JOHNSON STREET BASCULE BRIDGE - VICTORIA, B.C.

Modular Lift-In Cofferdam System for Bascule Pier Construction

When completed, the new Johnson Street Bridge in Victoria, BC will be the largest single-leaf bascule bridge in Canada and one of the largest in the world. The bascule is supported on a pier measuring 20.6 by 25.0 meters in plan supported by 16 - 1.83m diameter drilled shafts. The bottom of the bascule pier footing is 4.6 m below mean high water, and the area is subjected to tidal fluctuations in excess of 3 meters.

Artist Rendering of Complete Bridge

PROJECT INFORMATION

Year of Completion: 2016 (expected)

Construction Cost: $92.8 Million (completed bridge structure)

Client: PCL Constructors Westcoast

The primary challenge faced in constructing the bascule pier foundation is site access and available lifting capacity. The existing bridge foundation was immediately adjacent to the new bridge and there was limited access from the land side limiting access to just two sides. This eliminated the ability to extend any cofferdam structure or floatation device more than a few feet beyond the perimeter of the footing.

BSCE was selected by PCL Constructors to solve the known constructability issues for the bascule pier foundations and provide an effective cofferdam solution. The optimum solution selected was a lift-in modular cofferdam system supported by the drilled shaft casing. The bottom slab for the cofferdam was constructed in place above the water, the walls and internal framing were installed, and the entire unit was lowered to grade using a hydraulic system consisting of 32 synchronized hydraulic jacks.

The bottom slab was constructed in two stages. The first stage consisted of 16 precast modular form panels. The precast panels were limited to 25 tons for lifting and reach. The assembled precast panels were suspended from the drilled shafts by high strength threaded rods. For the second stage, a 610mm thick reinforced concrete seal slab was placed inside the precast concrete forms prior to lowering the cofferdam to grade.

The walls of the cofferdam consisted of steel form girder panels. The panels were supported near the top with an internally braced steel frame. Once the entire unit was constructed, it was lowered to grade. The 1081mm annulus between the cofferdam bottom slab and the steel shafts was grouted with tremie concrete and dewatered. The drilled shaft casings were cutoff to grade in the dry to allow construction.

SERVICES PERFORMED

Design of modular lift-in cofferdam system for main bascule pier pile cap

Exterior view of completed cofferdam

Interior view of the complete Cofferdam Prior to Lowering

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