



## REHABILITATION OF THE OUTEIRO BRIDGE WITH EMERGENCY STRENGTHENING OF THE SUPERSTRUCTURE DAMAGED BY BARGES IMPACT

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### Abstract

The collapse of one of the supports of the central section of the bridge compromised the overall stability of the deck, leading to the immediate shutdown of its operation on January 16, 2022. Therefore, the occurrence of the collapse of the AP4 support after 37 years of operation led to the immediate isolation of the population of Outeiro Island, which today has 80,000 inhabitants, who use the bridge daily, with a volume of motor vehicles in the order of 4,500 per day. Therefore, as a premise, both the emergency strengthening and retrofitting of the Outeiro I Bridge were carried out with the partial operation. Considered an urban bridge over the Maguary Canal where there are large shipyards and docking ports for barges convoy that transit on the Belém-Manaus waterway route, the solution considered the duplication of the navigation channel with the construction of the cable-stayed bridge on the central section, making it safe for both heavy vehicle traffic and navigation with 2 navigation channels with a width of 80m and 100m and 12m height.

**Keywords:** Evaluation of the collapse structure emergency strengthening and retrofitting project of the damaged superstructure with revitalization of the Outeiro Bridge 1.

### 1 Introduction

The Outeiro I Bridge was the first fixed crossing between the mainland and the island of Caratateua (Outeiro), built in a steel girder the Maguary Canal with 360m in length and 11,40m width, in 1986, with 37 years of operation, in the Metropolitan Region of Belém, Pará, Brazil. The population of Outeiro Island has grown over the 37 years, reaching today 80.000 inhabitants, who depend on the bridge daily, leading to a volume of motor vehicles in the order of 4.500 per day, in addition to motorcycles, bicycles and pedestrians.

The Outeiro I Bridge is, therefore, an urban bridge and crosses the Maguary Canal to access the industrial area of Belém, where there are large shipyards and ports for convoys of barges that transit the Belém-Manaus waterway route, with typical barges of 18,0m wide (beam) by 90,0m long coupled to pushers of up to 15,0m in length.

The state of emergency was installed on the morning of January 17, 2022, when the collapse of one of the supports of the central section of the 180,0m long bridge occurred. The collapse of the AP4 support was due to the frequent impacts of barges transiting the Maguary Canal, leading to the