

Innovative Box girder having Footpath at Bottom of Box girder by Cantilevering Soffit slab

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Abstract

Innovative structural forms for medium span bridges are a challenging effort for bridge design engineers especially in built-up area locations, where social impact plays a crucial role. Box girders are flexible forms compared to conventional 'I' girders, in the sense that they can have curved plan as well as varying shape of cross sections. Padaharam bridge at Alappuzha district of Kerala state is such a bridge planned, designed and under construction with superstructure having walkways/pedestrian way underneath cantilevering box girder. This ensued less land acquisition, environmental and social impact. In this paper, the planning, design, and construction of this bridge are introduced. The cross-sectional features of the box girder, the structural analysis of the superstructure and its constructional techniques are discussed in this paper.

Keywords: Box girder; Land acquisition; National Water Way; High Embankment; Land Span.

1 Introduction

There have been relentless efforts from Bridge Engineers to provide cost-effective structural solutions. Box girder bridges are a type of bridge in which the main beams comprise girders in the shape of a hollow box. Box girders are efficient form of construction for bridges because it minimizes weight, while maximizing flexural stiffness and capacity. The box girder normally comprises prestressed concrete, structural steel, or a composite of steel and reinforced concrete.

Analysis and design of box-girder bridges are very complex because of its three-dimensional behavior consisting of torsion, distortion and bending in longitudinal and transverse directions. The longitudinal bending stress distribution in wide flange girder is distributed non-uniformity throughout the width.

Waterway transportation play a vital role in Kerala as the inland navigation system encompasses 41 east to west flowing rivers along with backwaters in north-south coastal line of Arabian sea. The 633 m long west cost canal includes the 163km National Waterway-3 (NW3) from Kollam to Kottapuram. This paper presents the design features of Padaharam bridge across Pampa River under construction across the NW3 at Alappuzha having peculiar box girder form for superstructure reducing overall width and the aesthetic features.

2 Challenges in Planning the Bridge

As per the norms of Inland Water Authority of India (IWAI), a vertical clearance of 6m above high flood level and a horizontal clearance of 40m between piers is mandatory for bridges to be constructed across NWW in Kerala. Box-girders are cost-effective for spans range above 30 metres. As a result, there was a demand for constructing high