

## Full Live Load Test of a Cable-Stayed Bridge

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### Abstract

In March 2016, the cable-stayed Atal Setu Bridge, newly completed in northern India, was load tested with 42 trucks representing the full design live load of 854 tonnes. Load tests are routine in India and their objective is to assure the owner that the bridge had been built to the required quality. Test trucks were positioned in four phases; after each phase, the elevations of 26 control points on each side of the bridge, as well as coordinates of four control points on each pylon, were surveyed to track deflections. The survey results were corrected for thermal movements using a reference set of hourly survey results from the preceding five days. Surveyed deflections were compared to analytical predictions and a go/no-go decision was made for the next phase of trucks. All trucks were successfully positioned and at 24 hours after load removal, 97% of the deflection was recovered, satisfying the 85% limit of the Indian Roads Congress code.

**Keywords:** Load test; performance evaluation; cable-stayed; hybrid bridge; finite element method.

### 1 Introduction

The Atal Setu Bridge (see Figure 1) represents an important link between the northern Indian states of Jammu & Kashmir and Punjab (see Figure 2). Its span over the Ravi River eliminates over 1.5 hours of treacherous mountainside driving from the route and creates a second highway link into India's northernmost state, not only improving tourism and commercial mining access, but also providing a strategic route to improve local security.

The bridge has a total length of 592m with a 350m main-span, making it India's second-longest cable-stayed bridge. The USD \$22M project was the first cable-stayed bridge in India to be procured through a design-build contract, which was awarded to a joint venture of IRCON and SP Singla Constructions Pvt. Ltd., with the design firm of McElhanney Consulting Services Ltd. selected as the prime consultants who also performed the role of erection engineer during the construction phase.



*Figure 1. Completed Atal Setu Bridge*

The bridge owner, the Border Roads Organization of the Ministry of Defence, set several project constraints into the contract, including dimensional restrictions, applied loading requirements, and notably, a compulsory full-scale load test. The load test details were guided by the Indian Road Congress, which mandated that the full design loading be applied to the completed