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(Short Communication)

Steel structure project to support research at the Butantan Institute

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Abstract

Aiming to achieve Objective 3 of Sustainable Developments of the UN 2030 Agenda (solution for health and well-being), this paper categorized as a short communication deal with a technical project that supported the Butantan Institute, based in São Paulo – Brazil, in research and development of vaccines and medicines. In this way, the structural and constructive proposal devised by the authors contributed to the development of an integral, cohesive, sustainable project suitable for the objectives of supporting the technical production of the aforementioned Institute and providing greater interaction with the general public. This project proposal was part of the 14th CBCA/ALACERO Competition for Architecture Students – Steel Structures 2021, promoted by CBCA – Centro Brasileiro da Construção em Aço, in Brazil, awarded 3rd place.

Keywords: Structural system; Metallic structure; Technical design; Architecture

1. Introduction

In 1899, an outbreak of bubonic plague occurred in the port of Santos (SP), adding that sanitary issues since the Republican Constitution of 1891 became the responsibility of the state administration. This scenario encouraged the state public administration at the time to design a laboratory to produce a type of serum that combats this disease. From then on, installed at the Butantan Farm, it stands out as a renowned biomedical research center, considered the largest producer of vaccines and serums installed in Latin America, being a global reference in terms of efficiency and quality [1-2].

The Butantan Institute has been producing serums and vaccines since 1901, being the largest national producer and consolidating the country's sufficiency in vaccines, by acquiring strong notoriety in the current scenario due to the production of vaccines, as an example for Covid-19 [1,3]. Therefore, the project proposal is located in Horto Oswaldo Cruz – a central location for the institute and which is between the restricted areas (bioindustrial complex, laboratories and technical sectors) and public areas (cultural center, museums, library and hospital). The project makes it possible to reinsert Horto into the Institute's public dynamics – one of its initial objectives (Figure 1).

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Figure 1 Presentation of the site with detail of the conditioning and humanized diagrams

In view of the above, in accordance with Objective 3 of Sustainable Developments of the UN 2030 Agenda (solution for health and well-being), the project aimed to create a building that supported scientific production and research, enabling visitors to enter part of the facilities and learn about how they work – the essence of the proposal is to make scientific production more accessible and democratic to the public. Restricting access to certain floors means there is no direct interaction with the technical sectors, but rather contact provided by visual permeability.

2. Architectural proposal

The program is divided into two buildings. One of them aimed at the general public (Figure 2), located in the southern portion and closest to the main entrance of the Institute, on two floors houses a workshop, exhibition room and auditorium, aimed at offering free courses and open classes.

Figure 2 Public block square

The block to the north (Figure 3), on three floors, houses administration, library, classrooms/study rooms and specific rooms for research and laboratory production; the first two lower floors are of a technical nature and have restricted access to researchers and employees.

In both blocks, and on the ground floor, their roofs are free and connected through a walkway that permeates the Horto. The buildings sit on a 4 meters difference in level between them, providing a connection between the terraces on the same level. Servers access the technical block on the ground floor and the general public accesses it exclusively through the terrace – on the way to entering the public block and walking along the walkway. In addition to being a connection point, the walkway also serves as a viewpoint, a space for contemplation and lingering over Horto and with views of the Institute and the Pinheiros River valley.

Figure 3 Technical block square

Another fundamental element for the project is the building's hollow central atrium, which, together with the glass seals and the permeable external skin, allow visitors to observe the activities taking place inside the buildings; the most restricted environments are preserved by antechambers.

The application of sunshades around the blocks allows the use of glass seals, which provides an abundance of indirect natural light during the day, and added to the hollow central core, the openings guarantee good natural ventilation; At night, light emerges from the building and spills onto the squares on the ground floor. The brises are also a striking element for the visual identity of the complex, as they highlight terms linked to the project.

3. Structural proposal

The metallic structure was designed with a modulation of 8 by 8 meters, configuring a lattice system supported by structural cores (Figure 4). This shape allowed cantilevered volumes, bringing lightness to the project by touching the ground in just 8 points – 4 main pillars in each building.

