ITALY - INSTALLATION OF NO. 19 BARRIERS FOR THE MO.S.E. PROJECT IN VENICE

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<td>CIVIL</td>
<td>TAILOR MADE LAUNCHING SYSTEM</td>
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<td>STRAND JACKING SYSTEM - SPMTs -</td>
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After the operations successfully executed of the first mobile gates, Fagioli came up with the idea to create a new gantry launching system for the installation of No. 19 mobile gates at Malamocco. Due to the depth of the caissons in the new barriers, the Gantry had to be provided by movable towers which were able to rotate 180 degrees.

After detailed analysis and studies in order to create an efficient lifting / lowering system able to execute the No. 19 mobile gates’ installation operations, Fagioli, after months of tests and 3d simulations, ended up with the construction of a reliable launching system with the following dimension: HEIGHT 33.650m; LENGTH 47.019 m; WIDTH 18.500 m. The total lifting capacity was 690 ton and the structure was load tested before the use at 860 ton.
Assembly of the gantry launching system
Fagioli used gantry lifting system, spmts and mobile cranes to assemble the sections of the launching system. First, fagioli assembled the crosshead beams then the towers were assembled. Fagioli used spmts to mobilize the items and a 600 ton capacity gantry lifting system to lift the structure. The crosshead beams, 47,019 m long, were provided on top with strand jacking system for the lowering / lifting operations of the mobile gates. No. 4 x 300 ton capacity strand jacks were fixed on top of the crosshead beams. Then fagioli completed the assembly of the lateral movable towers, able to open up for 180 degrees. The towers were connected at the top and at the bottom with no. 2 beams called bottom and top frames. A middle frame is used to allow the rotation of the towers. In order to execute the installation of the gates it was built a dedicated lifting system called «fishing beam». This lifting device was connected to the strand jacking system allowing the hooking of the gate for the lowering and final positioning into the water.

Auxiliary equipment
Fagioli built another tailor made structure called “transport beams”. This structure was provided with retractable beams used to lift the gantry lifting system from the caissons and reposition it onto another caisson for the installation of the gates. The retractable beams equipped with no. 4 x 300 ton capacity each strand jacks and power packs for the skidding of the beams.
Moreover fagioli used a total of 36 axle lines spmt for the hauling of the sections during assembly operations, for the transport onto the barge of the gantry launching system and the mobile gates and finally for the mobilization of the transport beams onto the barge.
In order to complete the whole operation fagioli employed a dedicated barge for the transport of the gates and the lifting structure provided with winches positioned onto the barge for the mooring operations. Fagioli was also in charge of the ballasting operations.
Tests executed before the operation activity
Fagioli executed several tests before the installation entered into the operational stage. At Marghera port the rotation of the movable towers of the gantry launching system were tested several times, taking into consideration all the dynamic forces involved.
Another important test was executed offshore for the mooring connections between the barge the posts and the buoys. It was extremely relevant to have a continuous stability of the barge considering the weights of the gates and structures involved at open sea. Last but not least, a loading test was performed before the actual operations were executed, checking with a remote computer the forces, eventual unforeseeable movements, weights and ballast procedures.

Installation of the mobile barriers
The first step for the installation of the mobile gates was the load out and sea transport of the gantry launching system which was executed by means of SPMTs onto the barge. The barge was pushed by No. 2 tugboats towards its final destination at Malamocco. Once arrived at Malamocco, the barge loaded with the gantry lifting system was placed in position, over the 12,000 ton caissons on top of which the gate would be connected. The barge was moored and kept steady also by the tugboats. Once checked the correct position, the gantry launching structure started opening the movable tower systems with a rotation of 180 degrees. The bottom towers, once completed the rotation, were joint together with the middle frame. Once connected and checked the correct position of the launching system, the barge was unmoored and sailed away. The barge got to Pellestrina island where all the mobile gates were stored. Fagioli proceeded with the load out operation onto the barge.
The barge then was pushed back to the installation area. The barge was moored underneath the launching system previously laid onto the caissons. In order to reach for the correct position for the connection of the mobile gate with the fishing beam (supported by the strand jacks on top of the launching system) it was necessary to execute a 180 degrees rotation. This operation was executed by the SPMTs, which were also used to get the mobile barrier underneath the fishing beam.

The fishing beam was gently lowered and eventually connected to the gate. After connection, the gate was lifted by No. 4 strand jacks positioned on top of the lifting structure and the barge was sailed away. The mobile gate was lowered into the water by the strand jacks connected to the fishing beams. The final operation was the connection of the gate with the caisson after checking, by waterproof cameras, the correct positioning.

Once the connection was executed, the gate was automatically freed from the “fishing beam” and taken back into position ready for the following installations. Fagioli used the transport beam (positioned onto the barge) to lift the gantry system and reposition it onto the following caissons. The transport beam was a retractable structure positioned onto SPMTs and provided with strand jacks. The transport beams were skidded to the outside to get in contact with the gantry lifting system. The gantry lifting system was disconnected from the bottom base, and was connected to the transport beams. The transport beams strand jacks lifted the launching system and the barge was unmoored ready to be pushed by the tugboats onto the following caissons.