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Holbeach River Sluice

Client:	South Holland Internal Drainage Board
Location:	Holbeach, Lincolnshire
Value:	£625,000
Duration:	5 Months







In Brief...

An outfall sluice, located on the Holbeach River, had suffered excessive wear and tear and needed repair, rejuvenation and modernisation in order to prevent inland flooding during high tide surge events. The sluice is located on the River Holbeach where it meets the River Welland and is under the control of the South Holland Internal Drainage Board.

Original Contract Scope...

The scheme comprised:

- Replacing the upstream vertical sluice gate (penstock) and frame with a complete new unit and semi-automatic lifting operation
- Installing a replacement downstream Tidal Pointing Doors including hinges, pins, seals and safety rail
- Fitting a new downstream sheet pile wall in front of the existing sheet pile wall, relocating the handrail to the new wall and then in-filling the gap between the two walls. Doors were also replaced on downstream side
- Installing six new tie rod assemblies to connect the existing upstream sheet pile wall with the new downstream sheet pile wall
- Repairing the existing concrete structure including injections inside the culvert underneath the embankment, and refurbishing the existing upstream steel sheet pile wall and landscaping the area back to the original layout
- Supplying a new mobile actuator (Stihl BT45) and torque enhancer (Gedore Torque multiplier DREMOPLUS ALU 1300 Nm) to be used to conjunction with the new vertical sluice gate arrangement to provide semi-automatic opening and closing of the gate

Changes to Scope of Works...

- Originally, a temporary coffer-dam was planned to separate the work area from tidal water, however the geotechnical information provided at the planning stage was not accurate and this option could not be applied. The solution to this problem was to procure and install a temporary stop-log as a temporary dam to enable for downstream door replacement
- This event caused a delay and a change to the programme, which added some cost to the cost to the scheme, due to procurement lied-times and sub-contractors availability

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Technical Features...

- The replacement of the upstream penstock was achieved by installing temporary over-pumping of the river with capacity of 1000l/s. This provided access to the work area, allowing for the old gate to be removed and disposed, and for the new vertical gate to be supplied and installed by specialist subcontractor HC Water-control
- Due to the issues with ground conditions and the inability to construct a temporary coffer dam as planned, a decision was made to procure temporary stop-logs to act as a temporary dam to enable the downstream door to be replaced
- Sheet-pile walls were then installed by specialist sub-contractor, lvor-King. To enable the work, a temporary access ramp off the top of the embankment and temporary crane platform was constructed
- A mini directional drill rig (TT rig) was then used to install 150mm casing pipes underneath the embankment and tierods were installed inside them. Steelwork subcontractor, TAM Engineering, fitted waling on both sides of the sluice, each end of the tie rod was then passed through the installed sheet piling and associated waling beams and secured in place using supplied Tie Rod End Plates and Washer plates. The tie rods and, the articulated rods which allow for differential movement, were then wrapped in a denzo tape system to provide protection
- On the upstream side, before the waling was installed, the existing sheet-pile walls were shot blasted, coated with protective bituminous paint, and reinforcement plates were welded. The gap between old and new sheet-pile walls downstream was backfilled with gravel, and the existing handrails were moved to suit
- After the stop-logs were manufactured, delivered and installed, the old pointing doors were removed and the new pointing doors were installed by specialist sub-contractor Hargreaves Lock Gates. The doors were constructed of the timber, from the Lophira alata, (Ekki) tree, which derives from West Africa. This timber provides an outstanding hard and heavy timber and is selected to deliver a 50 year service life. The doors will remain shut by the tide of the River Welland, thus protecting the upstream land adjacent to the River Holbeach. Only when the hydrostatic pressure in the River Holbeach is greater than that in the River Welland will the doors open, this will subsequently cause a flow from one to into the other
- The 'hanging' scaffold resistant to tidal water was installed on the new sheet-pile wall from which we completed all the postinstallation remedial painting work
- Throughout the job the concrete repairs were progressed, with all damaged or missing concrete was replaced with Renderoc Plug 20, a rapid setting, cement based, water stopping mortar
- Prior to the application of Renderoc, any exposed reinforcing was blast cleaned and painted with Nitoprine Zinc Rich Plus and all looser damaged concrete was removed and edges cut back neatly
- All the remaining metal works such as the installation of capping on the sheet-pile walls, the moving of handrails, burning holes and repairs in existing sheet-piles, etc. were performed by TAM engineering as and when required
- Once all the elements were complete and commissioned, all the temporary works were removed and the area was reinstated to Environmental Agency requirements, including repairs to flood defences







Constraints...

There were a number of constraints to contend with whilst undertaking this project including working in a tidal environment which posed the potential for unexpected surge events. To manage the potential for surge, Barhale kept in contact with the Environmental Agency and were ready, in case of an event, to secure the site. In addition to regular contact with the Environmental Agency, Barhale maintained relations with a variety of third parties and stakeholders such as Nature England so that the works within an area of specific scientific interest could be managed in a considerate and responsible manner.

Due to the works delivery environment, for example, access being via flood embankments, work being on a live watercourse and working with protected species in the adjacent area (birds, seals), strong emphasis was placed on environmental sustainability throughout the project. Barhale managed these critical aspects through their Environmental Planning, for example, making sure that a safety boat was placed on standby and by deploying a seal watcher during noisy operations.

Innovation & Customer Benefits...

Despite the unforeseen changes to ground conditions, our value engineering and the innovative behaviour in resolving the coffer dam issues using stop-logs, allowed Barhale to complete the project whilst generating a saving of nearly 10% for the client.

Sub-Contractor Management...

The following Sub-contractors were successfully managed by the Barhale team on this project:

- HC Water Control Installation of the vertical flood gate – 2 operatives
- Ivor King Installation of Sheet Piles 3 operatives
- TAM Engineering Steel work installation 2 operatives
- Hargreaves Lock Gates Installation of the new pointing doors
 3 operatives