshore corner of dock wall.