

Durability of Piles for Water-Level Pile Caps for the Gov. Mario M. Cuomo Bridge

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1 Abstract

The new Governor Mario M. Cuomo Bridge spans the Hudson River between Rockland and Westchester Counties in southern New York. The Hudson is estuarine in nature at this location, and thus the water is brackish and subject to tidal fluctuations and additionally contained Sulfate Resistant bacteria. The new bridges are constructed using water-level pile caps, with exposed piles from the underside of the pile cap to the river bed. Concrete pile plugs were included to transfer loads from the pile caps into the piles. This presentation will discuss the approach to achieving the desired service life for the piles used for the majority of the foundations, including how the interaction between the steel piles and the concrete pile plugs was accomplished. The assessment considered embedded zones, submerged zones and splash zones, all defined based on actual environmental exposure and with guidance from the FHWA, Caltrans, Eurocode and other publications in conjunction with site-specific testing of the water.

Keywords: pipe piles, pile plug, uniform corrosion, accelerated low water corrosion, splash zone, immersed zone, embedded zone.

2 Introduction

The Governor Mario M. Cuomo Bridge spans the Hudson River in southern New York. Foundation conditions are challenging, with rock generally very deep below the river and a layer of weak organic clays underlain by intermittent thin layers of glacial till and/or sand, all underlain by very deep clays that are stiff enough to provide significant vertical resistance.

Most piles on the river bridges are open-ended pipe piles, primarily friction piles on the west side of the river, and end bearing on rock toward the eastern side. Using large diameter piles limits the number of piles per pier, making the long-term pile serviceability critical to the integrity of the bridge.

3 Design Loads

The limited number of piles results in high demand on each pile. Many approach piers had demands in excess of 17,800 kN (4000 kips), and main span demands approached 31,200 kN (7000 kips). The