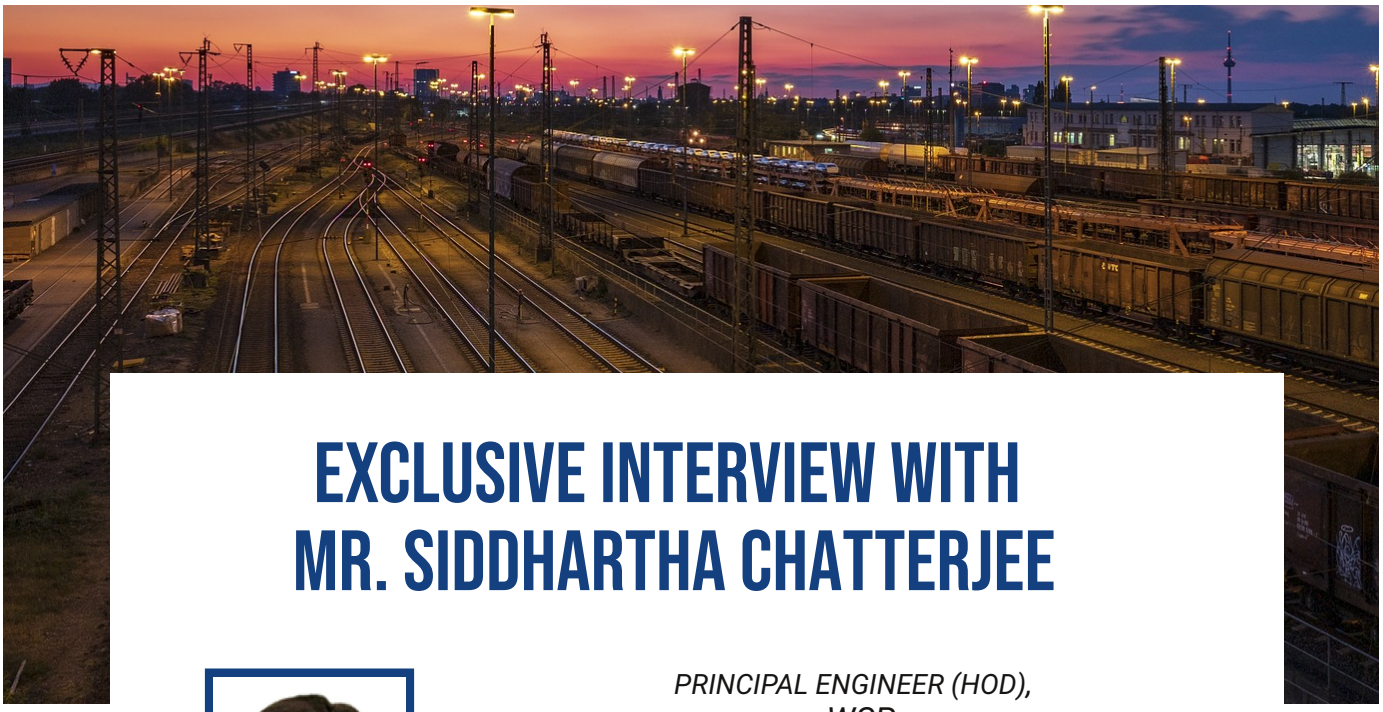

EXCLUSIVE INTERVIEW WITH MR. SIDDHARTHA CHATTERJEE

PRINCIPAL ENGINEER (HOD),
WSP

Total Experience is 22 + Years. Worked as Head of Department for last 3 years & as Principal Bridge Engineer for more than 12 years, involved in design of many major bridges, cable stayed & extradosed bridges, flyovers & complex interchanges, Railway Bridges, DFCC & Metro Rail Via-duct.

Congratulations on being selected as a finalist at the Bentley's Systems Going Digital awards 2021. Please share with us more details about the project.

Rail Vikas Nigam Limited (RVNL) has spearheaded the implementation of the construction of the new 125 km long Broad Gauge railway line from Rishikesh to Karnaprayag in the State of Uttarakhand in India. This new rail link will facilitate vastly improved mobility and connectivity for the residents of the State, in particular for those living in the mountainous areas, and for those visiting the State for tourism and for religious purposes. As you are aware, the new rail line will also cover the area known as “Char Dham” - the four highly sacred temples.

The design and construction of the new line is being implemented in eight packages. Louis Berger SAS in a consortium with lead partner Geodata has designed the 14.263km long section of the line included in Package 3 and is presently supervising the construction of the same. This package includes over 9km of tunnels, and 4 bridges (Bridge nos. 4 to 7). Of these, we have showcased “Bridge No. 6” in Bentley’s Systems “The 2021 Going Digital Awards in Infrastructure”.

The Rishikesh to Karnaprayag project is a very significant one. The terrain is extremely challenging with many bridges and tunnelling requirements. Can you share with us what are the latest technologies you utilized for the designing of bridges and how did the solutions provided by Bentley Systems assisted you in making this project a success?