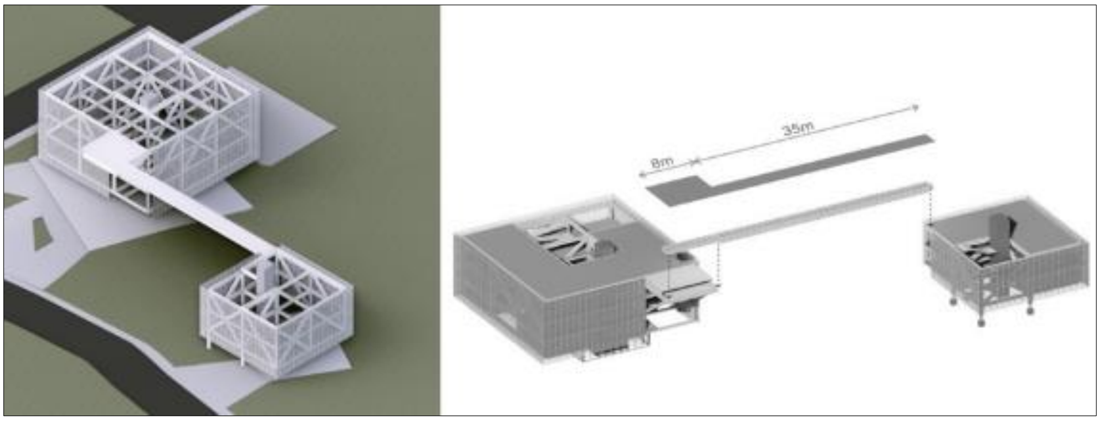

Figure 4 Isometric of the steel structure with detail of the walkway

For greater connection compatibility, the CVS 600x339 profile was chosen for structural core pillars, and the CVS 600x190 profile for beams and diagonals. The secondary structure (pillars on the perimeter of the buildings) is made of CS 400x106 profile. Connections between profiles are designed by welding. The walkway is arranged by two box beams, the largest spanning the 35 meters span and embedded in the public block and supported by the second beam, with a larger section (2 meters) and embedded in the technical block, braced by diagonals. Stiffening ribs are located along the entire section of the box beams, as well as in their connections to the buildings.

For the benefit of protection and aesthetic attributes, the metal structure assembly receives white polyurethane painting. The slab system is made up of prefabricated alveolar concrete and, on the roofs, they receive a layer of protection with an asphalt blanket, making it possible to use the same type of floor as the ground floor. The linings are of the honeycomb metallic type and on top of them receive a layer of thermoacoustic insulation. The installations (hydraulic, electrical, gas, communication – telephone and internet) derive from a shaft located in the concrete volume of the elevator shaft. The buildings are sealed with 22 mm thick laminated glass, drywall for dry areas and ceramic block masonry for wet areas (Figure 5).

Figure 5 Night image of the technical block**.**

4. Conclusion

The structural and constructive proposal contributed to the development of an integral, cohesive, sustainable project suited to the objectives of supporting the Institute's technical production and providing greater interaction with the general public. It is worth noting that the project proposal developed by the authors was part of the 14th CBCA/ALACERO Competition for Architecture Students – Steel Structures 2021, promoted by CBCA – Centro Brasileiro da Construção em Aço, held in Brazil. This proposal was awarded 3rd place on this occasion, and all 6 boards executed, as well as the administrative and technical bases of the competition can be viewed in full by accessing the link https://www.cbca-acobrasil.org.br/arquitetura/edicoes-anteriores/edicao-14/. In view of the above, the proposal contributed to Objective 3 of Sustainable Developments of the UN 2030 Agenda (solution for health and well-being).

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Institute Butantan. Historic. Available in: <https://butantan.gov.br/institucional/historico>. Accessed on: November 19th. 2023.

[2] Teixeira, L. A. The trajectory of the Butantan Institute: research and production of immunobiologicals for public health. Rev Bras de Inov, Campinas (SP), v.15, n.1, p.165-173, 2016. Available in: <https://periodicos.sbu.unicamp.br/ojs/index.php/rbi/article/view/8649124>. Accessed on: November 19th. 2023.

[3] Guimarães, R. Butantan Institute and the Brazilian anti-Covid vaccine. Cien Saude Col, v.26, n.7, 2021. https://doi.org/10.1590/1413-81232021267.07892021.