

SIZATLAS

Filling the Gaps for World Heritage

Edited by
Soraya Monteiro Genin
Teresa Cunha Ferreira
Mariana Correia

BRIEF ANALYSIS OF CONSTRUCTIVE STRATEGY INNOVATION

IN ÁLVARO SIZA'S BOAVISTA RESIDENTIAL COMPLEX

CLARA PIMENTA DO VALE

CEAU, Faculdade de Arquitectura da Universidade do Porto, Portugal

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Introduction

The work of Álvaro Siza displays a wise balance between continuity and innovation, and the Boavista Residential Complex (BRC) is no exception. It builds upon Porto's multi-family housing models of the 1940s and 1950s (Lameira 2017), before the issue of horizontal property regulations (Vale and Almeida 2012), focusing on high-quality materials and details in communal areas like facades and main spaces. At the same time, it represents a turning point in the Portuguese Construction Scene.

Located near Avenida da Boavista, Porto's most extensive urban axis, this residential and commercial building results from a decade-long process. Throughout this period, there were changes in developer and project stakeholders, which impacted the architectural and constructive approach (Comport *et al.* 1997). A comparison of the initial design phase (1991) and the final execution reveals shifts in strategy and similarities to other Siza projects of that era. Construction occurred between 1996 and 2000 (Álvaro Siza and Madureira 2000).

Methodology

This paper results from the author's PhD research (Vale 2012). It is based on interviews, public archive documentation, the professional archives of Álvaro Siza, António Madureira, and Engil Construction Company, and the author's photographic archive.

Structural Strategy

The BRC is among the first Portuguese residential buildings to use concrete load-bearing walls (CLBW) as the main structure. António Madureira notes that employing CLBW in residential projects was considered very costly at the time, with their use primarily limited to public or corporate buildings. Álvaro Siza aimed to demonstrate that such a structural system could be used to create an affordable building, thereby shifting prevailing attitudes.

The building uses CLBW combined with a few free-standing pillars. The CLBW are located on the building's perimeter, along the building's expansion joint, vertical communications (stairs, elevators), separating individual flats and distinguishing between private and public spaces within each unit (Álvaro Siza and Madureira 1992, pp. 14–16). In conjunction with solid concrete slabs, this structural approach offers two main benefits: I) it allows for longer spans between supporting elements, creating larger open areas without structural interruptions, and II) it eliminates visible beams on the ceilings. While this method has meanwhile become more common among architects, it was considered innovative then.

Façades

A key feature of the BRC is its north facade, characterised by curved walls and tile cladding. The use of a continuous CLBW along the building's perimeter,

combined with thermal regulations introduced in 1990, impacted the constructive design of the wall.

In the initial design used for the building permit (CMPorto *et al.* 1997), the facade was to be finished like in Álvaro Siza's previous project at the Faculdade de Arquitectura da Universidade do Porto [FAUP], with plaster over a layer of thermal insulation (ETICS). To prevent direct contact with the ground, the lower part of the building was to be clad in granite plates for durability, like FAUP (Álvaro Siza and Madureira 1995a).

The revised design proposed marble cladding for the south, east, and west facades and tile cladding for the curved north facade (Álvaro Siza and Madureira 1995b, 1997). While stone cladding did not pose issues for the CLBW and a rain-screen system was employed, the tile cladding, with the required thermal insulation, brought challenges that were solved only during construction.

Two options could be considered for the tile cladding during the execution phase: directly glueing tiles to the ETICS or constructing a secondary 7 cm thick brick wall supported by the concrete wall, with insulation in the cavity.

The direct glueing method posed a problem related to grout exposure to significant thermal amplitude, which impacted durability. Although the north facade was protected from direct sunlight almost year-round, the height of the building and the intense summer sunlight made this approach less viable and dismissed as an actual option. In contrast,

a similar solution was used in the second phase of Bairro da Bouça, but only in areas shaded by adjacent buildings (Vale 2018).

Though the brick wall solution provided more mass to absorb temperature variations, it was prone to cracking and water infiltration, potentially affecting both the tiles' appearance and adhesion.

The final solution, proposed by the building company Engil and approved by Siza and the FEUP Construction Physics Laboratory, involved a rain-screen facade with 5 cm thick precast concrete panels, finished with tiles. This solution addressed several challenges, including the tessellation of the curved facade with flat 90 cm wide concrete panels and 15 cm flat tiles. The curved facade was not meant as a continuous curve but a series of straight lines tangent to the curve, affecting how the wall's appearance varied with solar orientation and illumination. The constant size of the panels and tiles required careful facade division to align with its dimensions and architectural features. The choice of finishing with tiles on-site, rather than pre-finishing them in the factory, allowed for unmarked slab joints on the facade, which was considered an ingenious solution that addressed the varying joint widths by overlapping the tiles over the joints between the concrete panels, ensuring evenly spaced tile joints and concealing the concrete slabs from view.

This cladding system, in which there are only whole tiles with practically non-existent markings between tiles, required rigorous site preparation, in this case, conducted by Engil's technical office, followed by equally thorough execution.

Conclusion

The experience of this building turned out to be decisive for how construction strategies for residential buildings evolved over the following decades, influencing other architects and dismissing builders' concerns about using load-bearing walls in residential buildings, including single-family housing.

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Editors: Soraya Monteiro Genin, Teresa Cunha Ferreira, Mariana Correia

Coordination: Soraya Monteiro Genin

Graphic Design: Márcia Novais, assisted by Miguel Filipe Ferreira

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