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Bridging the River Alaknanda for Badrinath Shrine in Himalayas

Pont sur la rivière Alaknanda dans l'Himalaya

Die Brücke über den Alaknanda in Himalaya

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1. INTRODUCTION

This bridge located in a picturesque Himalayan ranges across the river Alaknanda leads to the Holy Shrine of Badrinath, consecrated by the great philosopher and preacher 'Adi Shankaracharya'. Bridging across a deep gorge of over 37 M was a challenging task, as the fast flowing river underneath has all the risks which demanded a long span bridge with hardly any space available for balancing the cantilever construction. The bridge provides for a 7.5 M wide roadway for vehicular traffic with 1.5 M cantilever footway on either side.

2. SALIENT FEATURES

The total length of the bridge as finally constructed is 125.1 M between the faces of the dirt walls of the abutments. The bridge is located in a highly seismic region, it was, therefore, necessary to reduce the seismic forces transmitted to the base of over 33 m tall piers. This was achieved by providing a 3 span continuous bridge with a span configuration of 25.7 M x 68.8 M x 29.7 M.

To keep in with the aesthetics of the locale it was proposed to provide a uniform depth box of 4 M for the entire length of the bridge, though not an ideal proposition for a bridge located in seismic zone. With a view to reduce the forces on the piers, the hollow circular piers of 5 M were provided with roller bearings on top. This enabled not only to reduce the longitudinal forces but also forces due to high water current. However, in order to provide stability and avoid tension at the base, it was necessary to fill up the lower portion of the hollow piers with mass concrete. The

balancing effect of the cantilever construction as also the transient loads was countered by housing the shore spans inside the end abutments. This provided the necessary dead weight to counter the uplifting forces. The bearings used at the fixed end are of spherical type. The spherical bearings were adopted so that they would reduce the rotational restraints. The bridge is prestressed longitudinally by Freyssinet cables consisting of 12 Nos. of 1/2" dia. strand with braking force of 2250 kN.

3. DESIGN

The deck is designed for IRC Class A / Class 40R - two lanes or Class 70R single lane of traffic whichever produces severest effects in addition to footpath loading as per IRC. The deck is designed as a Class I structure with no tensile stresses permitted, as the present codal provision do not permit partial prestressing.

4. CONSTRUCTION

The unsymmetrical span configuration demanded caution while taking up the construction activity for the deck in the central span. It was, therefore, felt advisable to cast the shore spans on staging first, before taking up the cantilever construction using cantilever construction gantries. The cantilever construction involved successive casting of 3 M segments progressively from each end and then joining by central continuity unit of 2.8 M. The local sand available being of finer variety, to improve and attain a mix of M-40 grade, it was necessary to mix the crusher dust together with admixtures. The footpath and other miscellaneous activities were taken up soon after establishing the continuity.

Though the bridge was awarded in 1983 due to difficult terrain conditions and approach to bridge site getting blocked due to heavy landslides, the completion of the bridge got unduly delayed.

Successful completion of the project has helped the pilgrimes to bridge the gap to Badrinath Shrine by one additional step.