Digital documentation of modern heritage: Álvaro Siza's Borges & Irmão Bank in Vila do Conde (1978-1986)

Documentação digital do património moderno: Banco Borges & Irmão de Álvaro Siza em Vila do Conde (1978-1986)

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Abstract

The digital revolution significantly impacts cultural heritage safeguarding offering advanced documentation and communication techniques. Modern heritage provides valuable research insights for its rich documentary, physical, and oral resources. This article focuses on digitally documenting Álvaro Siza's Borges & Irmão Bank in Vila do Conde (1978-1986), listed on the World Heritage (WH) Tentative List since 2017. Despite Siza's global recognition, the complex design process and construction features of this building are still scarcely disseminated. Hence, this article aims to deepen knowledge and disclosure of this relevant case-study. Research supports documenting its Outstanding Universal Value (OUV) and tectonic consistency for future preservation. The methodology, framed within the SizaATLAS (FCT) research project, employs combined techniques to document 18 buildings in the WH Tentative List, including: i) archival and bibliographic research; ii) fieldwork; iii) photogrammetry; iv) 360 ° virtual tours; and v) 3D didactic models. This framework enhances understanding and dissemination of Álvaro Siza's work while providing relevant documentation for future management.

KEYWORDS
Álvaro Siza
Borges & Irmão Bank
Digital documentation
Tectonic perspective
Modern heritage

Resumo

A revolução digital impacta a salvaguarda do Património Cultural, ao disponibilizar técnicas de documentação e comunicação. O património moderno é neste âmbito um campo privilegiado de estudo, pela consistência dos recursos documentais, materiais e orais. Este artigo aborda a documentação digital do Banco Borges & Irmão, de Álvaro Siza, em Vila do Conde (1978–86), inscrito na Lista Indicativa do Património Mundial desde 2017. Apesar do reconhecimento do arquiteto, o processo de conceção e as características construtivas deste edifício permanecem pouco sistematizados. A investigação suporta a documentação do seu Valor Universal Excecional e da sua coerência tectónica, visando a preservação futura. A metodologia, desenvolvida no projeto SizaATLAS (FCT), aplica técnicas combinadas a 18 edifícios da Lista Indicativa do PM, incluindo: i) investigação arquivística e bibliográfica; ii) trabalho de campo; iii) fotogrametria; iv) visitas virtuais em 360º; e v) modelos didáticos tridimensionais. Este enquadramento apoia a compreensão, divulgação e gestão futura da obra de Siza.

PALAVRAS-CHAVE
Álvaro Siza
Banco Borges & Irmão
Documentação digital
Perspetiva tectónica
Património moderno

Introduction

The digital revolution has profoundly altered the ways in which cultural heritage is safeguarded, introducing new methodologies and tools for its documentation, analysis and dissemination [1]. In a context increasingly shaped by techniques that have become both indispensable and unavoidable [2, p. 35], this transformation assumes particular significance for modern heritage. Modern heritage presents a rich tapestry of documentary, physical, and oral sources, offering a complex and fertile field for critical investigation and interpretative approaches [3].

Digital documentation of cultural heritage has increasingly consolidated its role as an essential tool for the study, preservation, and communication of cultural assets [4-5]. This approach contributes not only to the precise recording of formal and construction features but also to critical interpretation, enabling hypothetical reconstruction and cultural mediation. This is particularly significant in the context of modern heritage, as its study is often characterised by gaps in documentation and by the need to understand singular construction processes, which are frequently experimental and innovative in nature [6].

The preservation of modern heritage therefore requires comprehensive and systematic digital documentation, encompassing both its broader urban and territorial context and its intricate material and constructive details. Identifying the most effective methods for creating accurate digital models must be undertaken in parallel with considerations of cultural significance, authenticity, and conservation requirements. This holistic approach ensures that modern heritage is not only safeguarded but also critically understood by future generations. It also underscores the capacity of modern architectural heritage to embody visionary concepts of form, space, technique and social responsibility [7].

Within this framework, Álvaro Siza's Borges & Irmão Bank in Vila do Conde is a particularly relevant case study. Its complex and prolonged development over approximately fifteen years reflects not only architectural experimentation but also continuous negotiations between architect and client, especially regarding material choices during periods of economic constraint. This context underscores the historical and cultural importance of comprehensively documenting such sites, anticipating new interdisciplinary relationships and intuiting potential advantages in future research [8]. Amid shifts in Portuguese politics from the late sixties onwards, the management of Borges & Irmão Bank considered several proposals for establishing a branch in Vila do Conde [9]. The initial phase, conceived in 1969 near the Santa Clara convent, involved the unification of two existing buildings, including the bank's headquarters at the time, while preserving the facade of the building to be incorporated and proposing a redesign of the former headquarters' facade. Following the abandonment of this proposal (1969-1974), a second solution was developed in 1978, based on the renovation of an existing building, not far from the original site proposal. The third and final proposal (1978-86), on the same plot as the previous one, involved demolishing the existing structure and constructing an entirely new building. Reflecting on this troubled process, Siza later remarked that the only thing missing was being dismissed from the commission [10].

Furthermore, with regard to modern heritage, it is of particular relevance to document construction techniques and material features, as these are more vulnerable to decay because of the limited durability of industrial materials or the long-term performance issues related to new or experimental technological solutions, such as flat roofs and curtain wall systems. Hence, documentation of construction processes plays a crucial role in advancing knowledge and supporting future conservation strategies for such buildings [11].

This paper intends to shed light on Borges & Irmão Bank in Vila do Conde (1978-1986), a well-known yet insufficiently documented architectural project, particularly focusing on its phasing and materialization. The study aims to provide comprehensive documentation of the building through a methodology that integrates archival and bibliographical research with digital tools in order to constitute a pedagogy for the teaching and professional practice of

architects. Additionally, it explores the tectonic dimension of the work, including its constructive logic and material systems, an aspect often underrepresented in the study of Siza's architecture and particularly significant in this seminal example of modern architecture at both national and international levels. In this sense, the methodological and analytical approach adopted here directly supports the identification, interpretation, and communication of the building's cultural and material attributes. Consequently, the research contributes to the documentation of attributes associated with OUV, as framed within the serial WH nomination "Álvaro Siza's Architecture: Modern Contextualism Legacy," submitted by Portugal in 2024 [12].

Methodology

The methodology adopted in this study is framed within the SizaATLAS research project (FCT) and is supported by a synergy of techniques for the comprehensive digital documentation of modern architecture. This approach has been applied to 18 buildings designed by Álvaro Siza, which have been included in the World Heritage Tentative List since 2017 [13].

The methodology is supported by the cross-analysis of i) archival and bibliographic research, ii) fieldwork, iii) photogrammetry, iv) 360 º virtual tours, and v) 3D didactic models. The methodology has already been tested and implemented in previous case studies, including the Ocean Swimming Pool [14], the Beires House [15], and the Serralves Museum of Contemporary Art [16].

Archival and bibliographic research

As regards data collection, the cross-analysis of archival and bibliographic research with fieldwork proved to be of major relevance. Planning permission projects, including written documentation, drawings and correspondence, are preserved in the Archives of the Municipal Council of Vila do Conde. These materials are organised according to the different design phases and include sketches (Figure 1a), studies, working drawings, plans and photographs (Figure 1b-c).

Complementary sources, including negatives, slides, and textual records such as project reports, meeting minutes, and correspondence with Borges & Irmão Bank, can be found in Álvaro Siza fonds at the Canadian Centre for Architecture (CCA) [17-19]. This collection also includes a study model.

