Managing change with a living architect

OCEAN SWIMMING POOL BY ÁLVARO SIZA

CONSERVATION MANAGEMENT PLAN

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UNIVERSIDADE DO PORTO
FACULDADE DE ARQUITECTURA

CENTRO DE ESTUDOS DE ARQUITECTURA E URBANISMO
CEAU

matosinhos

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1. INTRODUCTION

1.1 Preamble
1.2 Aims and structure
1.3 Methodology
1.4 Safeguarding of modern architecture in Portugal: preserving the legacy of Álvaro Siza
1.5 Authorship and acknowledgments

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1. INTRODUCTION

1.1 Preamble

The Ocean Swimming Pool was designed by the Portuguese architect Álvaro Siza (Pritzker Prize, 1992) between 1960 and 1966 (with later additions until 1973) for the coastal town of Leça da Palmeira, to the north of Porto, Portugal. In this early work, Siza adopted expressively modern technology and abstract neoplastic language, building a succession of walls in reinforced concrete over the seaside rocks. The building is currently listed as a National Monument (since 2011) and is included in the “Ensemble of Álvaro Siza’s Architectural Works” in the World Heritage Tentative List (2017).

The Ocean Swimming Pool is one of Álvaro Siza’s most internationally recognized works, marking a turning point in his career by expressing a tectonic shift from regionalist inspiration towards more abstract design and innovative constructive solutions. Also, the building has been in full use for almost sixty years, becoming a social and cultural landmark for the local communities.

However, the bathing complex has been at risk for many years because of its maritime location and the nearby oil refinery. This combination of factors seriously aggravated the decay of its concrete structures and contributed to the obsolescence of the building’s technical installations, determining the need for a comprehensive intervention in 2018. Álvaro Siza’s recent conservation and extension (2018-2021) enhances the building’s significance by preserving the architectural integrity of the ensemble and accepting the signs of time as a densifying element of architecture.

This Conservation Management Plan began with support from the Getty Foundation through its *Keeping It Modern* initiative. The Getty grant enabled inspection and diagnosis to be carried out on the building site through a set of in-situ non-destructive or minor destructive tests and laboratory tests. They have contributed to the localized repair of exposed concrete – under Álvaro Siza’s coordination - which resorted to chromatic and texture integration techniques between the existing surfaces and the new repair mortars.

The *Keeping It Modern* grant also funded several activities directed at understanding the place and assessing its significance, namely a documentary film, an exhibition, four books, several academic papers, a Sharing Memories webinar, interviews with building actors, surveys of local communities, guided visits, activities with children and the identification of ‘Álvaro Siza’s Design Principles’ for the Ocean Swimming Pool. The lucid mind of Álvaro Siza constitutes an epitome of how living memories can positively contribute to the study and conservation of 20th-century architecture.

Drafting a Conservation Management Plan for the Ocean Swimming Pool benefits thus from the unique opportunity of engaging the original author in the conservation process. This background allowed for the definition of a set of conservation and management policies – overarching, planning and landscape, risk mitigation and climate change, visits and interpretation, communication and dissemination, maintenance and use (including user manuals and maintenance plan supported by BIM technology). In this way, this Conservation Management Plan aims at defining adequate management of change of this masterpiece still in full use by local communities, mitigating threats and vulnerabilities while preserving its cultural significance and design principles under the guiding inspiration of Álvaro Siza.

1.2 Aims and structure

Conservation Management Plans are a multi-staged process that allows and promotes the active preservation of buildings and places (Kerr, 2013). Anchored in the Burra Charter (ICOMOS Australia, 1999), they provide a cyclical framework in which heritage conservation is carried out by evolving communities' values to foster integrated management. In a holistic approach, the closer the relation of the various rights-holders in assessing significance and developing policies for achieving common agreements on maintaining it, the more efficient conservation is achieved (Mason, 2002).

Thus, this CMP is structured in 6 chapters, following the five stages described below. After a primary description of objectives and methodology in Chapter 1, Chapter 2 summarizes the historical development of the Ocean Swimming Pool, from its first design until the present, framing it on the occupation and evolution of a particular territory and as a result of a specific international and national context. Chapter 3 assesses the cultural significance of the Ocean Swimming Pool, understood as identifying heritage values to inform the development of significance-based policies to guide the conservation, interpretation, and management of the place. Chapter 4 assesses the physical condition of the Ocean Swimming Pool and identifies the vulnerabilities and risks that may affect its future management and conservation. The information gathered aims to inform the CMP's policy development, which must address the identified vulnerabilities. Chapter 5 addresses a broad range of subjects, from planning to maintenance, establishing a set of policies to implement in this CMP's context. These policies are framed to reinforce the primacy of Álvaro Siza's design principles, ensure adaptations and new uses are compatible with the significant values of the place, and provide guidance for the care and conservation of significant elements and fabric. Chapter 6 presents the monitoring recommendations aimed at providing a comprehensive framework for future management decisions regarding priorities and a timeframe for implementing conservation actions.

Additionally, the Appendices provide supplementary information. Appendix A gathers the design reports documenting the Ocean Swimming Pool's construction and conservation interventions until 1995. Appendices B and C contain the interviews conducted with the heads of Municipal Council Departments, site managers, and staff. The extended versions of the inspection and diagnosis report and the tolerance for change assessment can be read in Appendices D and E, respectively. Information on the listing process of the Ocean Swimming Pool was included in Appendix F, as well as the admission conditions and user regulations set by the site's current management.

1.1 Ocean Swimming Pool conservation management planning process.
1.2 Building assessment methodology.

STAGE 1	**Understanding the place**
	Gather documentary and physical evidence
STAGE 2	**Assessing significance**
	Identify attributes and heritage values
	Develop a statement of significance
STAGE 3	**Building condition assessment and vulnerabilities**
	Assess physical condition
	Identify vulnerabilities and risks
STAGE 4	**Management and conservation policies**
	Develop overarching policies covering governance and interpretation
	Develop site policies on planning constraints, risk assessment, climate change adaptation and landscape preservation
	Develop detailed conservation and management policies
STAGE 5	**Monitoring and implementation**
	Establish implementation priorities and phasing
	Monitor implementation process

