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ONE DOLLAR

ALASKA CONSTRUCTION & OIL

The new Port of Anchorage dock extension

Anchorage Dock Doubles Cargo Capacity

by OTTO SIEBER

When Anchorage dedicated its new dock during the celebration of the 50th anniversary of the city the occasion marked the end of one of the toughest marine construction projects anywhere on the West Coast as well as the beginning of a new era of increased port activity. The 320-foot dock extension completed under the terms of a $2.3 million contract doubled the general cargo handling facilities of the port by adding a second berth for ocean going cargo ships. At the same time it improved the efficiency of the port by addition of the new causeway and trestle which enabled traffic to drive onto the dock at one end and leave at the other.

Although the project is relatively small, the job was as tough as any because, as one noted engineer puts it, "There should not be a dock there at all."

"The site is probably one of the worst places in the world to build a dock but like a lot of other things about Alaska, there really wasn't much choice and the job got done anyway, however unusual or impossible it may have seemed.

Another veteran builder who has had a great deal of experience in both Alaska and the "lower" states once said, "if the job is in Alaska you can bet your bottom dollar that it is going to be unusual, because if you do things the usual way here you'll loose your pants for sure."

Even for Alaska, this project has more than its share of unusual angles and money saving techniques devised by both the contractor and the design engineers. The contractor was Locher Company — J.R. Clinton, a joint venture. The consulting engineer who designed and supervised the construction of the project for the Port of Anchorage was Tippetts-Abbett-McCarthy-Stratton, a Seattle based firm with wide experience in marine engineering and design.

First of all, from the design standpoint, if all the conditions that had to be designed against in this job were presented to a consulting engineer anywhere else except in Alaska, the first reaction would undoubtedly be, "forget it! Build your dock somewhere else."

Since there was no alternative in this case, the engineer went to work on the major problems. The first one was the poor soil condition. "The bottom of the dock area couldn't be worse", project engineer Tetsu Yasuda explained. "First of all you have a layer of mud that extends to a depth of 30 feet. Beyond this you have a belt of sand and gravel that ranges in depth from 20 to 30 feet and beyond that you have clay."

It was determined that the piles for the dock must bear on the layer of sand and gravel but the pile tip must not penetrate beyond the gravel layer into the clay. To obtain the design 120-ton per pile bearing, Tippetts-Abbett-McCarthy-Stratton, found it necessary to attach bearing collars to the steel piles. The exact location of the bearing collar was left to the resident engineer, Wm. S. Bunnselmeyer, to decide at the site as the situation dictated. The location of the bearing collar depended on the location and depth of the gravel layer at the particular point.

The second major design factor was the tremendous tidal variations, which range from a high of plus 36 ft. to a low of minus 6½ ft., or 42½ ft. difference between high and low tide. This meant that the distance between the mudline and the top of the pile was often as much as 70 feet. This height added a sway factor which required the designer to use more and larger piling than is normal.

Key personnel on the dock job include, from left, Bernie Robinson, carpenter foreman; Tom Waggoner, Red-E-Steel owner; Sid Jokiel, project engineer, and Wes Bethje, pile-driving foreman.

Incidental to the tidal difference is the ice condition that must be designed for. Here the designer added 800 lbs. psf to the normal 650 lbs. psf. live lead factor of modern docks. This is to resist the ice load of up to 20 ft. depth of ice under the structure with an average ice density of 40 lbs. per cu. ft. Because of the constant rising and falling of the tide, the ice forms on the pilebents until the entire underside of the dock is a frozen mass of steel and ice.

This ice acts against the dock in two ways. During high tide it tends to float and uplift the dock or tear it loose from the foundation if the piling was not properly seated. The uplift tension has been calculated at 30 tons.

During low tide the weight of all this ice is shifted entirely to the piles on which they are frozen. Considering that each cu. ft. of ice weighs 40 lbs., the 800-lb. additional load factor of the dock is not at all excessive. Improperly designed piles have been known to shear and buckle under the ice load which is greater than the live load factor of a normal lower 49 dock.

Finally the engineer had to add a 10% load factor to the final design to protect the dock against the danger of earthquakes. Incidentally, the dock originally designed by the same engineers survived the cataclysmic earthquake of 1965 with no structural damage.