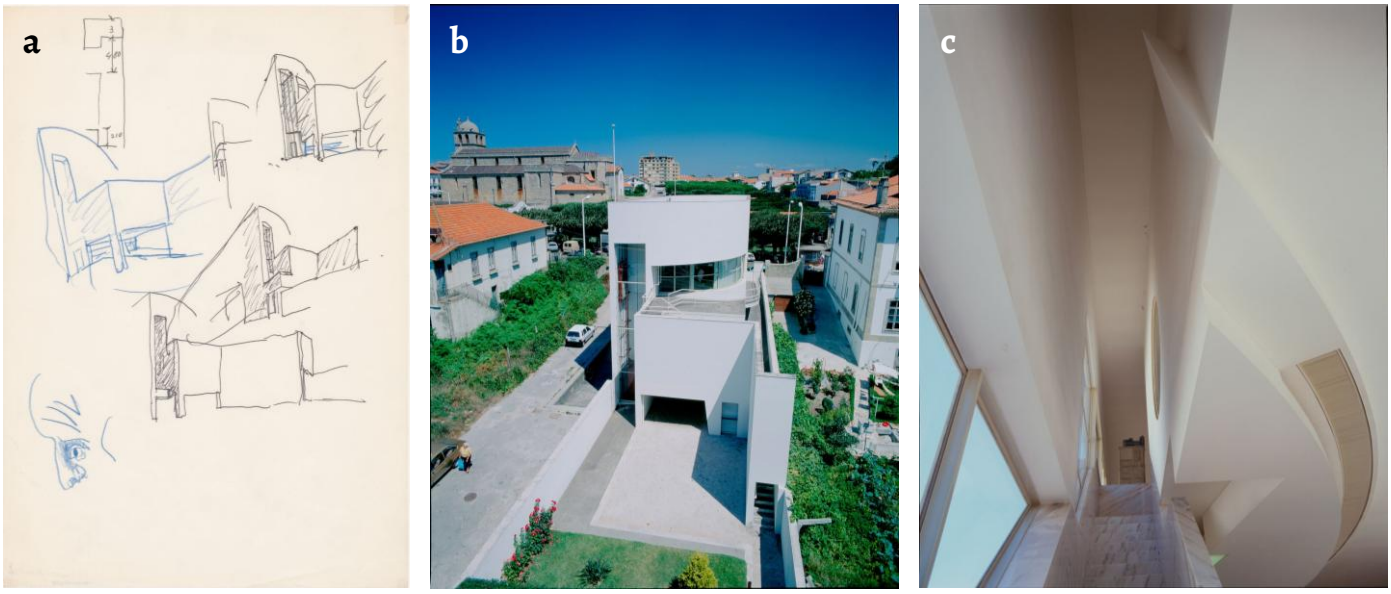

Figure 1. Documentation of Álvaro Siza's Borges & Irmão Bank in Vila do Conde: *a)* exterior sketches (1978-1986); *b)* rear view (1978-1986); *c)* interior view showing the ceiling and the staircase to the first floor. Álvaro Siza fonds, Collection Centre Canadien d'Architecture / Canadian Centre for Architecture, Montréal, Don d'Álvaro Siza / Gift of Álvaro Siza.

Fieldwork

Fieldwork conducted at the Borges & Irmão Bank encompassed a systematic survey of all interior and exterior spaces, complemented by insightful discussions with staff members, which provided valuable context information and enhanced understanding of the building's use. To ensure comprehensive documentation, an extensive photographic survey was conducted, including the use of drones to capture both aerial views and broader site perspectives.

This process was crucial in assessing the building's current condition and identifying areas requiring closer attention. Furthermore, the detailed analysis and photography of construction details, with a particular focus on tectonic features, significantly contributed to documenting the building's architectural integrity. The digital documentation protocol was thoughtfully designed to facilitate the systematic organisation and seamless integration of all gathered data, culminating in a coherent and easily accessible archive for future research and conservation purposes.

Photogrammetry

Photogrammetry facilitates the three-dimensional reconstruction of Siza's architectural works, elucidating their contextual relationships and physically documenting their construction. When combined with Building Information Modeling (BIM) and other digital tools, photogrammetry contributes to a robust documentation framework, enhancing the understanding and preservation of Siza's architectural legacy.

Although not originally designed for cultural heritage applications, photogrammetry has evolved into an indispensable tool in this domain. Since the 2010s, it has been a crucial tool for the 3D documentation of heritage sites, including twentieth-century architecture, using photographic data acquired from both ground-based and aerial ways. Digital photogrammetry stands apart from traditional methods by employing digital imagery and computational processes supported by cameras, computers, and specialized software.

Previously, the process was manual and required identifying matching points in photos to create orthophotos or simple 3D models. The major advance of digital photogrammetry lies in the use of computer vision and automated workflows, which make it possible the accurate documentation of very complex objects and the generation of high-resolution three-dimensional model.

360 virtual tours

Virtual tours are instrumental in the documentation and preservation of heritage assets, playing vital roles in outreach, communication, and conservation monitoring. In the context of twentieth-century architectural heritage, especially within the work of Álvaro Siza, 360º virtual tours emerge as a valuable complementary tool. The Borges & Irmão Bank stands out as a prime exemplar in this regard, demonstrating the effectiveness of this technique in capturing and disseminating the spatial qualities of architectural heritage.

Image acquisition for the virtual tours was carried out using a Ricoh Theta camera, with careful consideration on weather conditions and lighting to enhance the quality of the captured imagery. The captures material was subsequently processed and enabled using Pano 2VR software, providing an immersive virtual environment that contributes to the comprehensive digital documentation of the building.

3D Didactic Models

The Didactic Models (DM) offer an integrated analytical approach to study of the architectural tectonics in Siza's work. They focus on material compositions and construction logic, encompassing structural elements, envelops, frames, and detailed junctions. These models present precise 3D representations of selected sections and components of the building, emphasizing their pivotal role in informing material choices and construction practices.

Unlike conventional Heritage BIM (HBIM) workflows, that often aim at comprehensive digital reconstitutions or digital twins for conservation management, the DM prioritise analytical clarity over exhaustive description or completeness. Their purpose is to isolate, interpret, and communicate key constructive strategies. In this sense, the models function as curated interpretative tools rather than comprehensive replicas.

These models are not participatory teaching tools involving student modelling, as seen in recent BIM-based pedagogical research [20]. Instead, they perform a didactic function by providing analytical representations that support the interpretation of Siza's design principles. In this context, the term "didactic" does not refer to instructional frameworks within learning design, but to a method of communicating architectural knowledge through visual and parametric abstraction. In particular, they help bridge gaps caused by fragmented or inconsistent archival and field data.

The methodologic framework that supports these models is detailed across two sections: "Borges & Irmão Bank. Vila do Conde", which adresses i) archival and bibliographic research, ii) fieldwork); and "Digital documentation", which focuses on iii) photogrammetry, iv) 360 virtual tours and, v) 3D didactic models. Together, these stages constitute an essential methodology sequence for ensuring the rigour and coherence of the digital documentation process presented in this study.

Borges & Irmão Bank, Vila do Conde

Siza's repeated engagement with bank commissions across Portugal offered a sustained opportunities to reflect on this architectural typology. Notable examples include the Banco Pinto & Sotto Mayor branches in Oliveira de Azeméis (1971-1974) and Lamego (1972-1973), among others.

Three different projects were undertaken for the Banco Borges & Irmão Bank, referred to as the *Vila do Conde Agency*, situated in the historic part of the city (Table 1). The first project, spanning from 1969 to 1974, aimed to remodel the existing Borges & Irmão Bank. Located at the base of the Convent of Santa Clara (Figure 2a-c), the project evoked what Rafael Moneo described as a confrontation between "David and Goliath" [21]. It involved alterations to the façade (Figure 2d), interior design, an extension, as well as electrical and mechanical studies.

The second project, dating back to 1978, focused on another location within the historic area of Vila do Conde, near the Parish Church. This endeavour involved the construction of a new building, as the original was demolished. Siza made significant alterations to the design throughout the process, resulting in multiple versions of the building documented within the project series.