1.1

1.3 Methodology

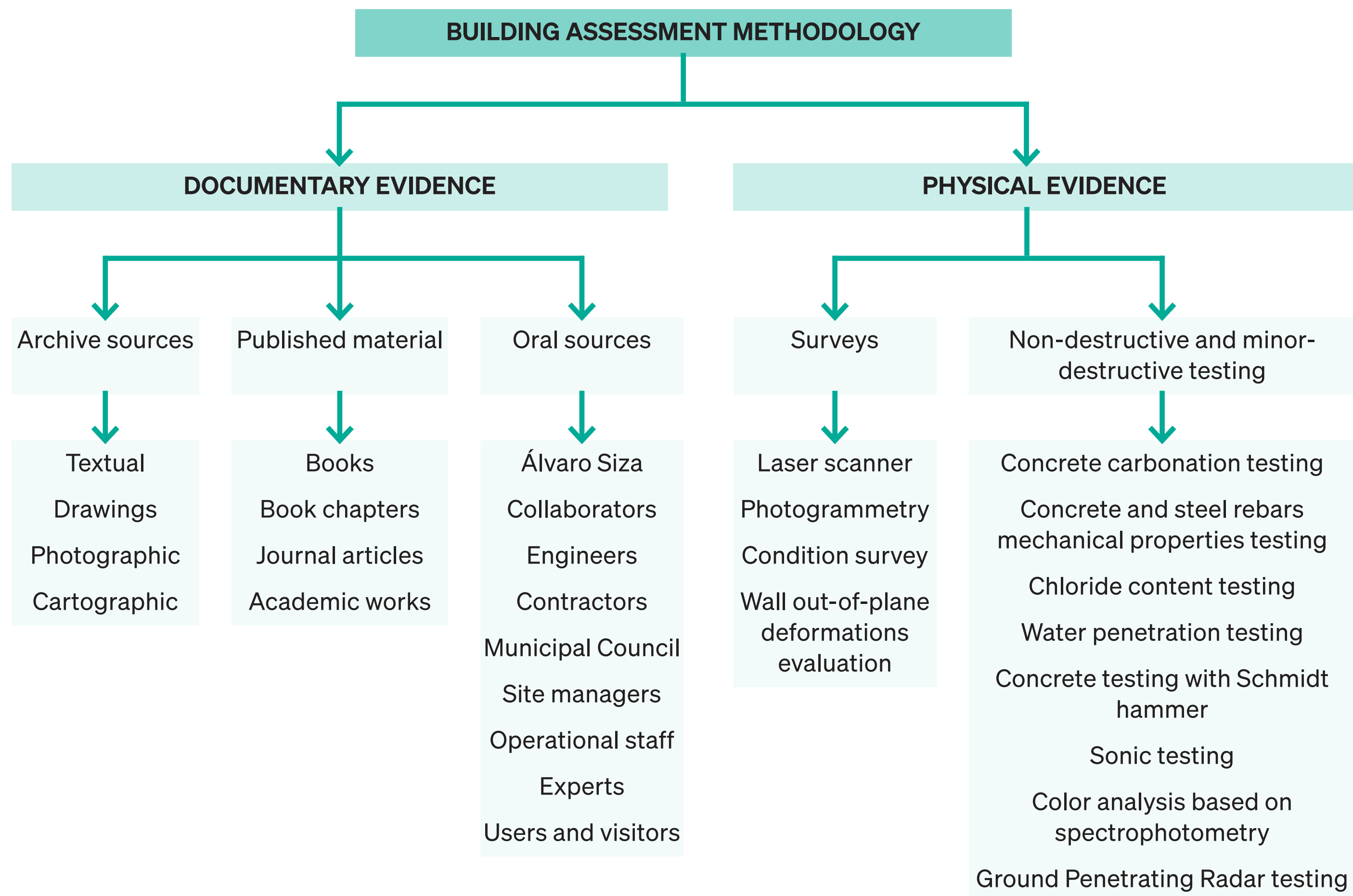
1.3.1 Integrated methodology

The CMP information gathering process includes the integration of both 'documentary evidence' and 'physical evidence' about the site or building (Kerr, 2013).

For the Ocean Swimming Pool, 'documentary evidence' included different kinds of sources from eight archives (written, graphic, photographic, and cartographic materials, among others), published material (more than eighty publications, including books, chapters, articles, and academic works), oral sources (interviews to building actors and to local communities), among others. To collect oral sources and assess the cultural significance of the site, several participation strategies were carried out, namely: i) interviews (building actors - architect, engineer, contractor, owner, site managers, Municipal Council); ii) interviews and surveys to stakeholders (building actors, experts, site managers, users, and visitors); iii) social media; iv) workshops (children, students, experts); and v) other activities (exhibition, visits, documentary film). The cross-analysis of these sources made it possible, even over half a century later, to assess the material history of the building, namely its construction phases and the building materials and technologies applied in its design and construction.

Using the building fabric as the most reliable source (Kerr, 2013, p. 7), the analysis of the 'physical evidence' was also of major importance in the process, supported by a geometric survey (laser scanner and photogrammetry, which allows for 3D BIM modeling for facility management, currently under development), building condition assessment using non-destructive and minor destructive testing. Hence, a laser scanner survey and photogrammetric processing of elevations were carried out. At the same time, inspection and diagnosis included a condition survey, evaluation of the out-of-plane deformations of the walls, and non-destructive and minor-destructive testing. The investigation campaign included: i) concrete carbonation testing; ii) laboratory tests to determine the mechanical properties of the concrete and steel rebars; iii) chloride content testing; iv) water penetration testing; v) concrete testing with Schmidt hammer; vi) sonic testing; vii) color analysis based on spectrophotometry; viii) Ground Penetrating Radar (GPR) testing.

The documentary and physical evidence allowed for the characterization of the building in detail and were the basis for the future definition of conservation and maintenance policies in the framework of the Conservation Plan developed under the *Keeping It Modern* grant awarded by the Getty Foundation to the Ocean Swimming Pool.



1.2

1.3.2 Community-based strategies

Community participation and stakeholder integration are among the best practices for heritage management and conservation, shifting from top-down, reactive, and regulatory approaches towards bottom-up, proactive, and participated approaches integrating communities throughout the process. Hence, this project attempted to overcome the traditional practices that only consider citizens' involvement at the final validation stages of conservation management planning. The variety and broadness of the raised aspects regarding the Ocean Swimming Pool demonstrates the potential of citizens' engagement to build more inclusive and democratic planning policies. Moreover, this research adopted a broad 'community' concept going beyond users and visitors, by also encompassing the perspective of academics, staff, concessionaires, and the Municipal Council.

Cultural significance is understood as the set of tangible and intangible qualities that make a place of value to society (Kerr, 2013, p. 4). The precise identification of the heritage values recognized by specific communities at a particular time and its assessment process is fundamental to inform the development of significance-based policies to guide the conservation, interpretation, and management of the site so that the significance of the place is retained.

Engaging communities in a broad sense, thus, was a fundamental decision within the methodology adopted for the Ocean Swimming Pool CMP. Being a public facility continuously in use, primarily by local communities, made compulsory the integration of these voices, alongside government institutions, experts, and site managers, into the discussion of the future management of change.

1.3 Community-based strategies.
1.4 Correspondence between key heritage values and policy response to sustain significance.

DATA COLLECTION METHOD	SUBJECTS/UNIVERSE/SAMPLING	RELEVANCE	TIME PERIOD
Interviews	Building actors (architects, engineers, owner)	Collecting data on original design and recent conservation Assessing Significance Vulnerabilities, Policies	July 2020-July 2021
	Municipal Council Departments (Culture, Heritage, Planning, Environment, Civil Protection, Environment, Conservation and Maintenance)	Assessing Significance, Vulnerabilities, Expectations Maintenance and User's Manuals Use and Vulnerabilities Protection Interpretation Plan	June 2021
	Site managers and staff (head of division, technical directors, maintenance foreman, receptionist, lifeguard, security guard, cleaning assistant) Bar concessionaire	Assessing Significance, Vulnerabilities, Expectations Maintenance and User's Manuals Interpretation Plan	June 2021
Surveys	Users (bathers) Visitors Staff	Assessing Significance, Vulnerabilities, Expectations Collecting memories	June-July 2021
Social Media	Instagram (virtual community)	Assessing Significance	April-July 2021
Workshops (activity with children, students, sharing memories)	Children (drawing) Students Álvaro Siza, Faculty of Architecture, Municipal Council, Casa da Arquitectura, Architects, Historians and critics (Sharing Memories webinar)	Assessing Significance Collecting Memories Collecting data on the original design and critical reception	June-July 2021 September 2021
Other activities (exhibition, visits, documentary film, symposiums)	Building actors, Archives, Stakeholders and visitors (exhibition) Visitors (visits) Building actors, site managers, viewers (documentary film) Experts, professionals and academics (Symposiums with ISC20C, Getty, ICOMOS Portugal/ France)	Assessing Significance Collecting Memories Collecting data on the original design and critical reception	May-July 2022 July 2021-2022 June 2021 July 2022

1.3

The policy definition of this CMP is sustained by a variety of sources, such as institutional documents and legislation (national and international), observation, and fieldwork, as well as the above-mentioned strategies: interviews (with the building actors, the Municipal Council departments related to the Ocean Swimming Pool and the site managers), surveys, workshops, activities, and social media analysis, engaging different kinds of stakeholders and communities.

