



## Rehabilitation and Strengthening of Bridges over Boa Vista River

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### Abstract

This work presents the analysis, strengthening and structural rehabilitation of the Bridges over Boa Vista River (North and South lanes on a Highway in the south of Brazil), due to a fire accident caused by a fuel tanker truck explosion. After the accident, both bridges were blocked and the traffic was diverted to secondary roads, leading to major inconvenience to the users and roads administration. Initially a new structure construction was considered, given the apparent damage caused by the large fire. After inspections, laboratory tests and structural analysis, it was concluded that it would be possible to recover the existing structure with the strengthening in specific regions and conduct a load test on the most affected areas. The collaborative work between the Highway operations, inspection team, contractors and structural engineers has reduced the expected reopening time of both bridges from 6 to less than 2 months.

**Keywords:** Bridges, Fire, Rehabilitation, Strengthening, Load test.

### 1 Introduction

On the 13<sup>rd</sup> march, 2021, a fire resulting from a fuel truck explosion affected the two bridges over Boa Vista River (North and South Lane), located on BR386 highway, in the municipality of Estrela/RS. The accident ended up in severe structural damage on spans 1 and 2 of both lanes and initially, the necessity of north lane total reconstruction was considered (the oldest and most affected bridge).

### 2 Bridge description

The two bridges are in parallel alignments, with the same total length, however, as they were designed at different time, the structural design, construction methodology and design load of projects are different.

#### 2.1 North Lane Bridge

Although there are no project records, the North Lane Bridge was designed using the 1960's code with a standardized vehicle load corresponding to 360 kN plus a distributed load of 5kN/m<sup>2</sup> at the vehicle lane and 3 kN/m<sup>2</sup> elsewhere. The bridge is 10.6 m wide, with 2 continuous prestressed concrete girders with a total length of 90.7 m with 31.5 m on central span and 29.4 m on end-span with a curved layout deck. The girders were designed with variable width, being 90 cm on midspan and reaching 130 cm near the supports.

From field inspections, it was inferred that the bridge had undergone through structural strengthening, adding prestressed cables along the bridge's sides.

The two girders are spaced 6.4 m apart with 2.1 m overhang slab length. The bridge was made with 1.25 m wide sidewalks on both sides and a reinforced concrete guardrail on the edges. The existing structure slab is 20 cm thick.