

FLOAT-IN COFFERDAM FOR PORT MANN BRIDGE ACROSS FRASER RIVER



Floating cofferdam position in guide frame over piles



Interior view of the dewatered cofferdam

In November 2008, the JV of Flatiron and Kiewit was awarded the design-build contract for the new Port Mann Bridge. The bridge crosses the Fraser River approximately 10 miles SE of Vancouver, Canada. The main in-water tower of the cable-stayed bridge is located mid channel in 45-ft of water. Tidal variation at the site is approximately 14-ft. The final foundation design for Pier N-1 consisted of 63 driven pipe piles, each with a 6-ft diameter. The tops of the piles are embedded in a 24.6-ft deep (138.13-ft by 108.60-ft) pile cap positioned just below the High Water.

The JV selected BSCE to design a float-in cofferdam for Pier N-1. The cofferdam's unique features included:

- **Cast & Launch Method** – The cofferdam was cast on the deck of two barges in N. Vancouver Harbor and launched from the deck of a floating dry-dock. See photo below of the cofferdam on a two-barge casting

bed under tow to the floating dry-dock.

- **Cofferdam Size** - It is the largest float-in cofferdam ever installed – 109-ft by 138-ft by 32-ft high and weighing in excess of 6,000 tons.
- **Number of Foundation Piles** – The pre-cast cofferdam was installed over the top of 63, 6-ft diameter pipe piles cut-off 10-ft under water.
- **Use of Pre-Installed Pre-Cast Support Collars for Initial Landing of Cofferdam** – Initial support for the cofferdam was provided by a support collar grouted to each of the 63 foundation piles.
- **Load Distribution System During Cofferdam Landing on 63 Piles** - In order to prevent overloading any single support collar by the 6,000 ton cofferdam during landing, a pipe ring positioned on each support collar was used to cushion the cofferdam

landing.

- **Pile Cap Size** – 24.6 feet deep with a total volume of 10, 400 CY.

Significant advantages of the cofferdam system designed by BSCE included:

- Elimination of the need for extremely long sheet piles typically required for cofferdams in deep water.
- Elimination of tremie concrete seal by transferring cofferdam uplift loads directly into the large foundation piles.
- With the elimination of the tremie seal, there is significant reduction in pile cap mass. This has very significant design and cost benefits by reducing lateral design loads in foundations for structures located in zones of high seismic activity.
- Offers the potential for significant schedule reduction by starting pile cap construction concurrently with pile installation.

PROJECT INFORMATION

Year of Completion: 2012

Construction Cost: \$820 million

Client: JV of Flatiron & Kiewit

Owner: B.C. Ministry of Transportation



Pre-assembled cofferdam on 2 barges

SERVICES PERFORMED

- ◆ Cofferdam Design
- ◆ Construction Engineering for Cofferdam Installation



BITTNER-SHEN CONSULTING ENGINEERS, INC.

SPECIALTY ENGINEERING: STRUCTURAL · GEOTECHNICAL · CONSTRUCTION · MARINE

921 SW Washington St., Suite 765, Portland, OR 97205