The ultimate goal of the policies is to retain, conserve and, where possible, enhance the significance of the place. Thus, the following table establishes a direct relationship between the statement of significance and related values, with the policy response to sustain it.

STATEMENT OF SIGNIFICANCE	CULTURAL VALUE	POLICY RESPONSE TO SUSTAIN SIGNIFICANCE
Outstanding work within the context of the revision of the Modern Movement	Historic	A.2 Álvaro Siza's design principles
Considered a masterpiece by leading international architecture critics	Historic Aesthetic	A.2 Álvaro Siza's design principles
Extensively photographed, filmed, and written about	Historic Aesthetic	A.7 Interpretation Plan / A.10 Archives and Collections
Expressing a tectonic shift from regionalist inspired designs towards a more abstract language	Historic Aesthetic	A.2 Álvaro Siza's design principles
Material integrity has been maintained	Age	B.5 Risk Management Plan/ C.2 Maintenance Plan
One of the first constructions in exposed concrete in Portugal, employing innovative construction systems	Historic Scientific	C.3 Maintenance Plan
Reflects a harmonious integration within the topography and surrounding landscape	Aesthetic Ecological	B.8 Landscape Management Plan
Social and cultural landmark for the community	Social	A.7 Interpretation Plan / A.8 Communication strategy / A.9 Community Engagement
One of the most sought after attractions in Matosinhos	Economic	C.5 Capacity and entrance control
An exceptional case of an architect preserving his own work while enhancing its significance	Historic Aesthetic	C.1 Significance and tolerance for change
Is included in the Tentative List for World Heritage Status as a component property of 'Álvaro Siza's Architecture Works in Portugal' and is listed as a National Monument	Political	B.2 Cultural Heritage Safeguarding

1.4

1.4 Safeguarding of modern architecture in Portugal: preserving the legacy of Álvaro Siza

Despite its international recognition, 20th-century architecture in Portugal is a 'heritage at risk' since it belongs to a recent past that has not yet been sufficiently recognized, either by the Portuguese management and safeguarding organizations or by the general public. There are few listed buildings (Tostões, 2013), and many are threatened by advanced degradation (due to lack of use and maintenance) or intrusive and transforming interventions.

Nevertheless, some positive programmes have been implemented in the form of inventories and surveys undertaken by DOCOMOMO Iberico, the Inventory of 20th-century architecture in Portugal - (Inquérito à Arquitectura do Século XX em Portugal - IAPXX) developed by the Portuguese Association of Architects (Ordem dos Arquitectos), the National Inventory of Architectural Heritage (Sistema de Informação para o Património Arquitectónico - SIPA) and the recent listing of 20th-century buildings carried out by the Directorate-General for Cultural Heritage (Direcção-Geral do Património Cultural - DGPC), among others. Moreover, seminars, exhibitions, and publications on these subjects have gradually increased, indicating a growing recognition and interest by the academic and professional communities (Ferreira, 2014).

In the international context, the conservation of 20th-century architecture has been a matter of intense debate over the last three decades, with the consensus that existing philosophical approaches are broadly applicable and should follow an architectural reflection based on a casuistic approach; still, there are some specific technical challenges which require careful consideration (Macdonald 2013, p. 8). Regarding this subject, the Madrid Document (2011) settles some principles for the conservation of 20th-century architecture, namely prior in-depth knowledge of material signs, "including physical location, design, construction systems and technical equipment, fabric, aesthetic quality and use", as well as of its intangible values, such as "historic, social, scientific or spiritual associations, or creative genius" (ICOMOS ISCAH20, 2011, p. 1).

However, some authors maintain that there has been a prevailing trend (particularly regarding the so-called iconic buildings) privileging the formal value of this architecture by restoring an original image and neglecting its material or intangible attributes and values (age, use, social), integrity, authenticity, and aura. Others defend the concept of 'progressive authenticity' (Jerome, 2009), referring to some material signs and alterations that can be preserved as part of the history of the building in time.

On this matter, Álvaro Siza maintains that "in conservation works, there is a mandatory requirement which is, in my opinion, absolute integrity. It is not necessary to change things unless, as I mentioned before, in special or exceptional cases" (Siza, 2011, p. 188), resisting the tendency of leaving the architect's 'signature' in his interventions (Siza, 2005, p. 21).

Sixty years after the construction of the Ocean Swimming Pool, Álvaro Siza carried out the conservation and extension of the bathing complex (2018-2021). According to Siza, one of the greatest challenges was the conservation of the exposed concrete given the numerous anomalies it presented, taking into account that any localized repairs (preferable to a complete replacement, in his opinion) would necessarily be visible. Thus, by assuming the impossibility of disguising 'patches' in the concrete – that is, "neither wanting nor being able to hide what the passage of time determines" (Siza, 2018) – Siza chose to assume some aging signs as 'scars of time' that testify to the material history of the building. In his words, this is also the "most brutalist" (Siza, 2019) attitude and, therefore, correspondingly coherent with the option of truth through the expression of raw materials advocated in the original project.

The recent intervention by Siza represents an interesting case of an architect intervening in his own work. By enhancing its significance while preserving the architectural integrity of the ensemble, Siza definitively finishes the work to the north and sustains its integration into the landscape requalification of the Leça da Palmeira seafront.

1.5 Authorship and acknowledgments

The Ocean Swimming Pool CMP was prepared by Teresa Cunha Ferreira with considerable research and editorial assistance from Hugo Mendonça. As senior consultants of this CMP, Rui Fernandes Póvoas, Paulo B. Lourenço, and Ana Tostões assisted in the process.

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The *Keeping it Modern* grant allowed for the localized repair of exposed concrete, conducted in two locations by a team from the Civil Engineering Research and Innovation for Sustainability (CERIS), composed of Judite Miranda, Jonatas Valença, Hugo Costa and Eduardo Júlio, and on two other pilots, performed by the specialized conservator-restorer Pedro Antunes (Cinábrio Restauro).

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1. INTRODUCTION

2. UNDERSTANDING THE PLACE

2.1 Introduction
2.2 History of the place
2.3 International and national context
2.4 Project commission
2.5 Design and construction
2.6 Critical reception
2.7 Programme distribution
2.8 Stakeholders

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2. UNDERSTANDING THE PLACE

2.1 Introduction

Chapter 2 summarizes the historical development of the Ocean Swimming Pool, from its original design until the present day, framing it on the evolution of a particular territory and as a result of a specific international and national context. This historical knowledge is essential for a full understanding of the form and fabric of the place, its components, and the relationship it establishes with the setting. Its purpose is to inform the CMP's assessment of cultural significance and the development of conservation policies.

