The Char Dham is a famous circuit of four ancient Hindu temples in the north, south, east, and west of India, and are visited by many Hindus on pilgrimage each year. Badrinath, the northern temple, lies within the mountainous State of Uttarakhand.

To provide easier passage to Badrinath, and to improve transportation facilities for the people who live in the area, Rail Vikas Nigam Limited initiated development of a 125-kilometre rail line, with Louis Berger SAS responsible for designing some bridges for the project, including a 125-metre structure over the River Ganges. In addition to the difficulties of working in a mountainous area, this bridge had to be strong enough to endure the highest level of seismic activity in India.

PROJECT PROFILE	
User Name	Louis Berger SAS (A WSP Company)
Project Name	Detailed Design of Bridges for BG Rail Link between Rishikesh to Karnaprayag (Package – 3)
Location	Uttarakhand, India
Overview	Louis Berger used ProjectWise and STAAD to design a fortified bridge that could be easily constructed in a mountainous area while withstanding strong earthquakes.

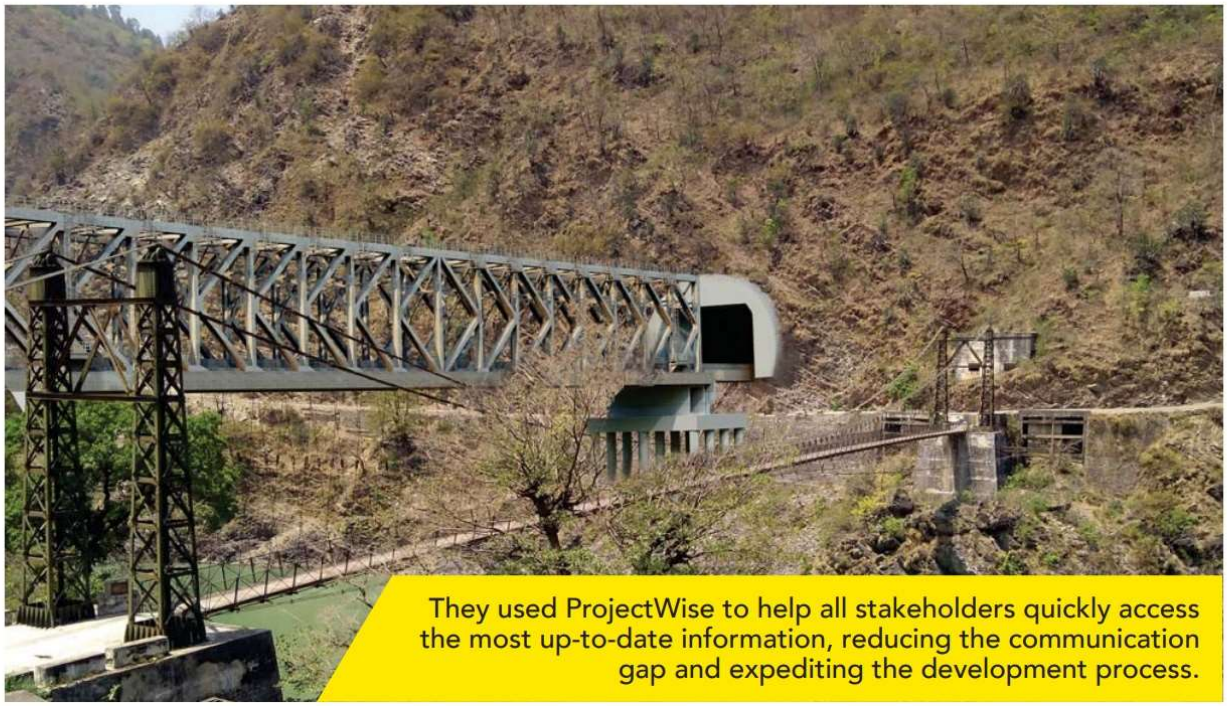
Flash Flooding

Louis Berger needed to create a design that suited the treacherous environment and ensured safe, reliable travel. Yet, they also had to determine how to safely build that design. Due to flash flooding that causes heavy water flow and unpredictable water levels on the River Ganges, traditional forms of bridge construction could lead to transportation collisions.

