Sichuan Road and Bridge Sets New Benchmark for Regional Smart Highways

Bentley’s Digital Applications Industrialize Project Delivery, Saving CNY 17.5 Million in Costs

**PROJECT SUMMARY**

**ORGANIZATION**
Sichuan Road and Bridge (Group) Co., Ltd.

**SOLUTION**
Roads and Highways

**LOCATION**
Chengdu, Sichuan, China

**PROJECT OBJECTIVES**
- To pilot BIM technology and digitalize workflows, construction, and production.
- To establish a smart highway model for integrated regional transportation development.

**PROJECT PLAYBOOK**
LumenRT®, OpenRoads™, OpenRoads Designer, OpenRoads ConceptStation, ProStructures

**FAST FACTS**
- Chengdu-Yibin Expressway is a pilot project in Sichuan to promote developing an integrated regional transportation system.
- The CNY 24.6 billion mountainous roadway presented technical and coordination challenges amid a tight timeline.
- SRB used OpenRoads and LumenRT to model, visualize, and correct line-of-sight issues at the 17 interchanges along the 155-kilometer route.

**ROI**
- SRB developed a construction management platform and smart beam fabrication system to help save CNY 17.5 million.
- The Bentley-based digital solutions improved efficiencies in process by over 50%, production by over 20%, and modeling by 15%.
- It is the first expressway in Chengdu to apply BIM across the entire line, providing a model for smart highways in the region.

**AN INTELLIGENT ROADWAY INITIATIVE**

As one of the pilot projects in the Sichuan province to promote developing an integrated regional transportation system, the Chengdu-Yibin Expressway is an intelligent roadway initiative that aims to establish a safe, convenient, green, and modern main traffic artery. The CNY 24.6 billion project focuses on building a smart road, integrating artificial intelligence and a cooperative vehicle infrastructure system into the expressway construction. Sichuan Road and Bridge (SRB) was awarded the engineering, procurement, and construction contract, which required that they follow strict landscape and environmental protection directives, as well as complete construction within three years.

Located in a mountainous area, the highway is 155 kilometers long, featuring 154 bridges totaling 39.7 kilometers and four tunnels spanning 7.3 kilometers. There are 17 interchanges and five service areas along the route as well. The scope of the work included numerous controlled elements and presented site constraints passing through scenic, protected spots. Given the bridge's long length and complex works amid a tight schedule, compounded by resource allocation and coordination issues when managing dozens of subcontractors, construction planning and management proved difficult.

**PILOTING DIGITAL WORKFLOWS AND MANAGEMENT PROCESSES**

To effectively improve inspection, design, production, and management efficiencies, SRB sought to pilot BIM along the entire route throughout the project lifecycle. They wanted to streamline and digitalize modeling and construction workflows by developing a cloud-based construction and information management platform, as well as establish a smart beam fabrication factory for intelligent steel processing and production. However, SRB knew that traditional workflows would be insufficient for this project. "It is difficult to [resolve] these problems with traditional 2D means," said Chunwei Qin, BIM engineer at SRB.

To implement these digital methodologies and enable visual, real-time, smart management practices, they needed reality modeling technology and a BIM methodology. While the sheer scale and short timeline of this roadway project presented numerous difficulties, SRB faced further challenges in addressing the sloping mountainous terrain and inefficient beam fabrication process. Specifically, with 30% of accidents along mountain expressways due to poor line-of-sight, they were confronted with various line-of-sight issues at the 17 interchanges where visual blind spots would negatively impact the safe operation of the Chengdu-Yibin highway. Furthermore, the steel beam fabrication factory employed costly, labor-intensive processes that required a large temporary land acquisition often resulting in environmental damage. SRB realized that their conventional design, fabrication, and construction management methods would only inevitably increase the overall project difficulties, as well as costs.

**LEVERAGING BIM AND REALITY MODELING APPLICATIONS**

After considering the challenges of this project, SRB chose Bentley’s open BIM and reality modeling applications to model, inspect, visualize, and correct traffic line-of-sight problems at all the interchanges along the expressway. They used OpenRoads Designer and OpenRoads ConceptStation throughout conceptual and detailed design to model the highway. They then imported the 3D model into LumenRT to perform...
Using [Bentley] BIM technology saved CNY 17.5 million and reduced the construction period, making the whole project more efficient.

-Wang HaiZhu, Project Leader, Sichuan Road and Bridge (Group) Co., Ltd.