The chapter starts with a brief record of Leça da Palmeira's historical development until 1960 (2.2). It is followed by an analysis of the post-war architectural context, both on an international and national level (2.3). The fourth section (2.4) is centered on the project commission, detailing the urban redevelopment strategy of which the Ocean Swimming Pool was part, the programme definition, and the choice of location, besides providing brief biographical remarks on the most significant building actors.

The fifth section (2.5) presents a thorough chronology of the design process, describing the evolution of the proposals as a result of changing requirements and new extensions. It also identifies Álvaro Siza's design principles which should inform the definition of conservation policies and any proposals for future changes, together with the identification of the building materials and techniques employed. Furthermore, section 2.6 analyses the critical reception of the Ocean Swimming Pool since its construction, comprising national and international publications and exhibitions. The last two sections include a description of the program distribution (2.7) and the identification of the different stakeholders involved in the site's management (2.8).

Gathering and examining documentary and physical evidence is the first stage of any Conservation Plan (Kerr, 2013, p. 4). Therefore, when preparing the Ocean Swimming Pool's CMP, the most significant information regarding first-hand involvement with the place was collected from the archival holdings of the Canadian Centre for Architecture (CCA), where the bulk of Álvaro Siza's archive is held, the personal archive of the architect and the Municipal Archive of Matosinhos. If the former allowed for a detailed understanding of the evolution of the design and its changes over time through plans and sketches, the latter provided information regarding program requirements, construction specifications, technical opinions, and submission dates.

Relevant graphic and written documentation was also collected from the FAUP Documentation Centre (CDUA-FAUP), Espólio Fotográfico Português, Serralves Foundation, and Casa da Arquitectura, amongst other private archives of architects, photographers, engineers, and conservators. Moreover, given the interest the Ocean Swimming Pool has sparked since its construction, both nationally and internationally, over eighty publications on the subject, including books, chapters, articles, and academic dissertations, were also considered for this research. Oral evidence also played a crucial part in this context, namely the invaluable testimony of Álvaro Siza and a series of interviews and surveys conducted with the communities and site managers.

The above-mentioned documentary and oral evidence collected were combined with a detailed examination of the existing fabric to achieve a thorough understanding of the place.

2.2 History of the place

Leça da Palmeira is a parish of approximately 6 km² located at the Leça river's right bank, next to its mouth. Together with the parish of Matosinhos, they form the urban nucleus of the Matosinhos municipality, a city of 170 000 inhabitants in the vicinity of Porto (INE, 2021).

The earliest evidence of human settlement in this territory is the remains of a hillfort nearby the Leça estuary that dates back to the Iron Age. With the beginning of the Roman occupation, the populations gradually moved from the hilltops to the valley's fertile lands, taking advantage of the optimal conditions for the practice of agriculture. The natural configuration of the estuary, sheltered by numerous rocky outcrops (the Leixões), allowed for the establishment of maritime trade with the south of the peninsula and the Mediterranean as early as the 2nd century BC (Santos, 2017, p. 29).

Despite the construction of a fortification to protect the estuary mouth during the 17th century, Leça da Pameira remained a small maritime village devoted to agriculture and fisheries, with clusters of rural houses set along the river bank. It was only during the second half of the 19th century that some English families associated with the trade of port wine, and Porto's bourgeoisie started to visit the area with regularity, initially staying in rented houses and later building their own residences (Oliveira, 1999, p. 98). The main reason for this sudden interest had to do with the sea and river baths, a habit that saw an increase in popularity throughout European countries in the eighteen hundreds since it was thought to have therapeutic properties. This attractiveness led to the significant expansion of the village that would see its rural constructions give way to bourgeois weekend chalets and small hotels, along with the paving of roads and the creation of a public park (Santos, 2017, pp. 47-49).

Leça's very intimate relationship with the riverside, however, would see a drastic change in the late 19th century when alternatives to the Douro harbor began to be sought due to the difficulties in entering the river mouth that originated, along the years, numerous shipwrecks and significant losses to the city's commercial actors. Due to its proximity and favorable natural setting, the Leça river estuary was chosen as an alternative harbor for vessels to wait in calmer waters when adverse conditions prevented the entrance into the Douro river mouth (Cleto, 1998, pp. 14-17). The design, by the engineer Afonso Joaquim Nogueira Soares, consisted of two jetties perpendicular to the coast, one to the north of the river mouth, in Leça da Palmeira, and one to the south, in Matosinhos. These were laid out in an arch configuration, taking advantage of the preexisting set of rocks as their foundations, the aforementioned Leixões, the name for which the port would eventually be known.

The construction of the two jetties and the increasing movement of ships inside the harbor originated a progressive decrease in the water quality of what was formerly the bathing beach by the river mouth, which led to its displacement to the north, to be outside the port (Oliveira, 1999, pp. 102-103). This change would be of paramount importance for Leça's future development and expansion along the seafront. Since the nearby Douro River was getting silted up and the increase in the steamboats' size prevented them from traveling in it, Leixões would progressively start assuming the leading role as the main commercial port from then on. The future extensions to the port would take place inward, towards the land, through the excavation of docks along the Leça riverbank (Cleto, 1998, p. 25). The opening of the first dock in 1940 put an end to the close relationship between both parishes (of Leça and Matosinhos) and the river's natural course, being, from that point onwards, separated by the new industrial infrastructure.

This significant change to the south was accompanied by a renewed interest in the unexplored beach extension to the north after the construction of the Boa Nova lighthouse in 1927 (Oliveira, 1999, p. 109). Thus, while the excavation of the artificial port was taking place, the earth removed from the river bank was being used for the construction of the coastal avenue facing the Atlantic. This would represent the first step in the touristic and leisure-oriented redevelopment of Leça da Palmeira, in which the Ocean Swimming Pool designed by Álvaro Siza (1933-) would play a key part.

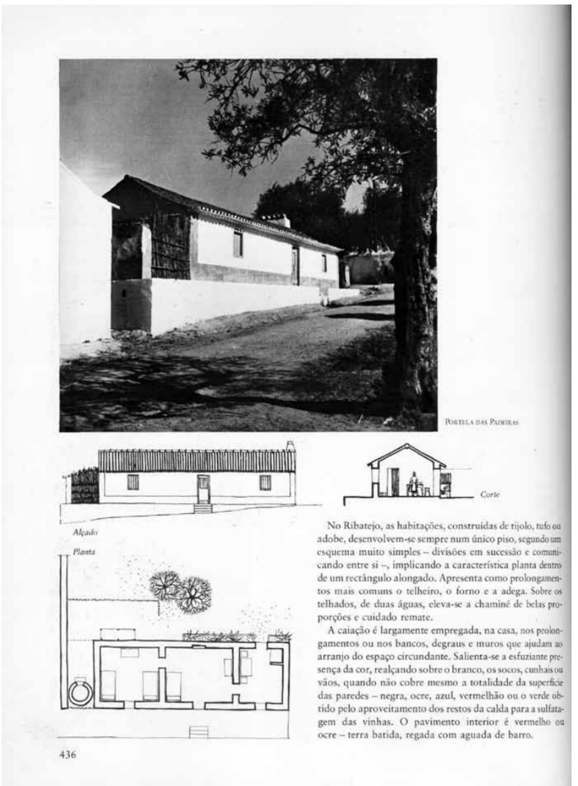

2.1


2.2

2.1 Leça da Palmeira beach, n/d.
2.2 Leixões port, 1962.
2.3 Leça da Palmeira coastline before the construction of the avenue, n/d.
2.4 Leça da Palmeira coastal avenue, 1960.


