INFRASTRUCTURE

TIE UP WALLS RECONSTRUCTION PROGRAM

PROJECT CREDITS

OWNER
St. Lawrence Seaway Management Corporation

ARCHITECT OF RECORD
Bergmann Associates

ENGINEER OF RECORD
Bergmann Associates

GENERAL CONTRACTOR
Dufferin Construction Company, A division of CRH Canada Group Inc.

MATERIAL SUPPLIERS
Dufferin Concrete, A division of CRH Canada Group Inc.
DECAST Ltd.

ADDITIONAL PARTICIPANTS
- Ducon Utilities
- E.S. Fox Constructors
- Euclid Canada
- James Donn Piling Limited
- LIUNA Local 837
- Salit Steel

PROJECT FACTS

LOCATION Niagara-on-the-Lake, Ontario

COMPLETION April 2017

QUICK PROJECT FACTS
- 21,489 m^3 of C.I.P. Concrete
- 2,619 EA of Pre-cast Concrete Panels
- 33,838 m^3 of Earth Excavation
- 60,900 LM of H-Piles
- 84,736 Tonnes of Granular Material
- 3,345 Tonnes of Reinforcing Steel
- 1,952 LM of Demolition of Existing Structure

2017 Ontario Concrete Awards

The Welland Canal is a major transportation artery within the St. Lawrence Seaway, and it connects the Great Lakes to the Atlantic Ocean. The reconstruction of the tie-up walls is one component of a $395 million renewal program to ensure the continued reliability of the Seaway. Over 227,000 jobs and $35 billion in economic activity are supported by the movement of goods within the Great Lakes and the Seaway System.

The Tie Up Wall Reconstruction Program was commissioned by the St. Lawrence Seaway Management Corporation and was awarded to Dufferin Construction September of 2013, to be completed April 30, 2017. The project included the complete removal and replacement of tie-up walls at Upper Lock 2 (2013-2014), Upper Lock 1 (2014-2015), Upper Lock 3 (2015-2016) and Lower Lock 3 (2016-2017). The removal and replacement of the Tie up wall could only be completed during the “Ice Season” where the canal was drained January 1st to “Water up” in the 3rd week of March yearly.

The project used 21,489 m^3 of Cast in Place concrete and 2,619 Precast panels were used, each consisting of approximately 3-7 m^3 of concrete. Each Tie-up wall is approximately 500 m in length; the existing walls were supported on timber piles that experienced deteriorated and overstressing over the years. The replacement of each wall included removal and disposal of existing deck, timber piles, ancillary earthwork and grading. The new tie-up wall superstructure consists primarily of a composite concrete deck using precast and cast-in-place elements. Precast coping beams were installed with improved fenders sections, the concrete deck spans between steel bent cap beams which, in turn, are supported by steel h-piles. The bent cap beam, consisting of two (2) wide flange sections, served as a pile driving template which allowed for an accelerated construction schedule.

The use of CIP and Precast concrete ensured a durable product that will last decades before any rehabilitation is required. The project utilized Accelerated Concrete, Set Delay Retarders and Superplasticizers to facilitate a rapid progress of work and to provide a superior end product. All concrete work commenced each January and the extreme cold challenged production and placement operations. Dufferin Concrete and Dufferin Construction used steam, indirect heating, insulated blankets and boilers to aid in construction.

Different mix designs were used simultaneously to balance the placement restrictions, structural requirements and formwork pressures. The concrete had to meet the thermal requirements of mass concrete as dictated by CSA so that internal and external temperatures were controlled in extreme weather. All structural concrete used was 35 MPa Class C1 mix designs with 20 mm and 13.2 mm aggregates. Slag was used as a Supplementary Cementing Material within the limits of the mix designs to ensure that all concrete requirements were met and to facilitate a rapid schedule.