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Reimagining Intermodal Integration: A Sustainable Development Hub At Presidente Epitácio, Brazil

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ABSTRACT
Aiming at intermodal integration: (i) Section III of the Paraná River Waterway – River of Silver Basin, (ii) Raposo Tavares Highway – SP-270 and (iii) Section of the Sorocabana Railway (EFS); the paper categorized as short communication refers to a technical project that proposes the configuration of a complex that rehabilitates existing infrastructures, recognizing their heritage value, in accordance with the 9th Development Objective Sustainable (DOS) of the UN 2030. With this, the project aspires to great potential for regional economic development, with the capacity to generate cross-border impacts. It is worth adding that the project proposal was part of the 15th CBCA/ALACERO Competition for Architecture Students – Steel Structures 2022, held by the CBCA – Centro Brasileiro da Construção em Aço, in Brazil, and awarded 1st place.
Keywords: *structural system, metallic structure, technical design, architecture.*

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I. INTRODUCTION

Presidente Epitácio, a municipality in the extreme west of São Paulo that borders the state of Mato Grosso do Sul, was founded in 1907 (Estância Turística de Presidente Epitácio, 2024), and has a strategic location in the logistics of transporting grains produced in the region and its surroundings. The municipality had its origins linked to the need to build a road that would connect its region with the southern portion of the state of Mato Grosso do Sul (Prefeitura Municipal de Presidente Epitácio, 2024; Moroni, 2011). Due to this, it is proposed to reactivate and expand the intermodal axis (rail, port and road) with the construction of a technological complex that supports such logistics, configuring itself as a development hub for other sectors and meeting the 9th Development Objective Sustainable (DOS) of the UN 2030.

The development of the western region of the State of São Paulo occurred through the expansion of the Sorocabana Railway (ESF) railway network at the beginning of the 20th century and, in the mid-1960s, with the construction of the Port of Presidente Epitácio. Since the late 1990s, both infrastructures have been underutilized, resulting in a large amount of unused space in the city. The area chosen for implementing the project is located in a location sheltered by the municipal pier, adjacent to the grain storage warehouses.

Thus, aiming at intermodal integration: Section III of the Paraná River Waterway – River of Silver Basin (interconnection between Brazil, Paraguay, Uruguay and Argentina); Raposo Tavares Highway – SP-270 and ESF Section (destinations: Port of Santos, Paranaguá and São Francisco do Sul – main for the flow of soybean and corn production from the southeast and south regions of the country), the technical project proposes the configuration of a complex that rehabilitates existing infrastructures while recognizing their heritage value (Figure 1).

Figure 1 – Presentation of the location.

II. ARCHITECTURAL PROPOSAL

A building that, at the same time, has a monolithic volume, presents a game of internal voids that allows visual permeability and structural clarity (Figure 2). In order to convey lightness, its implementation adapts to the natural profile of the land, allowing the program to float over a large public square at ground level, creating views of the coastal landscape, a tourist attraction in the region, and at dusk the lighting internal overflows to the exterior.

Figure 2 – Aerial image of the complex.

The building sector is divided into three main areas: administrative, research and technology. The administrative sector has rooms for the administrator of the logistics complex, the EFS and AHRANA (Administrator of the Paraná River Waterway). The Research sector features study rooms, laboratories and a library that functions as a Support Unit for EMBRAPA (Brazilian Agricultural Research Company) and surrounding educational institutions. The technology sector contains meeting rooms, corporate rooms and reception to support programs from Embrapa partner companies, which have logistics and agricultural innovation projects. The common areas (canteen, multipurpose spaces and auditorium) are located on the lower floors. The floors have small gardens, and the top floor is configured as a large elevated square with a gazebo.

III. STRUCTURAL PROPOSAL

The main structure is composed of two parallel Vierendeel beams connected by a modulated metal grid measuring 8 x 8 meters. Each metallic Vierendeel beam is 168 meters long (72 meters of central span and 48 meters of cantilevers) and features a lower member design that adapts to the local topography. Furthermore, it is braced using steel rods at its ends and has stiffening corbels. This system is structured by two reinforced concrete cores that concentrate the wet areas and vertical circulation of the building. The entire program is supported by a secondary metallic structure anchored to the roof grid and modulated every 8 meters with steel deck slabs. The connections between the profiles are designed by welding, and as it is located in a coastal area (C3-ISO 9223:2012), it requires anti-corrosive painting (epoxy mastic). The building is surrounded by perforated metal roof tiles, and its internal seals are light and composed of panels (corrugated metal sheet and thermoacoustic insulation) and pivoting translucent glass panels that allow flexible layout configurations (Figure 3).

Figure 3 – Front facade of the building.

The internal environments have honeycomb-type metal linings, and the building pipes are visible in the circulation areas. The roof is made up of metal fins welded to the grid beams, which guarantee natural ventilation and lighting throughout the building (Figure 4).

Figure 4 – Detail of the complex's metallic structure.

Therefore, the complex's proposal understands local potential, on different scales, and favors regional socioeconomic development. Finally, Figure 5 presents the night image of the proposed complex.

Figure 5 – Night image of the complex.

IV. CONCLUSION

The proposed structures include the insertion of a building that seeks self-sufficiency through the production of solar energy and rainwater collection and the construction of a new pier with the capacity to meet new demands. Another notable element is the support for scientific production, contributing to public and private educational institutions in the region through research laboratories, which can also house technological and innovation companies. With this, the project aspires to great potential for regional economic development, with the capacity to generate cross-border impacts. However, it is pertinent to inform that the project proposal developed by the authors was part of the 15th CBCA/ALACERO Competition for Architecture Students – Steel Structures 2022, held by CBCA – Centro Brasileiro da Construção em Aço, in Brazil, an opportunity that was awarded 1st place. The entire technical set of boards prepared, as well as the administrative and technical bases of the competition, can be viewed through the link <https://www.cbca-acobrasil.org.br/arquitetura/edicoes-previous/edition-15/>.

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