2.3


2.4



Portela das Padeiras

Alçado

Planta

Corte

No Ribatejo, as habitações, construídas de tijolo, tufo ou adobe, desenvolvem-se sempre num único piso, segundo um esquema muito simples – divisões em sucessão e comunicando entre si –, implicando a característica planta dentro de um rectângulo alongado. Apresenta como prolongamentos mais comuns o telheiro, o forno e a adega. Sobre os telhados, de duas águas, eleva-se a chaminé de belas proporções e cuidado remate.

A caiação é largamente empregada, na casa, nos prolongamentos ou nos bancos, degraus e muros que ajudam ao arranjo do espaço circundante. Salienta-se a esfuziante presença da cor, realçando sobre o branco, os socos, cunhais ou vãos, quando não cobre mesmo a totalidade da superfície das paredes – negra, ocre, azul, vermelhão ou o verde obtido pelo aproveitamento dos restos da calda para a sulfatagem das vinhas. O pavimento interior é vermelho ou ocre – terra batida, regada com aguada de barro.

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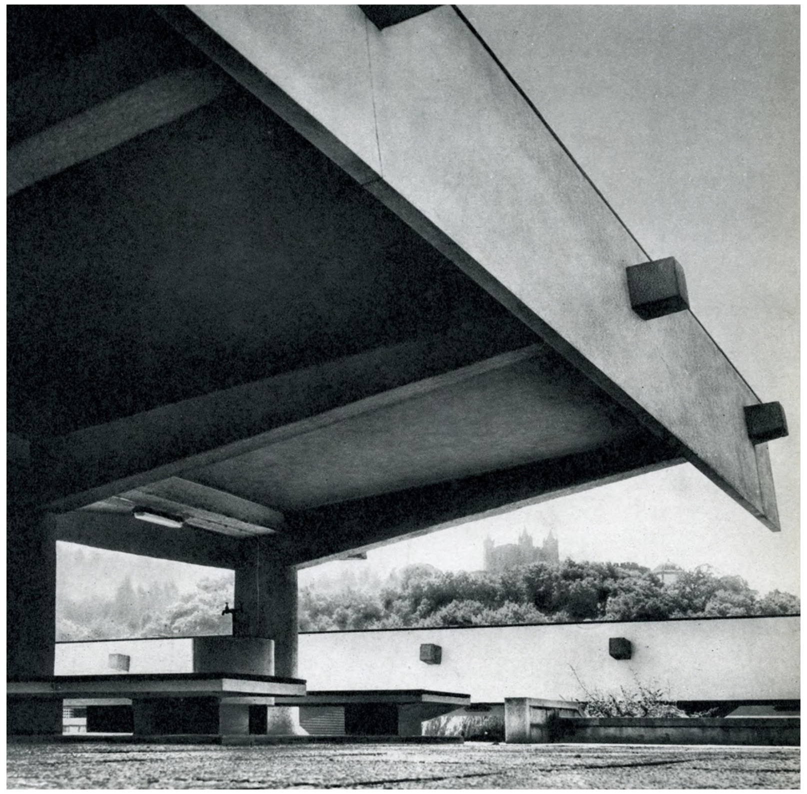
2.5



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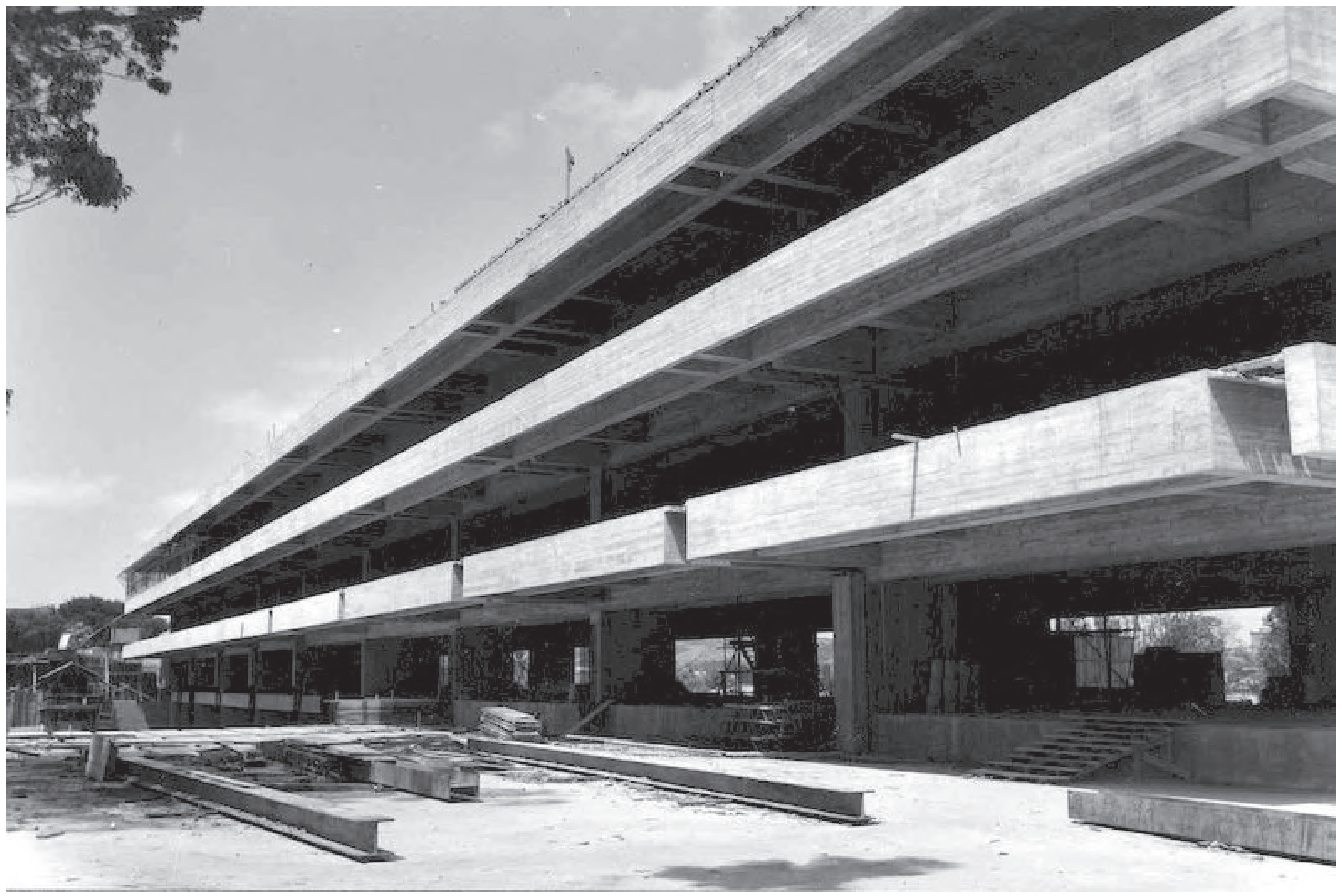

2.7

2.3 International and national context

In the aftermath of World War II, the positivist faith of the Modern Movement was being called into question, and a revision process was on its way. At the forefront of this process was the Italian architect and historian Bruno Zevi (1918-2000), who published in 1945 *Verso una architettura organica* (Towards an Organic Architecture), in which he re-evaluated Frank Lloyd Wright's work that he considered to have been neglected by Siegfried Giedion (1888-1968) in *Space, Time and Architecture* (1941) and sought for an organic overcoming of the rationalist standstill. The social emerges as the founding dimension of the 'organic project', replacing a pre-formulated objectual dimension attributed to rationalism. Alvar Aalto (1898-1976) was seen, at the time, as a vivid example of this path (Figueira, 2014, pp. 22-23).

