

Design And Estimation of High-Level Bridge

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Abstract — This manuscript presents the design and estimation of a high-level bridge developed under the Integrated Tribal Development Agency (ITDA), Andhra Pradesh. The study focuses on bridge planning, hydrological investigation, structural design, foundation analysis, loading conditions, and estimation procedures according to IRC standards. The project evaluates design discharge, scour depth, linear waterway, substructure, superstructure, and bridge accessories for safe and economical bridge construction.

Keywords: High Level Bridge, Bridge Engineering, Hydrology, Structural Design, IRC Loading, Estimation, RCC Bridge

I. INTRODUCTION

Bridges are essential civil engineering structures that provide connectivity across rivers, valleys, and transportation corridors. High-level bridges are particularly important in flood-prone regions because they ensure uninterrupted transportation during high flood conditions. The development of bridge engineering has significantly improved transportation, economic growth, and regional connectivity.

The present study focuses on the design and estimation of a high-level bridge proposed in Yellandu Mandal, Khammam District, under the Integrated Tribal Development Agency (ITDA), Government of Andhra Pradesh.

II. OBJECTIVES OF THE STUDY

The major objectives of this study are:

- To study the planning and design principles of high-level bridges.
- To determine design discharge and linear waterway requirements.
- To analyze bridge loading conditions according to IRC standards.
- To design substructure and superstructure components.
- To prepare estimation data for bridge construction.

III. SITE DESCRIPTION

The bridge site is located in Yellandu Mandal of Khammam District. The site is approximately 14.80 km from Yellandu town and 64.80 km from Khammam town. Hydrological and topographical investigations were carried out for safe bridge alignment and structural design.

The bridge was developed under the Integrated Tribal Development Agency (ITDA), Andhra Pradesh.

IV. METHODOLOGY

The methodology adopted in this study includes:

- 1) Preliminary data collection.
- 2) Hydrological investigation.

- 3) Determination of flood discharge.
- 4) Calculation of linear waterway.
- 5) Scour depth analysis.
- 6) Span arrangement.
- 7) Foundation design.
- 8) Structural analysis and design.
- 9) Preparation of estimation and drawings.

The bridge design was carried out in accordance with IRC specifications and standard bridge engineering practices.

V. DESIGN DATA

The important design data considered in the project are summarized below:

Parameter	Value
Design Discharge	1120.37 cum/sec
Maximum Flood Level	+100.000 m
Velocity of Flow	1.408 m/sec
Afflux	0.15 m
Vertical Clearance	1.20 m
Linear Waterway Required	80 m
Foundation Level	+91.000 m
Type of Superstructure	RCC T-Beam Girder
Bearing Type	Neoprene Rubber Bearings

VI. LOADS CONSIDERED

The following loads were considered during the bridge design:

- Dead Load
- Live Load
- Impact Load
- Longitudinal Force
- Wind Load
- Thermal Force
- Seismic Load
- Erection Forces

IRC Class AA loading was adopted for highway bridge design.

VII. FOUNDATION AND SUBSTRUCTURE

Open foundations resting on soft rock strata were adopted due to the availability of suitable bearing capacity at shallow depth. Wall-type piers and abutments were designed using reinforced cement concrete according to IRC provisions.

A. Abutments

Wall-type abutments in VCC M15 concrete were provided with suitable reinforcement.

B. Piers

Wall-type piers were designed to support the RCC T-beam superstructure.

C. Wing Walls

Box-type wing walls were proposed for retaining embankment soil and ensuring smooth water flow.

VIII. SUPERSTRUCTURE

The superstructure consists of RCC T-beam girders and RCC deck slabs with an effective span of 16.5 m. Neoprene rubber bearings were used to transfer loads safely from the superstructure to the substructure.

IX. ESTIMATION AND CONSTRUCTION

The estimation process includes:

- Excavation works
- Embankment preparation
- Foundation works
- RCC construction
- Expansion joints
- Bearings
- Bridge accessories

Proper construction methodology and safety measures were considered throughout the project.

X. BRIDGE ACCESSORIES

The bridge accessories provided include:

- Parapets
- Expansion joints
- Drainage arrangements
- Waterproofing treatment
- Bearings

These accessories improve safety, durability, and serviceability of the bridge.

XI. CONCLUSION

The study demonstrates the importance of systematic planning, hydrological analysis, structural design, and estimation in bridge engineering. The proposed high-level bridge satisfies the functional and structural requirements while ensuring safety, durability, and economic feasibility.

The project highlights the significance of proper site investigation, hydraulic analysis, and IRC-based structural design for successful bridge construction.

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