Structure of the new movable railway bridge on Pamban island

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Abstract

A new Tower Vertical Lift bridge on Pamban Island (India) replaces the existing “Scherzer” Rolling Bascule bridge within the railway line that connects the island to the Indian subcontinent across the Palk Strait. The lift span of the new bridge consists of a 77.5 m simply supported structure composed of two lateral steel Warren trusses of variable depth and a platform 10.3 m wide, holding two railway lines. The lift movement of the bridge is carried out through two sets of electromechanical systems placed in two towers 40 m high, located at the ends of the lift span, which hold the machinery in their upper part. The choice of this system responds to the criteria of reliability and robustness. Also, the high incidence of marine corrosion in the bridge location has been decisive in the design. The existing bridge is a national icon in South India; therefore, the aesthetic has been a fundamental condition.

Keywords: movable bridge, vertical lift, tower drive, steel structure, Warren truss, railway, deep foundation

1 Introduction

The historic Pamban Bridge is an unelectrified single-track railway viaduct with a length of approximately 2 km, connecting Pamban Island to the subcontinent in Tamil Nadu (India), spanning the Palk Strait. The construction works of the bridge began in 1911 and ended in December 1914. Since then, the connection between India and Sri Lanka has remained constant through this rail service that reaches the island of Pamban and, from there, continues to the town of Talaimannar in Sri Lanka via ferry.

The existing bridge comprises 145 12.2-m spans formed of simply supported steel beams and a Scherzer Rolling Bascule section with a 66.5-m span, composed of two movable lateral steel trusses, transversal beams in correspondence with the lower nodes of the truss, and two longitudinal stringers.

The Scherzer Rolling Bascule system [1][2] has a characteristic curved geometry of the lower chords of the lateral steel trusses at its butt-end, forming two-quarters of a circumference for each leaf called "segmental girders". During the opening or closing operation of the bridge, these circular elements roll on the corresponding back rails, establishing a rotation of the leaf accompanied by its horizontal movement backwards or forwards during the manoeuvre.

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