During the mid-1950s, new contributions to overcome the crisis emerge. Ernesto Nathan Rogers (1909-1969), at the head of Casabella-Continuità magazine (1954-1965), wishes to reaffirm the continuity of history without denying the original actions of the Modern Movement, framing it in the course of history and suggesting that the future of the practice should be built upon its lessons in order to surpass it (Rogers, 1957). Ultimately his goal was that the avant-garde logic gave way to a process of evolution through continuity, in which the focus was not on stylistic affiliation but on method.

This perspective was met with the fiercest opposition by the English architecture critic Reyner Banham (1922-1988), who thought that the Modern Movement had failed for not pursuing the functionalist ideals to the utmost extent (Banham, 1955). Appropriating Le Corbusier's expression "L'architecture, c'est avec des matières bruts, établir des rapports émouvants" (Le Corbusier, 1923, p. 121), he launched, in 1955, the 'new brutalism' that was based on the clear exhibition of structure, the valuation of materials 'as found' and memorability as image. The subsequent development of the Brutalist style found much of its vocabulary in the late work of Le Corbusier. His revitalization of the Mediterranean vernacular proved seminal to the formation of the Brutalist sensibility, deeply rooted in popular culture and the anthropological aestheticism of Jean Dubuffet's art brut (Figueira, 2014, p. 36).

2.5 Sindicato Nacional dos Arquitectos (1961) *Arquitectura Popular em Portugal*. Lisboa: Sindicato Nacional dos Arquitectos.
2.6 Municipal Market of Vila da Feira (1954-1959) designed by Fernando Távora.
2.7 Calouste Gulbenkian Foundation Headquarters (1959-1969) designed by Alberto Pessoa, Pedro Cid and Ruy Jervis d'Athouguia

Portugal was not immune or unaware of the debates that were taking place, even though between 1933 and 1974, the country was under the dictatorial rule of António de Oliveira Salazar (1889-1970), which sought to impose a romantic vision of vernacular values on Portuguese architecture, combined with an imperial monumentality influenced by Nazi Germany and Fascist Italy (Fernandes and Pereira, 2019). The architect Fernando Távora (1923-2005), considered to be the master of the School of Porto, and who had Álvaro Siza as his direct disciple and collaborator, actively participated in the last four CIAM (Congrès Internationaux d'Architecture Moderne) that took place in the 1950s.

Already in 1945, Távora had published a text entitled 'The Problem of the Portuguese House', in which he criticized Salazar's official architectural doctrine and defended the idea that architecture built in Portugal should simultaneously be Portuguese and Modern (Távora, 1945). Many of his colleagues defended an uncompromising internationalism three years later at the 1948 Congress of Portuguese Architects (Sindicato Nacional dos Arquitectos, 1948). Nevertheless, it seemed too late to implement modern internationalist architecture by pre-World War II standards.

As a compromise between modern rationalism and the proximity to local contexts, the architect Francisco Keil do Amaral (1910-1975) claimed that the study of traditional constructions and of the context that shaped them would help in making contemporary design decisions (Ferreira, Barbosa and Fernandes, 2021). His appeal was answered, in 1955, with the beginning of the fieldwork for the *Survey on Regional Architecture in Portugal*, a State-funded program promoted by the Union of Portuguese Architects, which would be "*of the greatest cultural and political significance, working as a lever for the rescue of the modern tradition made either with the incorporation of local preexistences as well as the interpretation of the avant-gardes*" (Tostões, 2022, p. 29).

The discussions that were taking place within the context of the modern revision, both on an international and national level, with the reflection dictated by the *Survey*, were at the origin of the synthesis between an organicist functionalism and the vernacular (Tostões, 2016, p. 45) that Fernando Távora achieved in works such as the Municipal Market of Vila da Feira (1954-59), the Ofir House (1957-58), the Tennis Pavilion of Quinta da Conceição (1956-59) and the Cedro Elementary School (1957-61).

Between 1955 and 1961, a period that saw the launch of the architectural competition for the design of the Calouste Gulbenkian Foundation Headquarters (1959) and the publication of the *Survey*'s results under the title *Arquitectura Popular em Portugal* (1961), a new Portuguese Architecture emerged, "*made with programmatic, formal and spatial invention, where the local vernacular is synthesized with disparate international references (...) in which the Portuguese circumstance of technological backwardness constitutes a potential to be explored with the use of a competent artisanal workforce*" (Tostões, 2022, p. 29).

2.4 Project commission
2.4.1 Coastal Development Plan

The idea to foster the economic development of Leça da Palmeira through tourism had in Fernando Pinto de Oliveira (1911-1975) one of its main promoters. First, as a municipal councilor in charge of tourism (1955-1958) and afterward as mayor (1958-1970), he was a relentless worker in pursuing his goal of modernizing Leça and transforming it into a relevant leisure destination.

In very close articulation with Henrique Schreck from the port administration and the architect Fernando Távora, he prevented the installation of industrial warehouses in the proximity of the docks, preserving the surrounding green areas and bourgeois estates. One of those estates, the Quinta da Conceição, was acquired by the Municipal Council and transformed into a public park by Távora, whose design included a tennis court and a swimming pool (under the responsibility of Álvaro Siza, who worked, at the time, in Távora's office), a museum, a library, an exterior amphitheater, while preserving numerous architectural artifacts from the convent that occupied the plot until the 19th century (Pinto, 2011, p. 145).

The seafront of Leça was at the core of Pinto de Oliveira's transforming strategy, for which he envisioned not only the extension of the coastal avenue further north, as numerous leisure infrastructures. These included the renowned Boa Nova Tea House and Restaurant (1958-1963), designed by Álvaro Siza, as well as a campsite, a hippodrome, and some restaurants, besides the Ocean Swimming Pool (Santos, 2017, p. 112). In an attempt to protect this vision, the Municipal Council commissioned, in 1966, additional urban plans for this area to the architect Arménio Losa (1908-1988). One of the main goals of these plans was to prevent the construction of any significant industrial building along the seafront. These attempts, however, did not succeed since the Petrogal's oil refinery was constructed in 1970 by the Boa Nova lighthouse, in an area where Pinto de Oliveira envisioned the construction of a golf course.

In 1954, the Municipal Tourism Commission's president, Edmundo Ferreira, identified the need, for the first time, to build a swimming pool in Leça da Palmeira. This intention would be formulated again in 1957, as the action was deemed necessary to overcome the difficulties presented by the sea condition during the bathing season (Pinto, 2011, pp. 152-154). The engineer Henrique Schreck and the port's commander Basílio de Sousa Pinto are entrusted with studying the coast in detail to identify the most suitable and economical location for the pool. Even if everything already seemed to point to the solution that would eventually be chosen, some ambiguity regarding the location of the pool remained, as testifies to the acquisition by the Municipal Council of a plot by the coastal avenue for this purpose.

