Two railway bridges across Vasai creek, Bombay, India

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Two Railway Bridges across Vasai Creek, Bombay, India

Deux ponts-rails sur la Vasai Creek, Bombay, Inde

Zwei Eisenbahnbrücken über den Vasai Creek, Bombay, Indien

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1. GENERAL FEATURES

A large number of bridges have been constructed as part of the Indian railway network and till recently they have been in structural steel. Only during the last one decade or so prestressed concrete has been used in the construction of railway bridges. The two bridges across Vasai Creek are notable for the construction techniques adopted, the economy in material consumption and features enhancing durability. The two bridges are spread out over about 3 km length and have two independent decks, each catering to one broad gauge track. One bridge has 28 Nos. and the other 11 Nos., of simply-supported spans of 48.50 m length, totalling 78 girders.

2. CONSTRUCTION METHODOLOGY

2.1 Precasting

The prestressed concrete girders were fully precast and completed on the shore itself to ensure good quality control. Since land was not readily available for precasting yard at the site, it had to be reclaimed from the creek. In the limited space available the casting and stacking beds which were on piles had to be located with ingenuity for optimum serial and parallel sequencing of the various operations on the various girders in the casting yard. The structural designs were optimised to minimise the material consumption and the self weight of the girders to be handled. Since all the girders were precast at one location, the variations in the thickness of deck and soffit slabs and webs did not pose much problem for the design and repetitive usage of the shuttering.

2.2 Launching

At the site, the creek had a tidal range of maximum 4.5 m and this was taken advantage of to evolve a simple but effective and economical solution for launching the girders. After completing all the finishing operations including addition of partial track ballast, the girder was brought to a launching jetty located at the end of the casting yard. A launching pontoon with a spreader truss was specially designed to handle the girders which had a finished weight of 750 t. The height of the truss was carefully correlated with the tidal levels and the levels at final location and the launching jetty was also accordingly planned. At low tide the pontoon is brought below the girder and as the tide rises, up the pontoon also rises and lifts the girder off the jetty. The pontoon is towed to site and positioned in final location at high tide. As the tide falls the pontoon lowers down and the girder on top gets seated at its location. Then the pontoon is withdrawn.

3. DURABILITY MEASURES

A number of measures for enhancing the durability were adopted such as giving a four-stage anticorrosive treatment to all reinforcement, surface protective painting for the girder, adequate cross drainage of the deck and waterproofing of the deck top, limiting the water-cement ratio for the concrete and grout used for sealing the ducts and protection against stray currents.

4. CONCLUSION

With proper prior planning, all the girders of the two bridges were successfully launched and located within the required accuracy. A load test has also been successfully conducted to check the performance of the girders. The owners of the project are Western Railway who had engaged as proof consultants, I.I.T., Bombay. M/s. Indian Railway Construction Co.Ltd. were the main contractors with M/s. Bhagheeratha Engineering Ltd as their associate contractors. M/s. STUP Consultants Ltd provided design and construction consultancy to the contractors.

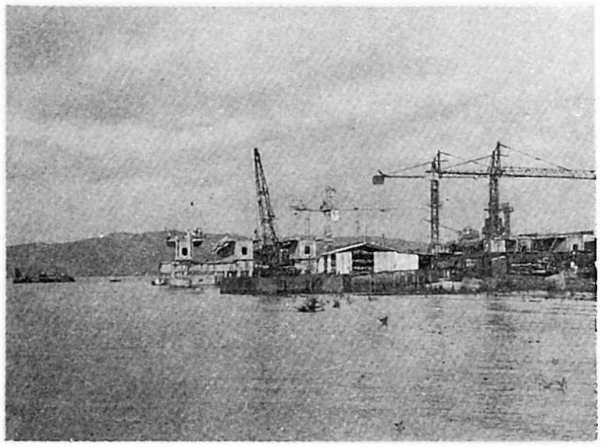

Fig.1 Casting Yard

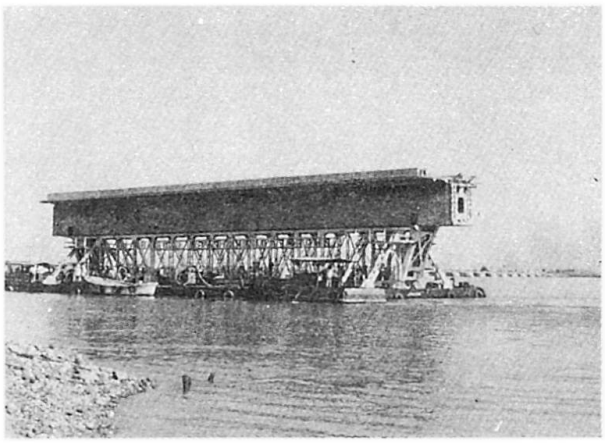

Fig.2 Girder being transported on a pontoon

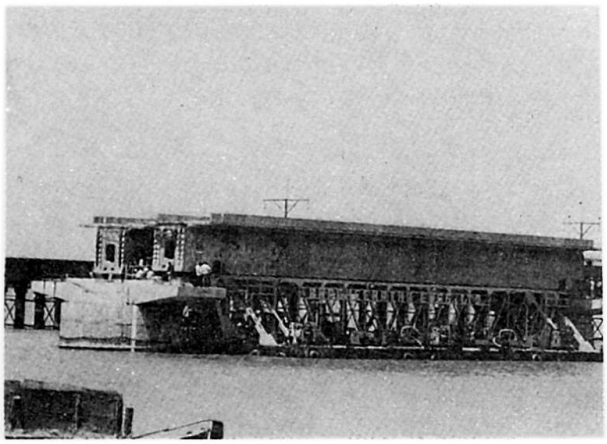

Fig.3 Girder in position

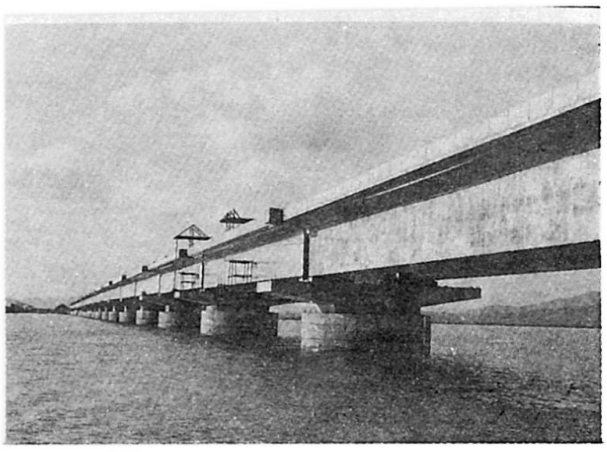

Fig. 4 Completed Bridge