The final design of the main dock extension (320 ft.) consisted of 80 longitudal and traverse batter piles (40 in the North-South direction, 40 in East-West) and 159 vertical piles. All of the piles are steel and they came in three sizes — 20-, 24-, and 42-in. diameters. They were placed in 26 bents of 12 seven-pile bents, 10 eleven-pile bents, and 11 nine-pile bents.

The entire project, which included widening the apron on the existing deck, the main deck extension and the addition of the north trestle approach to connect the north end of the extension to a rock and earthfilled causeway, involved the installation of 320 piles totaling 28,722½ ln. ft. The engineer's estimate for the job was 28,650 ft. The difference between the estimate and the actual footage installed was a remarkable one quarter of one percent.

From the contractor's point of view, there were only two ways to drive the pile; over the top, or off a barge. Project manager James Clinton elected to drive the pile from the top. By doing so he avoided fighting the tide problem.

The sequence of construction was to drive a bent of vertical piles, install the falsework to move the rigs out onto the new bent, drive another bent of vertical pile. Then he would return to place the batter piles in between the bents. Thus bent by bent, the work extended out from the end of the original dock.

While the pile driving sequence was not unusual, the contractor came up with a few original techniques to keep saving time and money.

The first was a pile fabrication system which turned sections of 40-ft. long steel pipes supplied by L.B. Foster into piles ranging in lengths from 75 ft. to 130 ft. In addition, the fabrication yard also added the friction collar to the pipes at the desired points.

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ANCHORAGE DOCK

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The yard was established at the end of the rock and earthfilled causeway and consisted of two sets of small gauge railroad tracks each 200 ft. long and perfectly level. These tracks served as fabrication table. The 40-ft. sections of pipes were placed on small mine car carriages with a forklift.

The two carriages loaded with a section of pipe were pushed to the middle of the track and another two carriages were loaded with a 40-ft. length of pipe. The second pipe was pushed toward the first until the ends met.

The mounts on the carriage consisted of rubber wheel rollers which were powered by an electric motor. When the wheel rotated the pipe resting on them also rotated.

After the two ends were butted together a welder tack welded the bevel joints. A pedal control at his foot enabled the welder to rotate the pipe at the desired speed as he applied the weld with one of the four Lincoln Automatic Welding machines. Then the splice plates were added to give the joint additional strength.

If another section of pipe was required to comple the pile, the car loaded with the pile was simply pushed further down the track and another carriage loaded with pipe was butted against the end of the recently welded pile. The friction collar was then added to the pile while it was still on the carriage borne roller. Here the entire pile was rotated while the weld was applied. (More than 10,000 lbs. of welding rod was used on the job.)

After the pipes were welded into a long length of pile, it was delivered to the dock by a Cary straddle-carrier normally used in lumber mills.

The vertical piles were placed in either a three-pile template or a four-pile template. The contractor generally spotted the piles in low tide. The driving of the piles did not start until all the piles in the template had been spotted.

Then the piles were driven down with a Foster 0-10 steam hammer. Two cranes, a Lorain and a Koehring, were used to drive the piles. The Lorain generally worked the three-pile templates while the Koehring drove the four-pile templates and the batter piles.

To attain the 120-ton per pile bearing the driving usually stopped at 40 - 60 blows per foot. The exact number of blows cannot be predetermined because of the subsoil variation and the fact the collar had to be seeted inside the gravel layer.

After two bents of vertical piles had been driven, the contractor returned to install the falsework required to support his ingenious A-frame type fixed lead. This lead was not attached to the crane. The lead tower was set on a fixed 3:1 angle which was the angle for all of the batter piles.

The crane lifted the lead to the point where the batter pile was to be spotted and it was then guyed down with four guy wires. The bottom of the frame was clamped securely onto the falsework.

The advantage of this fixed lead in the extremely limited space of the dock was that it could be maneuvered and spotted independently of the crane. Thus it could be placed in every space or at the edge of the dock where a crane with an attached lead could not possibly reach. It was also a lot faster to move the lead around than to move both the crane and the lead.

