Analysis And Design Of Railway Over Bridge At Kumaranellur

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Abstract: **Modern day construction prefers prestressed girders over conventional RCC for long span bridge construction. This paper deals with the design of railway over bridge at Kumaranellur, Kerala. The bridge connects MC road and Kumaranellur temple road. The bridge has an overall length of 312m with a width of 12m and longest span of 33m. The major goal of this is to validate and recommend details for the design of durable and constructible details to achieve structural continuity between the standard precast, prestressed concrete girders for this proposed bridge. Along with it, this paper will be dealing with the design of the pier.**

Keywords: **Prestressed bridge design, I girder, cross beam, end block, pier.**

I. INTRODUCTION

The proposed ROB plays a major role in stream lining the traffic control system. The ROB crosses the rail passing through Kumaranellur-Kudamaloor Road. This road is of religious importance as it connects to Kumaranellur Temple. Also it is a bypass to Kumarakom, the famous tourist place in Kerala. The road starts from MC Road passing through Kottayam district. The frequent closings of railway cross results in heavy traffic congestion at Kumaranellur junction and hence affect the movement of traffic through MC Road.

II. METHODOLOGY

Site visit and reconnaissance survey were done to prepare the location sketch and fix the alignment and dimensions of bridge (See Fig 1). Details regarding the requirements were collected from Road And Bridge Development Corporation-Kerala, Palarivattom, Ernakulam. The span over railway was fixed as 33m. The total width of the bridge is 12m. Each carriageway (2 lanes) has a width of 7.5m and consists of three longitudinal girders and nine cross girders. The bridge was designed as composite bridge with prestressed I girder and RCC deck slab. The grade of concrete for prestressed girder was taken as M40 and M30 grade concrete was taken for slab, hand rail, kerb and footpath. The grade of steel was Fe415. The analysis was done using SAP2000 and design was done manually. The design was done according to IRC 5-2000, IRC 6-2000, IRC 18-2000 and IRC 21-2000.
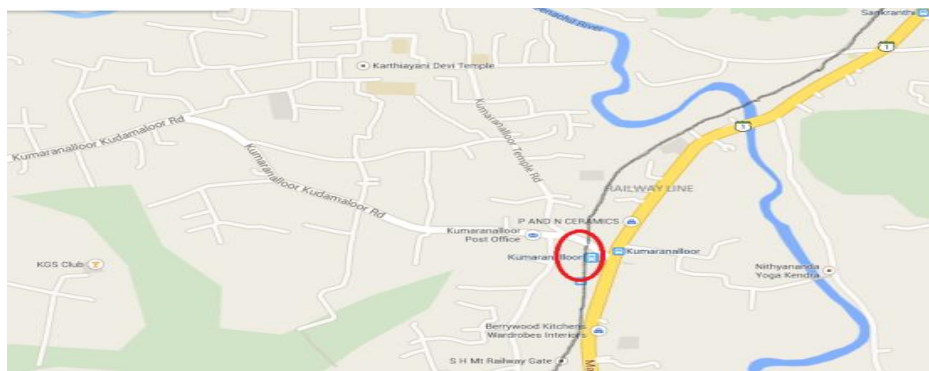
III. OVERVIEW

Fig: 1. Site plan

TABLE I: PRELIMINARY DESCRIPTION

Bridge type	Railway Over Bridge
Length of Bridge	312m
Span of beam under consideration	33m
Carriage way width	7.5m
No. of longitudinal Girders	3
No. of cross Girders	9
Width of Kerb	0.6m
Overall width of deck at top	12m
Thickness of wearing coat	0.07m
Grade of concrete	M40 (Girder) M30 (Handrail, Kerb, Footpath)
Grade of steel used	HYSD Fe$_{415}$
Live load	IRC-70R double lane loading
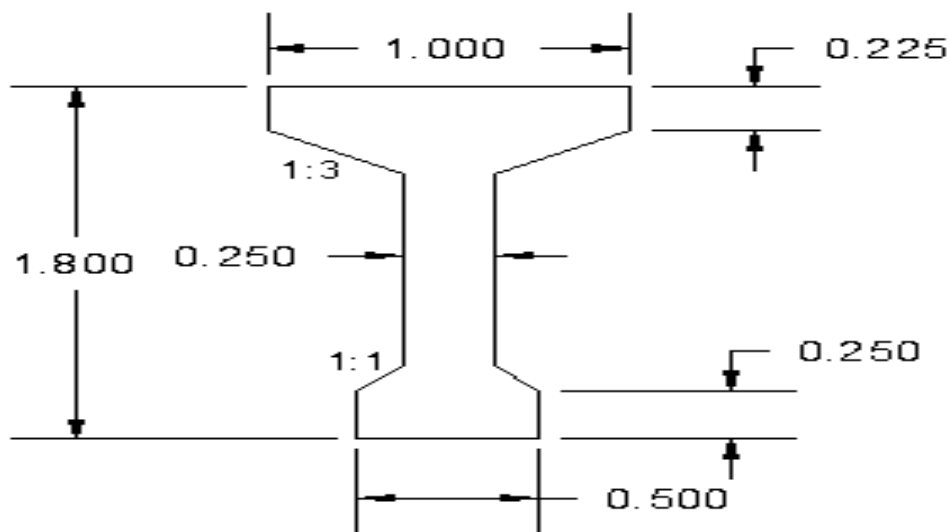
ALL DIMENSIONS IN M