The final building of Borges & Irmão Bank consisted of two floors and a basement. Administrative offices were situated on the top floor, public services occupied the second floor, and the basement, also serving as the garden level, housed safety deposit boxes. This project led to Siza receiving the prestigious Mies van der Rohe Award for European Architecture in 1988, acknowledging his substantial impact on the field of architecture.

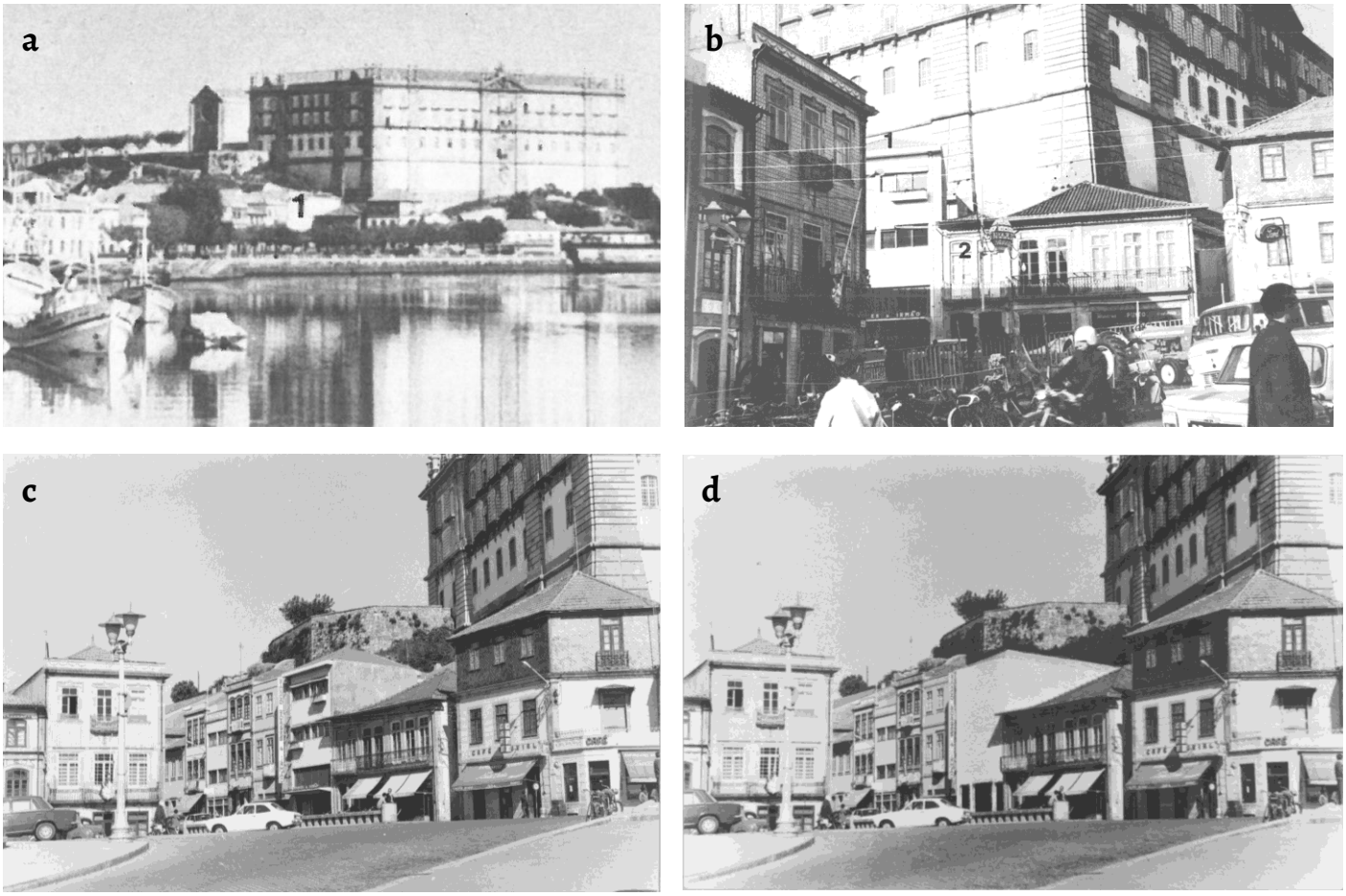

Figure 2. First phase location in Vila do Conde (1969-1974): *a)* headquarters at the time (no. 1 in the photograph), set within the urban landscape, with the River Ave and the convent in the background; *b)* closer view of the existing building to be incorporated into the new bank design [22, p. 35]; *c)* view of the existing building [18]; *d)* photomontage illustrating the proposed volumetric intervention and new façade [18].

Table 1. Synthesis of the three phases, with the corresponding process number in the Municipal Archives.

Phase	Process n.º	Date	Description
1st	691/70	1956-1979	The process spans from the establishment of the initial agency in 1956 to the project's approval in 1972. It includes Siza signing the planning permission project in 1970, obtaining ministerial approval in 1971, and applying for the extension of the bank agency license in 1972. Support for this progression came from the contractor's license, a budget estimate, and the opinion of the Municipal Art and Archaeology Commission.
2nd	148/78	1973-1978	This process includes a preliminary design package, which comprises a design report with an addendum, notifications, and orders. It also involves photographs taken before the project began, alongside drawings and supplementary documents.
3rd	71/80	1980-1983	This process encompasses vital project elements, including a responsibility statement, design report, drawings, and detailed plans for sanitation and water supply infrastructure. Additionally, it covers comprehensive terms, technical reports on various aspects, electrotechnical records, and essential notifications and requirements. These components collectively ensure a comprehensive grasp of the project's scope, design details, and the approval process.

First phase: 1969-1975

The Municipal Archive of Vila do Conde preserves the plans from the original building permit application, relating to the initial design by Siza for the bank. This project involved an intervention in two contiguous pre-existing buildings. One of these structures was originally conceived by Francisco Manuel de Almeida de Eça Guimarães, with a Design Report dated 15 August 1956, just 14 years before Siza's proposal (Figure 4).

Drawings from the 1970's reveal Siza's intention to replace the existing modern façade with a more abstract, presumably whitewashed, featuring a tripartite glazed opening approximately

matching the height of the ground floor openings of the neighboring buildings. On the adjacent façade, the only visible sign of intervention is the replacement of the ground-floor joinery. Sketch lines drawn over the circular opening suggest a possible attempt to eliminate it, bringing the façade design closer to the constructed version, the third iteration (Figure 4a).

The project received early international attention and was published in several key architectural journals and monographs during the 1970, including *Controspazio* [22, pp. 34-35] and *Arquitectvras BIS* [19]. It was also selected as one of Siza's projects for the monograph of *L'Architecture d'Aujourd'Hui* dedicated to Portugal [23, p. 54] and listed in the monograph dedicated solely to him by the same editor [24, pp. 66-67]. These publications feature sketches (Figure 3a-c), axonometries and photographs of models.

The published sketches reveal Siza's exploration of the façade, particularly through the distribution of openings, where he experiments with variations of shapes and scale and introduces projecting elements, such as protective window canopies and a pronounced emphasis on the main entrance. This investigation of apertures can be interpreted as an attempt to establish a controlled dialogue with the adjacent monastic volume of Santa Clara, characterized by its monolithic appearance, reinforced by stone masonry at the corners and pilasters and defined by its with white façades punctuated by granite-framed windows. It also may evoke the main façade of Vila do Conde parish church.