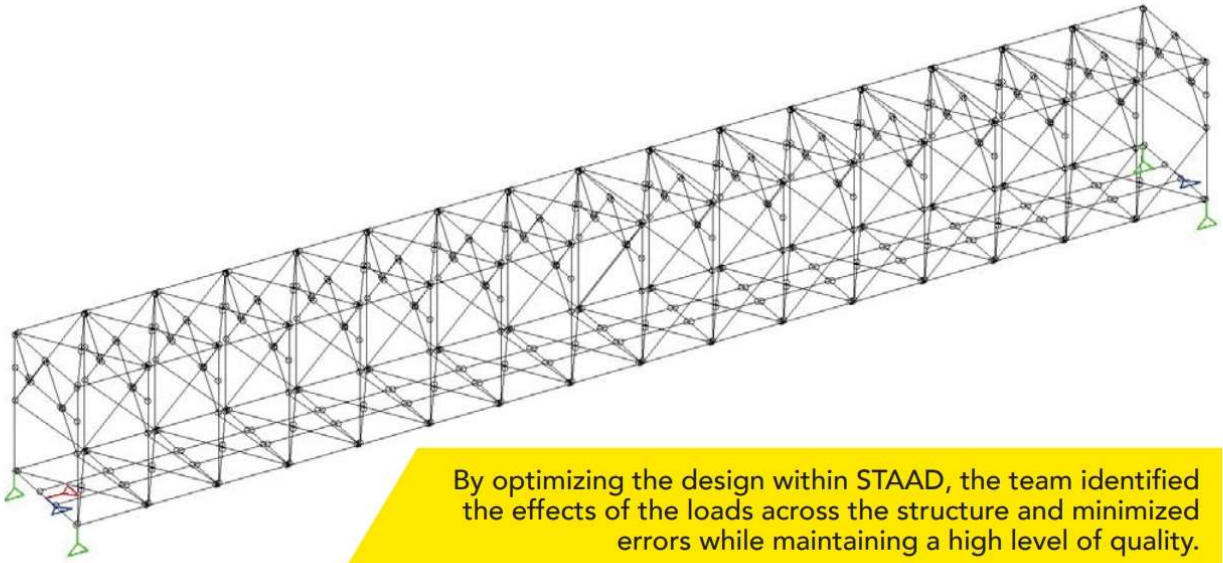
The design team realized that they needed to assemble the bridge via a push launching method, which would require a relatively lightweight steel truss design instead of traditional concrete. Each bridge element would be fabricated offsite, transported to the construction zone, assembled into panels, and then lifted into place with the assistance of a temporary nosing attachment. To execute their ambitious plan, they needed reliable structural analysis software.

Load Forces

Already a longtime user of Bentley applications,



They used ProjectWise to help all stakeholders quickly access the most up-to-date information, reducing the communication gap and expediting the development process.



By optimizing the design within STAAD, the team identified the effects of the loads across the structure and minimized errors while maintaining a high level of quality.

Louis Berger realized that the software could help them design both the complex structure and the unique building method. They first established a connected data environment with ProjectWise to manage all documents and help stakeholders collaborate. The team then designed the 125-metre bridge within STAAD and assigned materials and all applicable loads to the model. As the team adjusted the design to accommodate the unusual construction method, the application helped them quickly detect and resolve any mistakes or load variances and determine how to make the process more efficient.

OUTCOME/FACTS

- To improve transportation to a temple in mountainous terrain in India, Louis Berger had to build a steel bridge that could withstand severe seismic activity.
- They used ProjectWise to help all stakeholders quickly access the most up-to-date information, reducing the communication gap and expediting the development process.
- By optimizing the design within STAAD, the team identified the effects of the loads across the structure and minimized errors while maintaining a high level of quality.

Louis Berger saved significant development time and costs by using Bentley applications. Managing all documents with ProjectWise helped all stakeholders quickly access the most up-to-date information, reducing the communication gap and expediting the development process. By optimizing the design within STAAD, the team identified the effects of the loads across the structure, including the strong seismic activity, and minimized errors while maintaining a high level of quality.

The resulting design can be quickly assembled in the rugged project area. In the process, they lowered construction costs, reduced the quantity of materials needed and lessened the impact on the environment. Louis Berger delivered their design to the client on time, which will help to build a reliable transportation link in the area and allow pilgrims safe passage.

"During the process of analysis and design, optioneering has been conducted in STAAD to obtain the most efficient and economical arrangement of the steel components. After conducting an option study, as well as a concept study in STAAD, a final optimized configuration of the open web girder bridge was achieved," says Siddhartha Chatterjee, Head, Structures, Louis Berger SAS.

No wonder, the project became 2021 Going Digital Awards in Infrastructure finalist.

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