After the fixed lead was positioned, the Koehring 605 would place the pile into the lead slot, then pick up the hammer and place it on top of the pile. The hammer rode on the lead slot and followed the pile down. Production averaged one seven-pile bent per day.

Key personnel for the contractor included: James R. Clinton, project manager; Sid Jokiel, project engineer; Glen Loomis, carpenter foreman; and Wes Bethje, pile driving foreman.

Resident engineer for the Port of Anchorage and Tippetts-Abbett-McCarthy-Stratton was Wm. S. Bunselmeyer. Tetsu Yasuda was the project manager. □

February
Wed. 24, 1971

20 Anchorage Daily Times

Board OK's Stepping Up Port Safety

The Anchorage Port Commission has taken steps to increase safety measures at dock loading facilities by approving renovation of the Petroleum, Oil, and Lubricants building.

An electrical unit on the south wall of the building will be moved and replaced by an observation window for the hose watch.

Port Director Erwin Davis said that in cold weather a man on watch must go inside periodically.

"The watch cannot observe loading operations from the building at present," he said.

Davis stressed the need for extra security on a 24-hour a day basis. He said the port has no guard on duty after midnight so the sole watch is the oil companies manifold watch.

A budget request for extra security was defeated by the City Council last year.

"Under the new federal code," Davis said, "if a situation of polluting occurs it is the designated port that loses its privileges to handle certain types of cargo."

In the past, commission members and port authority have assumed that responsibility for safety rested with the particular ship or company.

William O'Neill, commission member, moved a Monday's meeting that the commission make formal objection to the City Council for deletion of the item in the budget.

In other action, the commission announced that bids for construction of the Stevdore building probably will open next month.

Davis also told the commission he approved an expenditure of $6,500 for a reappraisal of port facilities by Tippetts, Abbett, McCarthy and Stratton.

44 Anchorage Times
Thursday, March 4, 1971

Icebreaker Visits Here

The nation's largest and most powerful icebreaker, the Coast Guard's Glacier will arrive Saturday in Cook Inlet on the way to a three-month mission in the Bearing Sea.

The 310-foot vessel left its home base in Long Beach, Calif., in late February for the northern journey. It will stop in Anchorage, although exact arrival time here is not known.

Part of its duties will be to evaluate ice operations in Cook Inlet. The Glacier will evaluate present ice conditions and attempt to get some idea of how an icebreaker of its size could be of assistance should theneed arise, a Coast Guard spokesman said.

Besides studying the ice, the Glacier will study the feasibility of year 'round shipping in the Nome-Port Clarence area off theiSeward Peninsula. The vessel will be in Nome March 22, 24-26, Kodiak March 8-12, and Seward April 24-25.

Also at Nome, scientists from the University of Alaska and the State Fish and Game Department will board the ship to conduct a mammal survey in the Bering Sea.

The Glacier carries 220 enlisted men, 14 officers and two helicopters. Commanding officer is Capt. Theodore L. Roberge.

46 Anchorage Times
Thursday, March 4, 1971

Crossing Is Urged

Times Juneau Bureau

JUNEAU — A crossing of the Knik Arm would improve the transportation link between Anchorage and Fairbanks, said the Anchorage port and open up the Susitna Basin to development, according to Rep. Helen Fischer, who has introduced a resolution in the state House of Representatives which would call on the highway department to construct such a crossing as soon as possible.

According to the Anchorage Democrat, the economic stability of the state depends "to a great extent" on the transportation facilities between Anchorage and Fairbanks. A crossing of the Knik Arm of Cook Inlet would greatly reduce the mileage between the cities and improve the cost of living in all of Alaska, Mrs. Fischer says.

The crossing, she says, also would enable to Port of Anchorage to "reach its full potential." The expansion of the port, she says, is a key factor in justifying the crossing.

Thursday, February 11, 1971 Anchorage Daily Times

BOSTON HEADS SOUTH

Sea-Land's van ship Boston, which made its first trip to Anchorage this week, is shown as it left the Port of Anchorage Wednesday afternoon. It is headed down Cook Inlet to Seattle for another load. The Boston was rotated into Alaska service in place of the New Orleans. Shown at left is the bow of the Standard Oil Co. of California tanker J. H. Tuttle.

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