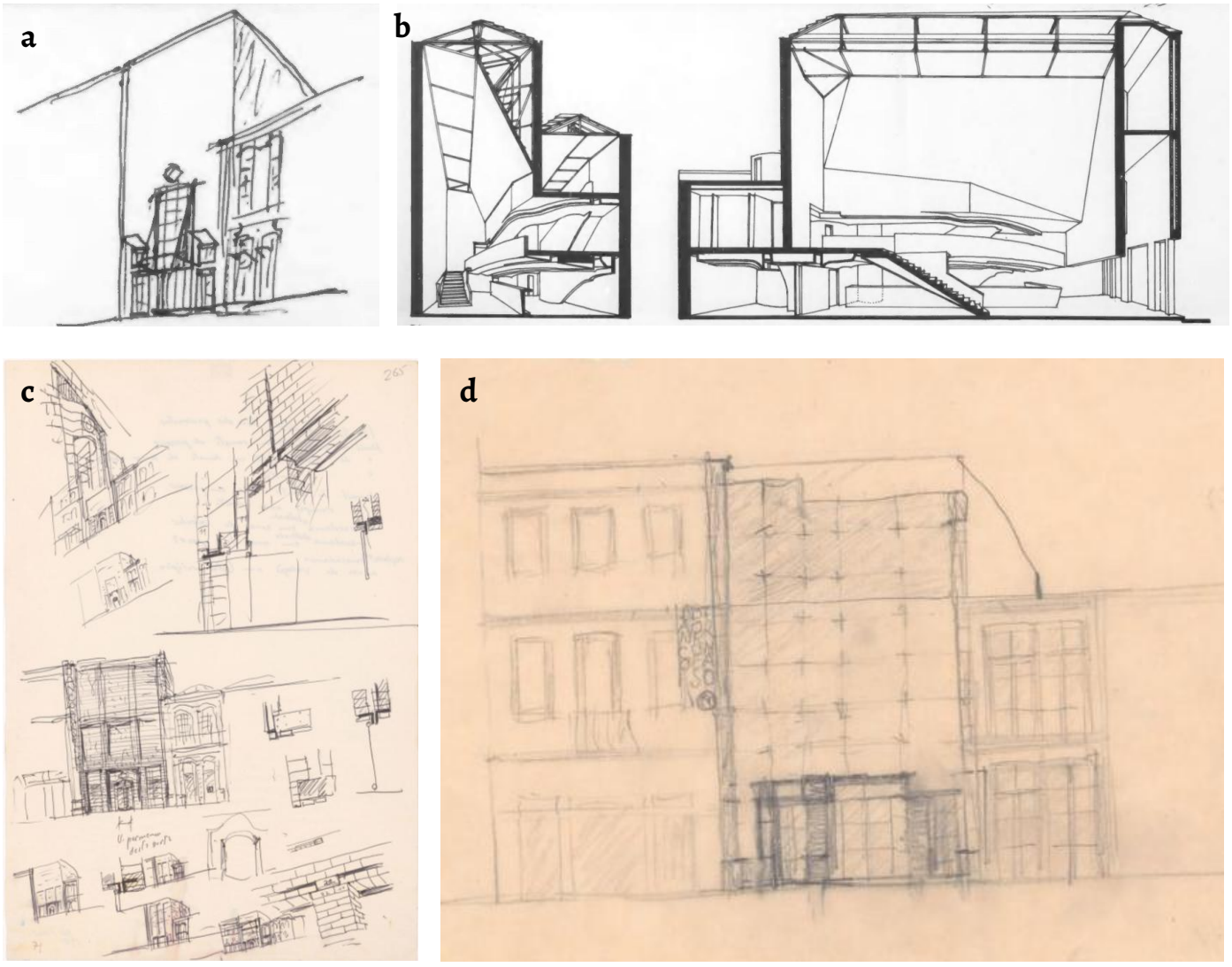

Figure 3. Drawings by Álvaro Siza for the first phase of the Borges & Irmão Bank design (1969): *a)* façade [24, p. 9]; *b)* axonometries [23, p. 54]; *c)* façade study [17]; *d)* façade study [17].

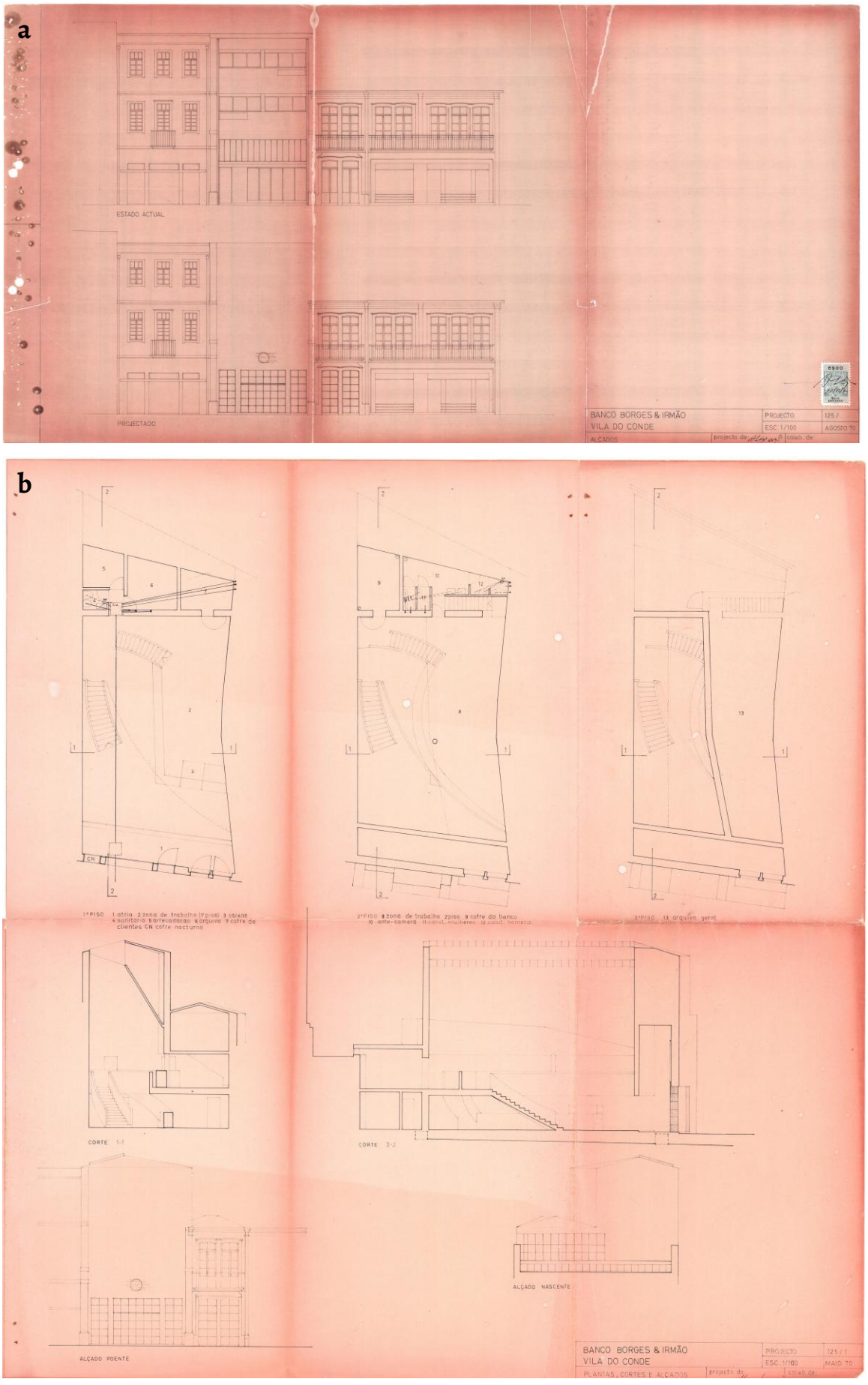

Figure 4. Drawings: *a)* façades of the original design by Francisco Eça Guimarães (1956) and Álvaro Siza's proposal. Archive of the Municipal Council of Vila do Conde, August 1970; *b)* plans, sections, and façades. Archive of the Municipal Council of Vila do Conde, May 1970.

Plans, sections, and elevations, along with axonometric drawings and the development of models, reveal Siza's intention to explore the interior of the bank through the articulation of the two previously separate plots, now unified. The public reception area is treated with the maximum possible ceiling height, while the adjoining volume is organised over three floors, distributing the remaining programme (Figure 4).