In 1958, the Tourism Commission presented a proposal to build a saltwater swimming pool with a seafood restaurant to the north of Leça's beach. This area, known as *meia laranja*, consisted of a coastal avenue platform extending over the beach where a rocky outcrop already presented a natural cove. The Commission's view on this matter was that the construction should not rise above the avenue level to safeguard the surrounding landscape, admitting the possibility of building directly over the rocks (Pinto, 2011, p. 154). It must be said that this favorable location was already being explored for lobster farming and that to the south there was a previous bathing pool limited by a low semicircular wall where people could bathe when the sea conditions were rougher.

Even if there is a decision of the Municipal Council to promote a public competition for the pool's preliminary design, the fact is that it never took place. Instead, in November 1959, the Municipal Council promoted a direct consult to the firm Ribeiro da Silva, Lda., which was a public works company specialized in maritime works, to assess the feasibility of the project and a first cost estimate (Ferrão, 1960, p. 1). At this stage, the project consisted solely of an artificial tank that would fill and empty according to the movement of the tides. For economic reasons, the tank should take advantage of the preexisting rocky outcrops as its limits and adapt to the existing bedrock with minimum regularization. Within this program, the aforementioned company sent a description of the required works and the respective estimate to the Municipal Council, that, in its turn, requested the presentation of the definitive design and the conditions under which the contractor could undertake the execution of the work with the intent of having it finished before the 1960 bathing season. Nonetheless, the sensitive nature of the context in which the intervention would take place made it clear that a study of its urban arrangement was necessary, leading to the indication of the architect Álvaro Siza to integrate the design team (Ferrão, 1960, pp. 1-3).

2.8 Boa Nova Tea House and Restaurant (1958-1963) designed by Álvaro Siza.
2.9 Quinta da Conceição Swimming Pool (1958-1965) designed by Álvaro Siza.
2.10 Bathing pool at Leça beach, 1947.
2.11 Leça da Palmeira coastal avenue, 1960.
2.12 Leça da Palmeira coastal development plan (1966) conceived by Álvaro Siza.
2.13 Leça da Palmeira coastline during the oil refinery's construction, n/d.


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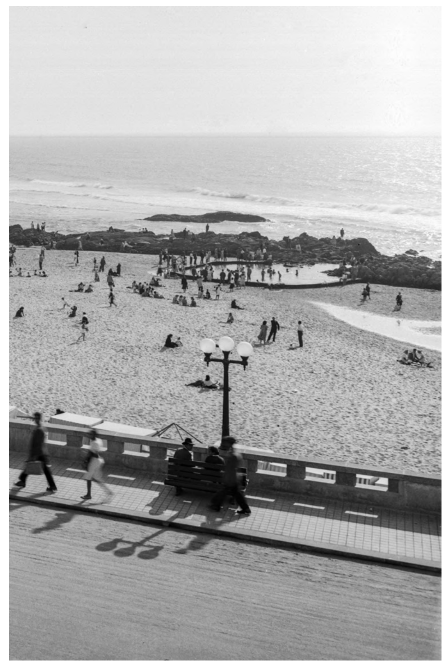
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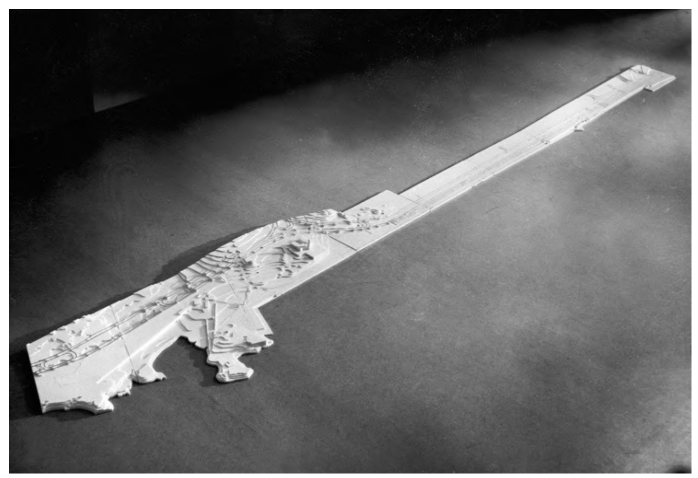
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2.4.2 Building actors

Fernando Pinto de Oliveira (1911-1975)

Fernando Pinto de Oliveira attended the Superior Institute of Agronomy of the Technical University of Lisbon, where in 1938 he graduated as an agricultural engineer. In 1955, he joined the Matosinhos Municipal Council as a councilor in charge of tourism. He presided, by inherence, the Municipal Tourism Commission, where he carried out a relevant action, creating the Tourism Office, where art exhibitions and other shows were hosted. He also held the position of vice-president, which meant that after the death of Fernando da Hora Aroso (the former mayor), he was appointed for the position of President of the Municipal Council (1958-1970). During his mandate, he pursued the implementation of his vision for the economic development of the municipality through tourism, promoting the acquisition of former bourgeois estates that were transformed into public parks, the extension of the coastal avenue further north, and the construction of multiple infrastructures along the coast as the Boa Nova Tea House and Restaurant, the Angeiras campsite or the Ocean Swimming Pool (Pinto, 2011).

Bernardo Ferrão (1913-1982)

Bernardo Ferrão graduated as a civil engineer from the Faculty of Engineering of Porto in 1938, starting his career as an employee of the Directorate-General for Hydraulic Services. In 1948 he started his own practice, specializing in major public works, among which the riverside road along the Douro, its retaining walls, and the Ribeira tunnel (the first road tunnel built in Portugal) are worthy of mention. He pioneered the use of bituminous pavements and introduced numerous technologically innovative solutions in his bridge designs, such as the use of heavy prefabrication and pre-cast concrete. On the other hand, as a prolific writer and editor, he collected information relating to the technical state of the art (retaining walls and masonry coatings (Ferrão, 1945), construction legislation and regulations (Ferrão 1947; 1962a), public works contractors (Ferrão, 1962b) and the accounting of public works (Ferrão, 1963), among other subjects.

Thus, due to his great expertise, Bernardo Ferrão played an important role, working both as an engineer and a contractor in the construction of the Ocean Swimming Pool, which was one of the first in the country to make use of exposed concrete (Ferreira, Barbosa and Fernandes, 2021).

2.14

Álvaro Siza (1933-)

Born in Matosinhos in 1933, Álvaro Siza studied architecture at the Fine Arts School of Porto (Escola Superior de Belas Artes do Porto) from 1949 through 1955. His early career was closely linked to that of his teacher and colleague Fernando Távora, with whom he worked between 1955 and 1958. Through this association, he had the opportunity to design the Boa Nova Tea House and Restaurant (1958-1963) and the Quinta da Conceição Swimming Pool (1958-1965), both in Matosinhos. In 1966 he started teaching at the Fine Arts School of Porto and ever since has been a visiting professor at numerous universities, namely at Harvard University, University of Pennsylvania, Los Andes University of Bogota, and the École Polytechnique de Lausanne, besides being a guest lecturer in many others (Castanheira, 2009, p. 298).

