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UNIQUE CONSTRUCTION METHODS FOR WHARF REHABILITATION

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Unique construction methods were employed in constructing a wood pile foundations in rehabilitation of steel girder type wharf on the Mississippi River at the U.S. Naval Station, New Orleans, Louisiana, during World War II. New wood piles were driven by a pile-driving rig which was supported on the existing steel girders, and concrete caps were constructed on the tops of the wood piles to provide adequate support under the old steel girders. The methods employed made it possible to utilize the existing steel girders and beams of the wharf and to place the wharf in operating condition to meet a time deadline.

The defense plans of the United States in 1941 pointed out the need for naval shore facilities at New Orleans, Louisiana, near the mouth of the Mississippi River on the Gulf Coast. The defense program included the rehabilitation of the naval station, supply depot, and ship repair base located in the Algiers section of New Orleans. These facilities at New Orleans had been permitted to deteriorate during the period of peace subsequent to World War I owing to lack of maintenance funds. In view of the international situation existing and particularly the sinking of U. S. merchant shipping in waters adjacent to the United States, it was important to rebuild and repair these naval facilities in a short time. One of the most important projects was to rehabilitate the existing wharf to provide waterfront facilities on the Mississippi River.

The condition of the wharf in September 1941 is shown in Fig. 1. Many of the piles had rotted and all were in a deteriorated and unsafe condition. The picture also shows that the steel girders and cross-beams were corroded, particularly on the flanges. A detailed examination showed, however, that the badly corroded flange sections could be sufficiently strengthened by welding on new steel sections to salvage the steel members. The rust on other portions of the girders and beams was not serious, and practically all rivets and connections were sound. The timber decking and railroad ties were in poor condition and required replacements.

The supply of steel beams of the sizes required was critical, and a considerable period of time would be required to procure new steel members. Time was of importance and would not permit any delay in getting this wharf in operating condition. It was, therefore, not feasible to consider the purchase of new structural steel beams and girders. The choice lay then between rehabilitating the old steel girder and beam wharf, or building an entirely new wharf with all timber members. The first method, salvaging the old steel girders and beams, was considered preferable in that it would provide a superior structure and would conserve heavy timber members which were very much in demand for other construction. This decicion was based on the premise, however, that the existing steel girders and beams could be kept assembled in place and intact; it was recognized that it would be a difficult and time-consuming operation to disassemble and reasemble the steel structure. A method of driving wood piles under the steel girders had to be devised. It was not feasible to employ a pile-driving rig mounted on a barge floating in the river owing to the width of the wharf and the fact that the wharf was located at the edge of the river.

Fig. 2 illustrates the method which was employed of carrying the piledriving rig on the top of the steel girder and beam frame after the old timber decking had been removed. The rig is of skid type and has a No. 1 Vulcan 5,000 pound single-acting steam hammer. At the left is shown the new piling which was driven. These piles were later cut off to a level below the bottom of the steel girders. The problem of providing proper support from the tops of the wood piles to the underneath side of the steel girders was solved by building concrete caps on the tops of the pile clusters as shown in Fig. 3.

Fig. 4 shows the building of forms on the tops of pile clusters for the construction of the concrete caps. By vibrating the concrete, honeycombing of the concrete was avoided. Shims were placed under the girders on top of

Condition of old wharf in September 1941.

FIG. 1

Pile driving rig No. 1 Vulcan 5,000-pound single-acting steam hammer on top of old steel girder frame.

FIG. 2

Curved approach to wharf showing concrete caps on pile clusters.

FIG. 3

Building forms for concrete caps for wharf.

FIG. 4

Sand blasting, cleaning, and painting steel beams on wharf.

FIG. 5

U.S. NAVAL STATION
NEW ORLEANS, (ALGIERS) LA.
JANUARY 1, 1942
PILE DRIVING RECORD
CONTRACT NO. J.O. NOy
REFER TO PW DRWG No. 617

Pile driving record for wharf.

FIG. 6

the concrete caps to take up the load evenly and bring the girders to correct elevation. The pile clusters were braced. Old wood piles were then removed.

Sand blasting, cleaning, and painting of the structural steel members after the removal of the old timber decking is illustrated by Fig. 5. An air compressor for the sand blast is shown at the left. Bad sections (particularly on the flanges) were burned out by torch and new sections welded in place to reinforce the beams. There was a buffer, consisting of timber stringers and steel springs, along the river side of the wharf to cushion blows from ships. At the left in Fig. 5, men are seen in the work of disassembling this buffer. The springs were removed, cleaned, painted, and then reassembled in place. The footing for the workmen was bad because of the removal of the decking, but fortunately, no men fell through a great deal of the work was done at night.

An example of the summary of the pile driving record is given in Fig. 6. Each pile is designated by group or row as shown on the plan. The dimensions of each pile are given. The piles driven in this project were creasoted Douglas Fir and Yellow Pine piles, ranging from 50 to 80 feet in length. The soil encountered was the typical alluvium of the Mississippi delta consisting of stiff clays with numerous pockets of packed sand. Owing to the variable soil conditions, there was a great variation in the energy required to drive the different piles. It was found necessary to jet most of the piles while they were being driven in order to get them down. The jetting apparatus may be seen in Fig. 2. Fig. 7 gives a close-up view of the pile driving operations. The inspector counted the total number of blows required to drive the pile. The penetration under the last blow was determined. This was taken as the average penetration under the last ten blows of the hammer. In calculating the safe bearing capacity, the U.S. Navy use the formula $L = \frac{2WH}{S+0.3}$. This formula differs from the more familiar Engineering News formula for single-acting steam hammers wherein the constant is 0.1 instead of 0.3. The Bureau of Yards and Docks maintains an accurate record of the history of each pile that is driven.

Fig. 8, facing east, shows the operations on top of the wharf and the beginning of the work of railroad rails on new wood ties. The pile driver is seen in the distance. Fig. 9, facing west, shows the construction of heavy six-inch creosoted timber decking and railroad tracks. The dredge operated under the direction of the U.S. Army Engineers is shown in the background. Dredging in front of the wharf

Pile driving operations on wharf.

FIG. 7

Facing west - construction of timber decking and railroad track.

FIG. 9

Looking east - wharf reconstruction - laying railroad rails.

FIG. 8

Reconstructed wharf showing locomotive crane and Mississippi River levee.

FIG.10

was carried to a depth of 30 feet below low-water level.

The contractor on this project was the W. Horace Williams Company of New Orleans. The contract number was NOy-4853-SA1 and was under the jurisdiction of the Bureau of Yards and Docks of the U.S. Navy. Captain G.S. Burrell was District Public Works Officer of the Eighth Naval District. The author was Resident Officer-in-Charge of Construction and Public Works Officer of the U.S. Naval Station at New Orleans.

The work was done under pressure. The contractor's men worked day and night, Sundays and holidays, to complete this wharf early in 1942 as shown in Fig. 10. (The river levee may be seen at the right). A supply depot, ship repair base, and barracks were also built so that ships coming to the wharf at the Naval Station could be outfitted with equipment and supplies, repaired, and manned to go to sea to combat enemy submarines as well as to join the fleets of the U.S. Navy in the Atlantic and Pacific Oceans. The methods used in rehabilitation of the wharf made it possible to have the wharf ready in the hour of need.

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