The end of the public area, marked by a full-length service counter, is punctuated by a staircase that provides direct access to the upper floor. The interior lighting design takes advantage of large glazed surfaces, which generously illuminate the interior spaces. Despite the proposed changes to the façade, the former bank building retains its pitched roof, tiled in the traditional technique, preserving the urban profile. A sloped wall, a feature later employed in the Santa Maria Church, completes the scenographic effect of the ensemble.

Besides this version that was refined and submitted for a building permit application, more recently the AMAG publication *Álvaro Siza Unbuilt works* [25, p. 5] includes previously unpublished sketches by Álvaro Siza illustrating the design process. Supposedly dating from 1969, and therefore preceding the first formal proposal, these sketches focus on constructive detail as a guiding element in the design process, namely the idea of a double brick masonry façade, left exposed both on the interior and exterior (Figure 3d).

Although such technical investigations are characteristics of Siza's work during this period, drawings with this degree of focus on construction detail at such an early stage are relatively uncommon. They also demonstrate a wide range of approaches to materials and construction systems. It is worth recalling that, at this time, Siza was experimenting with concrete, as exemplified by the Manuel Magalhães House (1967-1970) and the Unicoope building (1970).

Second phase: 1976-1977

The second design for the Bank (Figure 5) was featured in the monograph of *L'Architecture d'Aujourd'Hui* dedicated to Álvaro Siza [24, pp. 66-67] and more recently, in the AMAG editions *Álvaro Siza Unbuilt works* [25-26]. The 2020 article presented the three design phases together for the first time, allowing for direct comparison.

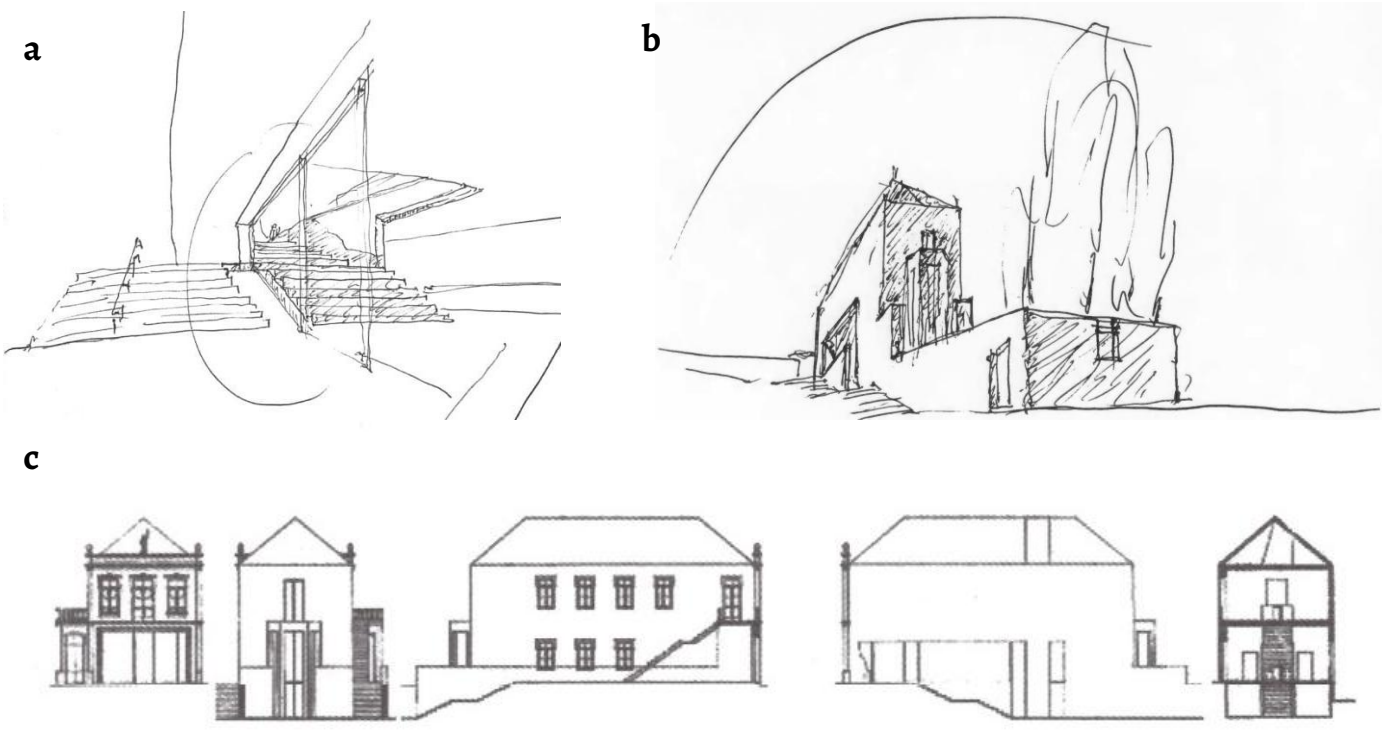

Figure 5. Drawings by Álvaro Siza for the Borges & Irmão Bank II: *a)* perspective detail, 1979, Sketchbook 41, p. 39, Drawing Matter Archive; *b)* sketch; *c)* façades and sections by Álvaro Siza, including the redesigned street-facing façade with glazed elements, the rear (south) façade, the east and west side façades, and a longitudinal section [25, p. 5].

The second design epitomizes simplicity, with its central feature being a magnificent staircase with multiple flights aligned along the room's axis. This striking staircase is bathed in natural light from a generous lantern that seamlessly stretches through the roof above. Additionally, the redesigned street-facing facade introduces a contemporary touch with a sleek glass section that gracefully extends along the building's side, enhancing both its aesthetic appeal and functionality [24, pp. 66-67].

The new intervention is only revealed on the main façade through a large glazed opening at ground-floor level. The remaining façades are entirely redesigned, with the rear elevation characterised by a "bow window" that transforms into a balcony on the upper floor. As seen in the final built proposal, the design is defined by a monolithic volume anchored to the main street. The basement level is enclosed by a wall that defines a garden with trees and, due to the slope of the terrain, aligns with the street level at the rear of the building.

Third phase: 1978-1986

The final version of the design is authored by Álvaro Siza, with assistance from architect José Luís de Carvalho Gomes and collaboration from Miguel Guedes de Carvalho, Eduardo Souto de Moura, Manuela Sambade, Nuno Ribeiro Lopes and Luiza Penha. The structural engineering was overseen by Fernando Eça Guimarães, while the electrical and air conditioning systems were executed by engineers Fernando Madeira and Jorge Maria. The construction itself was executed by *Sociedade Cooperativa dos Operários Pedreiros Portuenses*.

The third design was first published in the monograph of *L'Architecture d'Aujourd'Hui*, dedicated to Álvaro Siza [24, pp. 66-67], preceded by the presentation of the second design. It was later published in Domus [9, pp. 20-21], showcasing photographs capturing the final construction phase, depicting the site set-up and the building without window frames. The accompanying text emphasizes that the "predominant aim of the project is to merge into the landscape, without yielding to mimetic temptations or allowing itself to be swallowed up by the charming scenario" [9, pp. 20-21]. The bank was subsequently published in *Obradoiro* [27], documenting the construction works (Figure 6).

The debut of the bank's completion in 1986 marked the beginning of its prominence in the architectural discourse, with appearances in esteemed publications (Table 2).

Table 2. Key Publications featuring the Borges & Irmão Bank, after its completion in 1986.