Bridge number 6 is proposed to be built across the mighty and holy Ganga River. The bridge has a two-span configuration (32.65m + 125m). The superstructure of the shorter span (32.65m) is steel composite plate girders whereas the larger span (125m) is an open web girder bridge or Steel Truss bridge. What sets this bridge configuration apart from other similar bridges is the 125m long truss span. In addition, the bridge is located in close proximity of faults in this highly seismic Himalayan region categorized as the highly severe Seismic Zone V. To adequately capture seismic forces, a site-specific response spectrum was prepared which entails seismic coefficients that are around 22% higher than those specified under Zone V.

In addition, the design of the bridge had to cater to the significant flow of in the Ganga River, including

unpredictability of water levels. Bridge piers were located outside the banks of the river so as to avoid collision with floating debris during the construction as well as service stage. The bridge will be launched using the "Push Launching" method with a temporary nosing attachment. It is planned for individual members (top and bottom chords, diagonals, verticals, bracings etc.) of the truss bridge superstructure to be fabricated at the fabrication yard and transported to the site. Each panel will be assembled and erected using HSFG Bolts. Subsequently, each panel will be erected using push launching or incremental launching arrangement from the approach span location.

The Truss Bridge superstructure was modelled using STAAD Pro (a Bentley Systems product for structural analysis & design) in order for the structural analysis to be conducted. For long spans such as the 125m truss span, it is important for such long spans to analyse the structure in such a manner so as to estimate the impact on the distribution of member forces including analysis during the critical construction stage. Such long span steel truss bridges cannot be designed as a "pin jointed frame" . STAAD Pro is a suitable and effective design software for the assessment of design forces for such long span truss structures.

What are some of the challenges you faced in the project and the steps taken to mitigate them?

The major challenge was to design the bridge for extreme seismic loads. To reduce the impact on foundations, it was decided to opt for steel superstructure so that foundations could be optimized. Due to high seismicity, significant joint rotation is expected. Thus, it was very essential to do a 3D Space truss analysis. In addition to the detailed global analysis using 3D STAAD Models, various localized 2D or 3D models were prepared in STAAD Pro. In addition, many joints were modelled using 3D model to obtain effects of seismic loadings and behaviour related to long span bridges. In addition, innovative arrangement for seismic stoppers and anti-dislodgement devices have been incorporated in the design of the bridge.

Another challenge was to fix the structural form of the long span truss bridge. To choose the structural form, optioneering was conducted in STAAD Pro to obtain the most efficient andeconomic arrangement of steel members. After conducting this option study as well as concept study in STAAD Pro, the final optimised configuration of the open web girder bridge was adopted.

Can you let us know your complete footprint in the Indian market for the Rail & Metro projects where you are presently involved?

Louis Berger was founded in the United States in 1953 and, by December 2018, had grown into a US$ 1 billion global consulting engineering firm with over 6,000 staff worldwide. In December 2018, Louis Berger was fully acquired globally by WSP Global headquartered in Montreal, Canada. Today, we are therefore an integral part of WSP, with over CA$ 7.5 billion in annual revenues and over 55,000 professionals worldwide on six continents. WSP is ranked No. 1 in the world in transportation by ENR.

Across the globe, we provide a wide range of services from concept and feasibility studies, design, project management and construction supervision extending often into the O&M stage across diverse sectors including Transportation (Highways, Bridges, Tunnels, Rail, Metro Rail, Light Rail, High-Speed Rail, Aviation, Ports), Property and Buildings, Industrial and Energy, and Environment.

We are "Future Ready" and aim to bring "Solutions for a Better World".

Some of the other landmark ongoing projects of WSP/Louis Berger in India are as follows:

- Mumbai Metro Line 3 (33km, fully underground)
- Mumbai Metro Line 4 (30km, fully elevated)
- Bhopal Metro & Indore Metro (60km in total, part elevated, part underground)
- Versova Bandra Sea Link in Mumbai (17km of marine roadway bridges)
- Mumbai Coastal Road with significant reclamation works, sea walls, complex interchanges and marine viaducts
- Mumbai-Pune Expressway Missing Link with 11km of 4-lane twin tunnels and an iconic cable-stayed bridge of 350m main span
- 9km long twin roadway Tunnels under River Brahmaputra in Assam

Any additional insights you would like to share with our readers?

At WSP/Louis Berger, we believe in being fully accountable and taking full ownership for the work that we execute on our projects. We understand the responsibility we must bear in the design and project/construction management of public-sector infrastructure works, especially using taxpayer funds in the most optimum manner. We believe in bringing our "Future Ready" approach to our designs and processes, factoring in aspects such as climate change into our designs. Above all, we stand for "zero tolerance" where Safety is considered, operate with the highest integrity and ethics, and work towards ensuring the best quality.