

摘 要

本项目为荣乌赵家庄中桥的方案规划与结构设计研究。研究的最终目标是提出一个安全、可靠、实用的桥梁设计方案，既满足功能与安全要求，又基于真实的工程数据与现场条件。在参考长郭中桥的设计基础上，项目充分考虑了最有利的地质与水文条件，力求实现桥梁在实际环境中的最佳性能表现。

1. 设计参数与技术指标：本桥桥面净宽为 8.5 米，另设两侧各 0.75 米的路肩，结构安全等级为一级，设计荷载等级为公路-I 级。桥梁主跨为 20 米，采用设有五道横隔板的钢筋混凝土简支 T 梁结构。主梁计算跨径为 19.50 厘米，在结构强度与承载力分析中，对主梁的尺寸、间距及钢筋布置等关键参数进行了详细考虑和精确控制。
2. 方案比较与选择：本项目对四种桥型方案进行了对比分析，分别为钢筋混凝土实心板桥、预应力混凝土箱梁桥、钢-混凝土组合梁桥以及钢筋混凝土简支 T 梁桥。方案比较从结构特性、施工可行性、经济性、耐久性与维护性以及地质适应性等方面进行多角度评估。经综合比选，最终选定钢筋混凝土简支 T 梁桥作为设计方案，因其在施工便捷性、结构耐久性 & 经济成本控制方面表现优越。
3. 结构与计算：在确定 T 梁结构方案后，对桥面、主梁与横隔板等构件进行了深入的结构分析与计算，包括恒载与活载作用计算、内力分析以及配筋设计。同时，对横隔板布置与钢筋配置进行了优化设计，以提高桥梁整体结构的稳定性与耐久性，确保其满足各项安全与性能要求。

关键词：公路桥；方案比选；T 梁桥；结构设计；结构计算。

Abstract

This is the scheme planning and structure design of the Zhaojiazhuang Medium Bridge on the Rongwu Highway. The final aim of this study is to come up with a safe, reliable, and practical bridge satisfying both functional and safety requirements and also founded upon real engineering data and onsite conditions. In reference to Changguo Medium Bridge, the project is taking the most favorable geological and hydrological conditions into consideration to meet maximum performance of the bridge within the environment.

1. Design Parameters and Technical Specifications: The deck of the bridge will be designed with a clear width of 8.5 meters, having two shoulders of 0.75 meters. The structural safety class of the bridge is Class I, and it has a design load rating of Highway – Grade I. The main span of the bridge is 20 meters with a five-transverse diaphragm-reinforced concrete simply supported T-beam structure. The main beam span has been calculated to be 1950 cm and with additional precautions in beam size, spacing, and location of reinforcements while determining the structural strength and load-carrying capacity.
2. Scheme Comparison and Choice: Reinforced concrete solid slab bridge, prestressed concrete box girder bridge, steel-concrete composite girder bridge, and reinforced concrete simply supported T-beam bridge are the four bridge alternatives compared for scheme comparison. The alternatives were: Point-wise compared on the structural characteristics, Feasibility in constructability, Economic evaluation, Durability and Maintenance, and site suitability. After a close scrutiny, reinforced concrete simple supported T-beam bridge was utilized on account of having its highest constructability, durability, and economy.
3. Structural Design and Calculation: After the T-beam structure was identified, in-depth structural analysis and calculation of bridge deck, main beam, and diaphragms were conducted. They included permanent and variable load calculation, internal force calculation, and reinforcement design. Location of the diaphragm and rebar location were also optimized to improve overall stability and durability of the bridge as per safety and performance requirements.

Keywords: Highway bridge; Scheme comparison; T-beam bridge; Structural design; Structural calculations.