Year	Author(s)	Publication data
1986	Fernandes, J.M.	'Agência Bancária em Vila do Conde, Álvaro Siza Vieira', in *Revista Arquitectura Portuguesa*
	Safran, Y.	'City Segments', in *Building Design*
	Siza, Á. *et al*	'Banco Borges & Irmão III, Vila do Conde 1982', in *Álvaro Siza: Professione Poetica*
	Capitel, A. *et al*	'Banca Borges & Irmao, Vila do Conde', in *Revista do Colégio Oficial dos Arquitectos de Madrid*
	Croset, P.	'Álvaro Siza Vieira. Banca a Vila do Conde/ Bank in Vila do Conde',in *Casabella*
1987	Bru, E. & Mateo, J. L.	'Agencia bancaria, Vila do Conde (Portugal)', in *Arquitectura europea contemporánea*
1988	Siza, Á.	'Banco Borges & Irmão III, Vila do Conde', in *Álvaro Siza: Profissão poética*
	Siza, Á.	'Uma espécie de cruzamento de escalas', in *Jornal dos Arquitectos*
1989	Nakamura, T.	'Alvaro Siza, 1954-1988', in *A + U*
1990	Frampton, K. *et al*	*Mies van der Rohe Award for European Architecture*
	Costa, A. A. Siza, Á.	'Banco Borges & Irmão', in *Álvaro Siza arquitecturas 1980-1990*
	Mardaga, P.	*Architectures à Porto*
	Siza, Á.	*Arquitecturas 1980-90. Álbum de la exposición*
1992	Rodrigues, J.	*Álvaro Siza / obra e método*
1993	Santos, J. P. *et al*	*Álvaro Siza, Obras y Proyectos 1954-1992*
1995	Fleck, B.	*Álvaro Siza*
1997	Trigueiros, L. *et al*	*Álvaro Siza 1954-1976*
1998	Testa, P.	*Álvaro Siza*
1999	Jodidio, P.	*Álvaro Siza*
2000	Cecilia, F. M.	*Álvaro Siza: 1958-2000*
2023	Choupina, A. *et al*	*Siza: 90 anos. Volume 10. Siza por Kenneth Frampton*
2024	Ferreira, T. C. *et al*	*SizaAtlas: Borges & Irmão Bank, Vila do Conde*
	Pedreirinho, J. M.	*Álvaro* Siza. Unbuilt Works
2025	Quintáns, Carlos *et al*	*Siza – Catálogo Gulbenkian*

Tectonic, construction and details

The built Vila do Conde bank replaces a previous building that was demolished. In contrast to other works by Siza, this design privileges spatial plasticity over explicit structural expression. This choice has sparked a broader discourse on the building's tectonics. However, the careful selection and use of materials underscore the architect's vision, particularly evident in the seamless visual connection between the interior and exterior spaces. Large glass surfaces and marble claddings bridge the gap between inside and outside, enhancing the sense of continuity.

The bank's interiors were also developed with a focus on materials, especially the use of marble, with special attention to stone cutting. The design of the wooden furniture includes desks, credit cabinets, and file trays, among others. The side gate was carefully designed and features the bank's logo.

The Borges & Irmão Bank building, with three floors, has a reinforced concrete structure and walls. The structural solution sought to interpret, as faithfully as possible, Álvaro Siza's design principles. The steel adopted was type A/40 N and concrete B/225. The foundation walls are in cyclopean concrete, remaining exterior to the projected reinforced concrete walls.

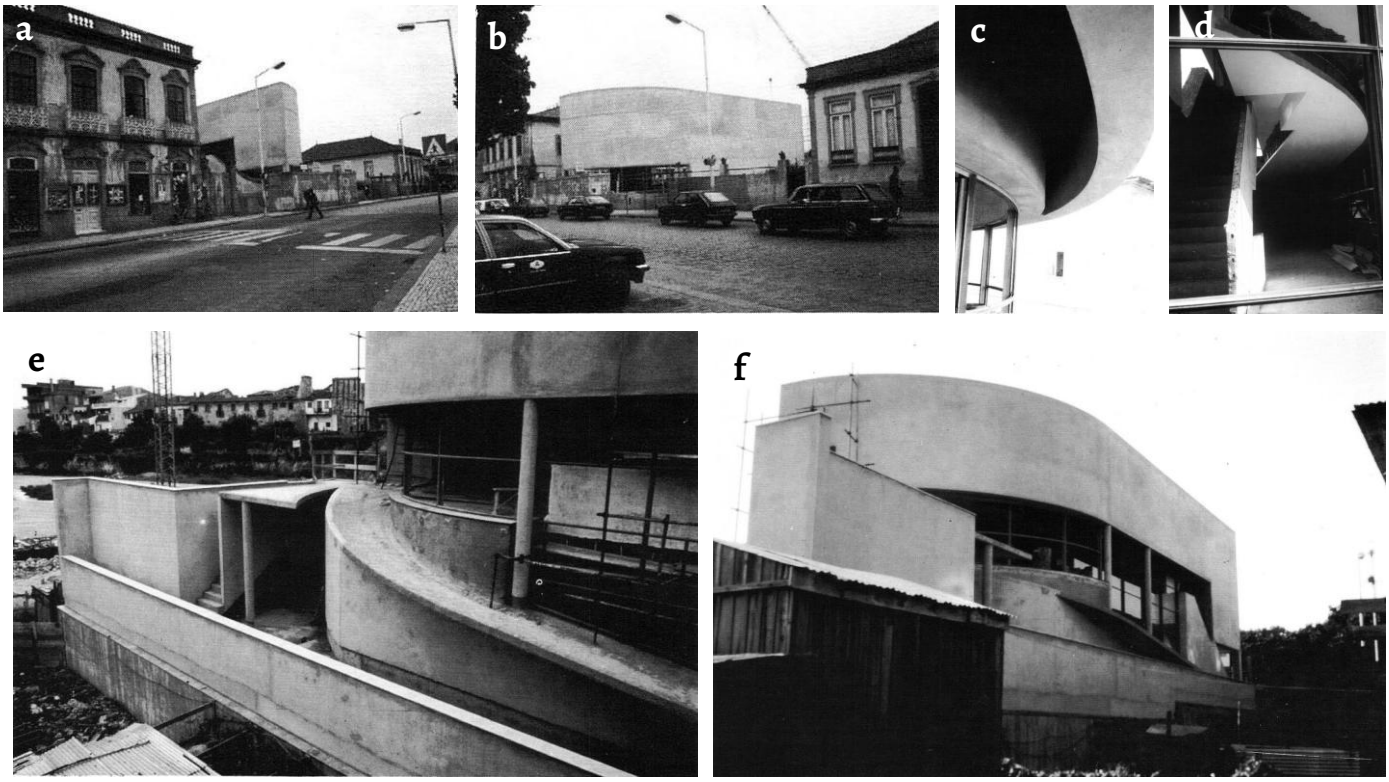

Figure 6. Construction site photographs (*a-f*) [27].

The exterior walls consist of a double construction: concrete on the outer layer, an air gap, and perforated brick masonry on the inner layer, with both surfaces finished with plaster. The reinforced concrete walls have a distinct structure, comprising panels reinforced with Malhasol welded wire mesh, and are reinforced by pillars and belts at floor levels, at the top, and mid-height. Interior walls are constructed of perforated brick masonry and finished with painted stucco.

All floors are integrated through a circulation system that, in addition to vertically connecting the building's rooms, articulates it with the public space. From the second floor, with the main atrium and reception areas, two staircases connect both the administrative area and the loan department on the third floor, as well as the deposit boxes on the ground floor (first floor). There is also an elevator that connects the three floors. An external ramp is attached to the east side of the building to provide direct access to the top floor. The interior flooring is marble. The exterior surfaces, including the ramp, street, and English courtyard, are finished in asphalt or asphalt concrete, with curbs in granite and limestone.

Figure 7. Documentation of Álvaro Siza's Borges & Irmão Bank in Vila do Conde: *a)* interior view, photograph by Teresa Cunha Ferreira; *b)* details of the window frames [19]; *c)* curtain wall plan and façade [19].

