

Geometrical Road Design From NH163 to CJITS Boys Hostel Using AUTOCAD Civil 3D

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Abstract: *This project investigates the application of drone-based surveying for the design of a 743.43-meter-long roadway. The primary aim was to enhance the precision and efficiency of the roadway design process through the integration of Unmanned Aerial Vehicles (UAVs) and geospatial technologies. The road alignment was surveyed using a drone equipped with RTK GNSS, ensuring high positional accuracy. The UAV-collected data was processed using photogrammetry software like Agisoft Metashape, which generated Digital Elevation Models (DEM) and orthoimages. These outputs were crucial in visualizing the terrain and ensuring the accurate modeling of the project area.*

Following the data collection, geometric design principles were applied to develop the road's horizontal alignment, which included a circular curve, and the vertical profile was adjusted using the existing terrain data. The design ensured that the roadway conformed to standard highway design parameters, considering factors such as camber, slope, and design speed. Special attention was given to the cut and fill volume estimation, which is integral to the earthwork calculations and material requirements for the project.

The study incorporated AutoCAD Civil 3D for the design of the horizontal and vertical alignments, cross-sectional layers, and the preparation of construction drawings. Global Mapper was used to analyze cross-drainage structures at chainages 80m and 100m by generating flow networks and watersheds, which informed the optimal drainage design.

In addition to road alignment design, the project also addressed superelevation design by calculating the roadway's cross slope adjustments at different points along the curve to enhance road safety. Sight Distance Analysis (SSD and OSD) was conducted to ensure adequate visibility for drivers and prevent potential safety issues caused by obstructions.

The project concludes that the combination of drone-based surveying, photogrammetry, and advanced design software offers a significant improvement in the accuracy, cost-effectiveness, and speed of road design. The integrated approach also improves planning for earthworks, material management, and construction scheduling. This method presents a viable solution for future road projects, especially in challenging terrains where traditional surveying techniques may not be as effective.

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