



Upgrading of three historic arch bridges over the Orange River near Keimoes, South Africa

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Summary

This project is located on the South African National Roads Agency SOC Ltd's (SANRAL's) Route R27 near Keimoes in the Northern Cape Province of South Africa. The overall objective was to improve traffic capacity and safety of the route, with the main focus being the widening of four single traffic lane bridges over the Orange River floodplain. This paper reviews the upgrading of the three main historic arch bridges.

The project included a detailed hydrological and hydraulic assessment which resulted in the raising of two of the structures by approximately 2,5m to prevent overtopping of the structures during larger flood events. The largest of the three bridges, a ten span arch bridge, was at a higher level and the existing deck was therefore retained and widened. The raising and/or widening of the bridges had to comply with heritage requirements as these structures, completed in the early 1930's, have significant historical importance. This resulted in the original form and appearance to be retained by using a similar arch configuration and detailing. Construction was completed in 2013.

Keywords: Historic arch bridges, major flood events, aesthetics, bridge strengthening, precast concrete arches, post-tensioning.

1. Introduction

This project is located on National Route R27 Section 11 of the South African National Roads Agency SOC Ltd's (SANRAL's) road network near Keimoes in the Northern Cape Province of South Africa. The overall objective of the project was to increase the traffic capacity and improve the safety of this route due to the current single lane configuration and limited flood capacity, of especially the arch bridges. The main focus was on the widening of five bridges over the Orange River floodplain, four of which only allowed single lane traffic. This paper reviews the upgrading of the three historic arch bridges.

A detailed hydrological and hydraulic assessment of the complex Lower Orange River system was undertaken by specialists from the University of Pretoria. Two of these bridges, consisting of multiple arch structures, with 6 spans and 3 spans respectively (Bridge B2461 & Bridge B2462), were raised by approximately 2,5m to prevent overtopping of the structures during larger flood events. The other, a ten span arch bridge, Bridge B2463, was not required to be raised for similar flood events and the existing deck was retained and widened in its current position.

The raising and widening of Bridges B2461 and B2462 as well as the widening of Bridge B2463 had to comply with heritage requirements as these structures had significant historical importance. An in depth heritage study which formed part of the Environmental Authorization process was performed on these structures. The comprehensive Heritage Impact Assessment which was part of this study established that the three arch bridges collectively, known as Grobler's Bridges, were built between 1931 and 1933.