The roof is finished with concrete slabs laid over a levelling layer and concrete slab. As construction photos reveal, the false ceilings, are made of panels of plaster and vegetable fibres, named "Estafe" (Figure 6d). The lighting circuits include fixtures designed for two 65 W fluorescent lamps with a metal grid, used in both work areas and above the public area (Figure 7a). As stated in the design report, the window frames are made of wood for interior use and iron for the exterior (Figure 7b-c).

Digital documentation

Photogrammetry

Photogrammetry of the Borges & Irmão Bank clarified its contextual relationships and provided a detailed physical record of the building (Figure 8). Utilizing drone photography from both DJI Air 2 and DJI Mavic Pro, alongside Map Pilot Pro software, comprehensive volumetric data was captured, providing insights into the buildings' integration with their surroundings.

This method not only captured the buildings' physical dimensions but also their visual impact on the landscape. Terrestrial photogrammetry further refined the models' accuracy, supported by Agisoft Metashape software for georeferencing. Employing a BIM approach ensured data interoperability and facilitated the creation of didactic models, allowing for the testing of various resources, including 3D printing.

Figure 8. Aerial photopgraphs: *a)* aerial capture; *b-d)* 360º captures2022 (photos: Ricardo Dias).

One significant challenge in the photogrammetric documentation of the Borges & Irmão Bank concerns the modelling of white surfaces, which are prevalent in many of Siza's architectural works. Such surfaces often lack sufficient texture and contrast, making it difficult for photogrammetry software to detect and match key points accurately. This issue can result in noisy data and artefacts in the 3D models, reducing their overall accuracy and quality.

To address this challenge, multiple acquisition campaigns were combined, integrating both terrestrial and aerial photogrammetry, as well as testing various software processing options to find the best possible combination of results. To further optimize the outcomes, there remains the possibility of combining the photogrammetric model with one obtained through a laser scanner campaign.

360 virtual tours

For the 360 º tours, careful attention was paid to the five OUV attributes proposed for the inscription of "Álvaro Siza's Architecture: A Modern Contextualism Legacy" [12], in the WH list (Table 3). Each tour was designed to highlight the architectural responsiveness to the surrounding physical, social, and historical context. Furthermore, efforts were made to showcase how international and local influences were seamlessly integrated into the design. The virtual tours were structured to foreground volumetric articulation, spatial sequencing, sculptural quality and contextual relationships, from the most significative angles (Figure 9).

Moreover, special consideration was given to providing visitors with oriented spatial experiences, allowing them to navigate through the spaces in a coherent and meaningful way (Table 4 and Table 5). Lastly, the tours aimed to present the buildings as a holistic "Total Work of Art," showcasing not only the architectural design but also the intricate details, furniture, and artworks that contribute to the overall aesthetic experience.

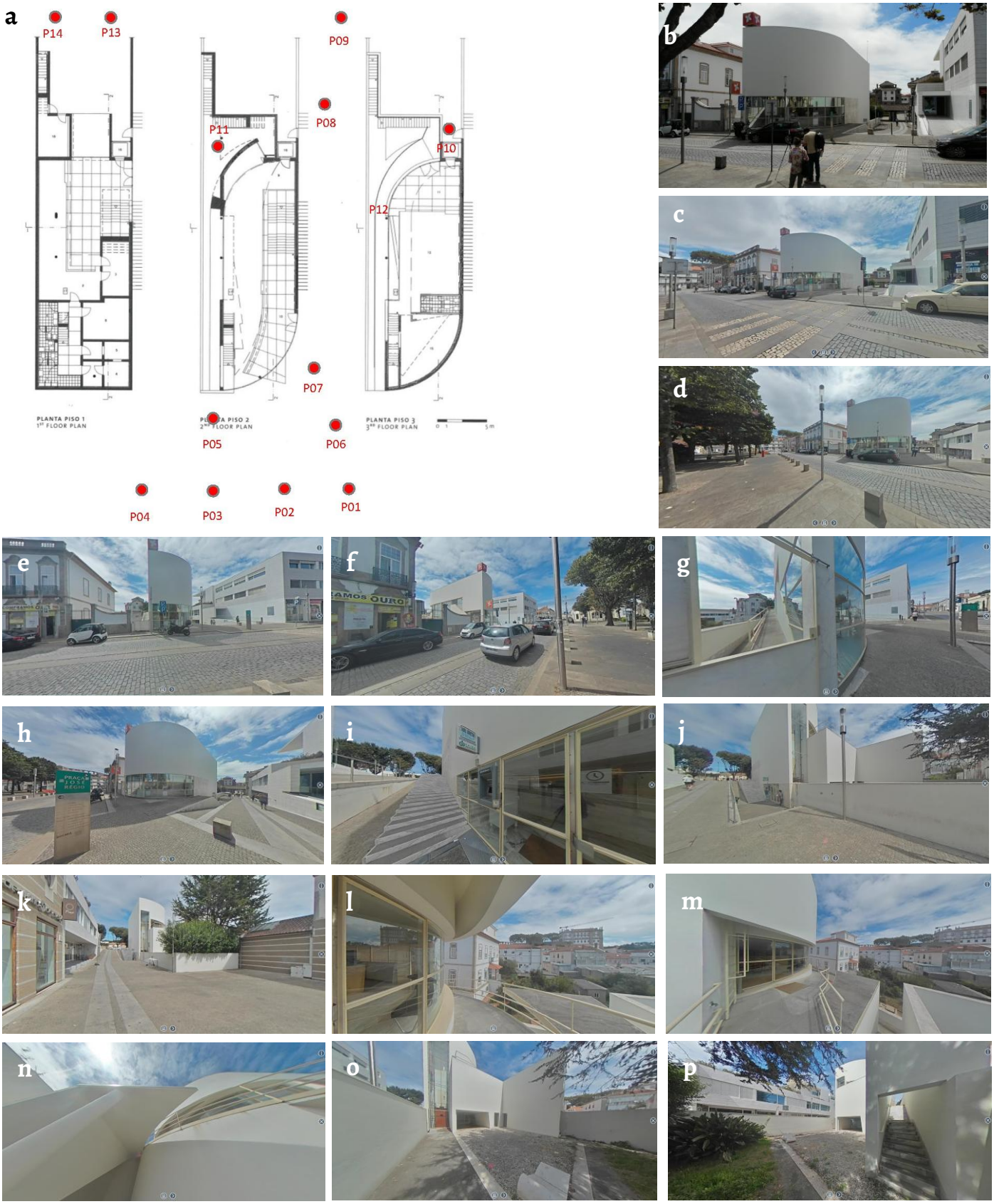

Figure 9. Points of capture: *a)* location on plans; *b)* during the capture process; *c)* north-west perspective; *d)* north-west perspective, from São João Square; *e)* north perspective; *f)* north-east perspective; *g)* north façade, window frames; *h)* north-west perspective, access to the pedestrian pathway; *i)* west façade, window frames; *j)* south-west perspective; *k)* south-west perspective, pedestrian pathway; *l)* view towards the Monastery of Saint Clare; *m)* outdoor walkways; *n)* east façade; *o)* south perspective from the private courtyard; *p)* private courtyard.

Table 3. Attributes proposed for the inscription of "Álvaro Siza's Architecture: A Modern Contextualism Legacy" in the WH list [12, pp. 142-143].

Attributes	Description
Attribute 1	Architecture responsive to a physical, social and historical context
Attribute 2	Integration of international and local references
Attribute 3	Sculptural volumetric expression
Attribute 4	Oriented spatial experiences
Attribute 5	Total work of art including details, furniture and art works

Table 4. Relation between attributes and points of capture.

Attributes	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14
Attribute 1	●	●	●									●	●	
Attribute 2				●										
Attribute 3	●						●	●						
Attribute 4					●			●		●	●			
Attribute 5				●		●								

Table 5. Description of points of capture.