Fig: 2. Section of Longitudinal girder

IV. DESIGN STEPS

4.1- The following steps were carried out for the span of 33m

    4.1.1 – Load calculation (IRS 6:2000)

    4.1.2 – Design of Deck slab (IS 456:2000)

    4.1.3 – Design of cross section of girder (IS 1343:1990)

        4.1.3.1 Design of section

        4.1.3.2 Calculation of prestress

4.1.3.3 Calculation of eccentricity

4.1.3.4 Design of shear reinforcement

4.1.3.5 Design of End Block

4.1.3.6 Design of Bearings

4.2- Design of piers (IS 456:2000)

V. RESULTS

5.1 Slab

-Concrete M_{30}

-Steel Fe_{415}

-Total depth of slab=200m

-Provide 16mm diameter bars at 160mm as primary reinforcement

-Provide 16mm diameter bars at 155mm as secondary reinforcement

-Nominal cover of 25mm is provided.

5.2 I girder for 33m span

-Concrete –M_{40}

-Steel -1500N/mm^2 and Fe_{415}

-Using Freyssinet system, nineteen ducts each having 7mm diameter bars are provided.

-Prestress = 1100N/mm^2

-Two legged stirrups of 8mmØ is provided at a spacing of 300mm as end face reinforcement

Cross Section of bridge
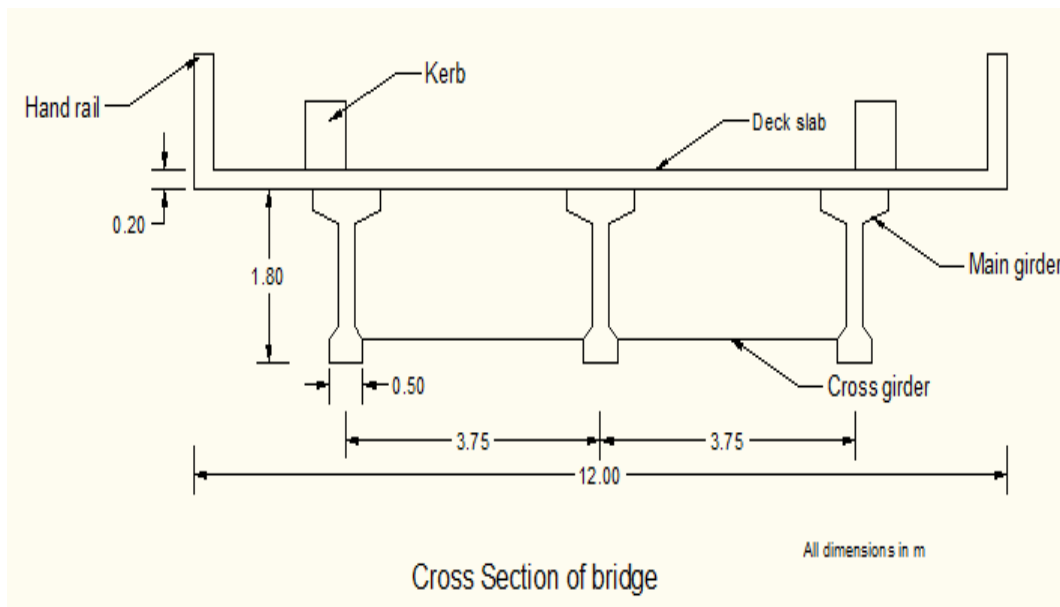
5.3 Piers (column)

-Concrete –M_{35}

-Steel –Fe_{415}

-Height =7m

-Diameter =3m

VI. CONCLUSION

The design of superstructure of railway over bridge proposed at Kumaranellur, Kerala, India was completed and all drawings (using AutoCAD 2010) and specifications were prepared. The design of superstructure was done manually using relevant codes. In this paper, the different loads and forces that are likely to act on the structure are considered. The analysis and subsequent design has shown that the structure is capable of handling the external load and forces safely. On completion, this project will reduce the traffic congestion of Kumaranellur-Kudamaloor road.

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