Point	Title	Description
1	Bank's Integration with the surroundings	Relationship with the pre-existing structures; creation of pedestrian access
2	Pedestrian pathway	Integration with existing elements and creation of outdoor walkways
3	Southwest façade of the Bank	Interaction with surroundings, volumetric expression
4	Bank atrium	Interaction with exterior (glass), public reception area
5	Interior circulation	Connection between bank levels for public access; pathways
6	Public access areas	Spatial quality, interior relationships
7	Exterior design	Architectural volumetric expression
8	Outdoor walkways	Promenades
9	Articulation space	Connection between ramp, elevator, and stairs
10	Ramp	Promenades
11	Staircase	Promenades
12	Bank façade from the street	Interaction with surroundings, volumetric expression
13	Bank façade from the square	Interaction with surroundings, volumetric expression

Didactic Models (DM)

In this research, we refer to Didactic Models (DM) as interpretative frameworks designed to foster critical engagement with architectural construction, rather than merely representational or instructive tools. These models serve not only to visualize but to interrogate the tectonic, material, and formal logic of buildings, creating a space for reflection on how design decisions were shaped by Siza, in the interplay between his collaborators, the client and the contextual constraints that informed the project.

Their main objective is to conduct a thorough examination of architectural component properties, highlighting the role of tectonics, technical details, and material selection in architectural design. This process begins with carefully curated building sections that showcase artistic and formal attributes alongside construction principles, presented in sectional and perspective views (Figure 10).

Drawing inspiration from Edward Ford's "The Details of Modern Architecture" [28] these models prioritize clear language to disseminate knowledge effectively (Figure 10e-f). The development process involves cross-referencing between written and visual documentation, physical construction, photogrammetric models, and virtual tours.

Furthermore, by comparing diverse solutions proposed for similar component properties, the models enable a holistic evaluation of Siza's architectural achievements, emphasizing the integration of form, function, tectonics, and materiality.

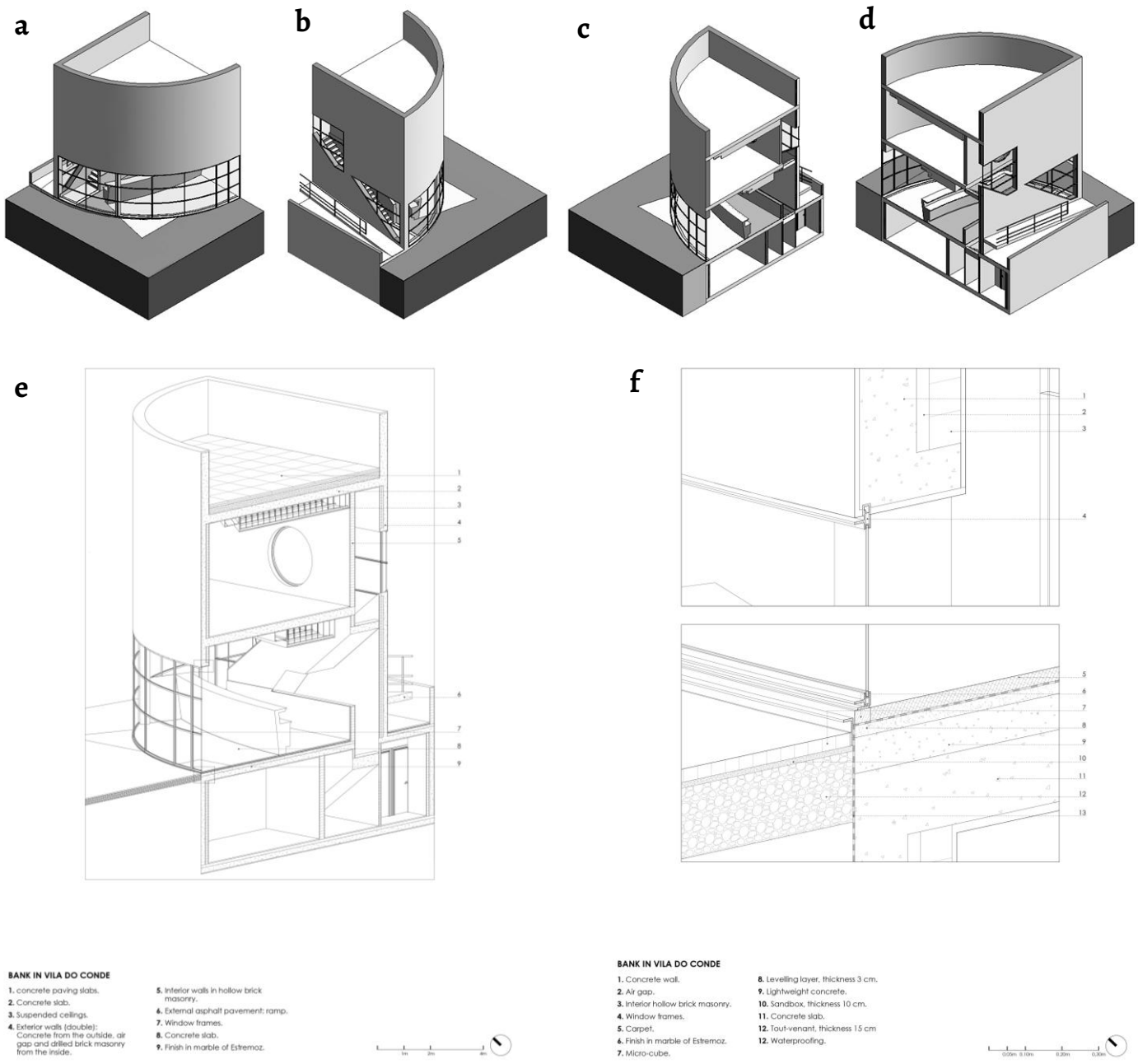

Figure 10. 3D Models of a section of the bank: *a–d)* exploratory studies; *e-f)* didatic models, 2022 (scientific coordination: Joaquim Teixeira, Teresa Cunha Ferreira, Tiago Cruz; 3D modelling: Juan Piedrahita).

Final considerations

This study digitally documents one of Álvaro Siza's most significant architectural works, the Borges & Irmão Bank in Vila do Conde, awarded the inaugural Mies van der Rohe Award for European Architecture in 1988 [29], and contributes to the preservation and critical understanding of its historical, material and cultural significance. This research establishes a replicable methodology that aligns with the required information to address conservation actions in compliance with international heritage documentation standards, developed in the *Principles for the recording of Monuments, Groups of Buildings and Sites* [30]. The paper also integrates the specificities of architectural heritage documentation [31], acknowledging the interplay between cultural meaning and material culture.

Moreover, this article demonstrates the impossibility of developing rigorous digital documentation (photogrammetry, 360 captions, didactic models) without the previous methodological steps of exhaustive archival and bibliographic documentation and detailed fieldwork. These preliminary steps are indispensable for both accuracy and interpretative depth of the resulting digital outputs.

The Borges & Irmão Bank is a relevant case study to apply and demonstrate this methodology because of its complex design process, which extended more than fifteen years. This period included extensive negotiations between the architect and the client, particularly concerning the choice of materials, such as marble, due to budgetary constraints during an austerity period. These contextual layers are essential to provide the critical context for investigating the building's design decisions, construction details and material expression. Limitations of research are related to technical challenges in photogrammetry (white surfaces) and difficulties in accessing and photographing interior spaces due to the building security standards as a Bank agency. Future developments regard the expansion of this methodology to other buildings of Álvaro Siza, as well as other sites with cultural values to be sustained and preserved.

This article also contributes to the broader knowledge and preservation of modern architecture by documenting its construction systems, material characteristics and design principles, which are essential for future conservation and management of change. Finally, it also contributes to support ongoing efforts to articulate and communicate the attributes of the Outstanding Universal Value (OUV) within the serial WH nomination "Alvaro Siza's Architecture: Modern Contextualism Legacy" [12].

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