After the 1974 Portuguese Revolution, Siza started working on a series of social housing projects for the cities of Porto, Évora, Berlin, The Hague, and Venice, among others. These commissions brought him significant international recognition, and from the late 1970s onwards, he increasingly worked outside Portugal. The ensemble of his work, comprising more than 500 projects and built works in 16 countries and 4 continents, earned him many awards, including the Mies van der Rohe Award for European Architecture (1988), the Pritzker Architecture Prize (1992), the Japan Art Association's Praemium Imperiale prize for architecture (1998), the Royal Gold Medal for Architecture of the Royal Institute of British Architects (2008) and the Golden Lion for lifetime achievement at the Venice Architecture Biennale (2012).

2.14 Fernando Pinto de Oliveira at the opening of the Municipal Park of Quinta da Conceição, 1960.
2.15 Álvaro Siza presenting the design of Boa Nova Tea House and Restaurant, 1960.

2.15

2.5 Design and construction

2.5.1 Design chronology

1960

Even though the first design presented in 1960 by the engineer Bernardo Ferrão envisaged the construction of a swimming pool in front of the *meia laranja* structure (measuring 20 x 33.33 m), the sanitary need for water treatment was soon identified, preventing the use of the tides to supply the pool. The progressive increase in the programme's complexity and the understanding that it would be desirable to study the urban arrangement of the place led to the indication of the architect Álvaro Siza to collaborate on the commission. As a result, new design options emerged: the use of exposed concrete instead of stone masonry, the tops of the swimming pool support walls measuring just 1 m, ladders, and removable railing, the need for a children's pool in a place to be defined, among others (Ferrão, 1960, pp. 2-3). If the first drawings (plans and sections) only show the adults' pool and a water treatment facility, sketches from 1961 already depict the children's pool and an architectural solution that is very close to the definitive one.

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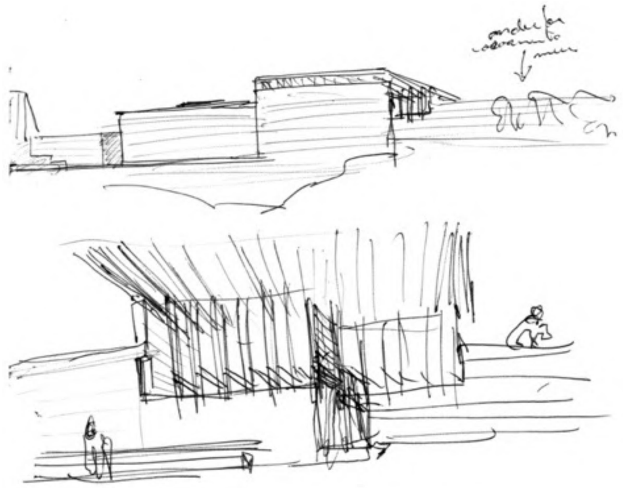

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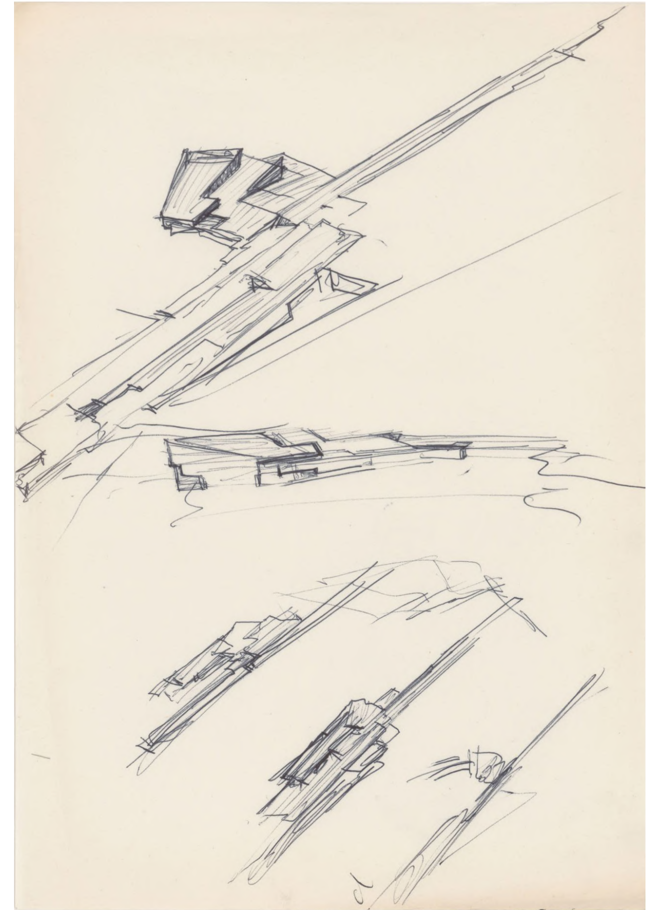
2.16 Beginning of the pool's construction, 1961.
2.17 Sketches of the changing room's building, 1961.
2.18 Plan of the swimming pool as envisaged by Bernardo Ferrão, 1960.

2.18

1962

As part of a plan to enhance the landscape of the Leça da Palmeira seafront, Álvaro Siza presents, in 1962, a first preliminary design with two pools (for children and adults, taking advantage of the terrain's topography), and a support building (equipped with changing rooms, bathrooms and a water treatment facility), running parallel to the retaining wall of the avenue. The *meia laranja* structure would then be demolished to make way for the new building and a solarium area (Siza, 1962, p. 1). Articulated perpendicularly with the volume of the changing rooms, to the north, it was foreseen the existence of a restaurant with a fan distribution and sloping roofs, which would not be built. Several drawings attest to the formal research of the changing rooms and restaurant volumes. Hygienist concerns are already apparent at this stage, namely the separation of shoed and barefoot circuits, the foot washing basins, and the suspension of wooden structures to allow for the washing of the floors. Judging by the dates of detail drawings, the construction is thought to have been carried out between 1963 and 1964, despite the project's entry record in the Municipal Council dating of April 1965.



2.19 Sketches of the overall composition with the (unbuilt) restaurant volume, n/d.
2.20 Preliminary plan, 1962.

2.19

2.20

1965

The set of drawings from 1965, signed by Siza and Ferrão, systematizes what was initially built and which existed at the time of the swimming pool's opening in May of that year. From the 1962 draft, the configuration of the children's pool and the changing rooms, bathrooms, and water treatment building, accessed by a ramp from the avenue, is maintained. The solarium is extended and equipped with a set of concrete platforms and stairs that ensure the connection between the different levels of these permanence areas. The bar's design was still being studied, with only its intended location indicated on the plan. The design report, dated February 1965, details the project's evolution, the dimensioning of spaces, the construction and materials, and the operation of equipment and technical installations (Siza and Ferrão, 1965). The adopted construction system is characterized by lightly reinforced concrete walls supporting a Baltic pine roof structure clad with copper. This is the richest phase in terms of designed and photographic documentation, setting out the materialized solutions, together with photographs illustrating the first moments of the pool's operation.

2.21 Ocean Swimming Pool's surrounding context, 1965 (previous spread).
2.22 Changing rooms' building and walkway over the children's swimming pool, n/d.
2.23 Men's changing room, n/d.
2.24 Plan, 1965.

2.22

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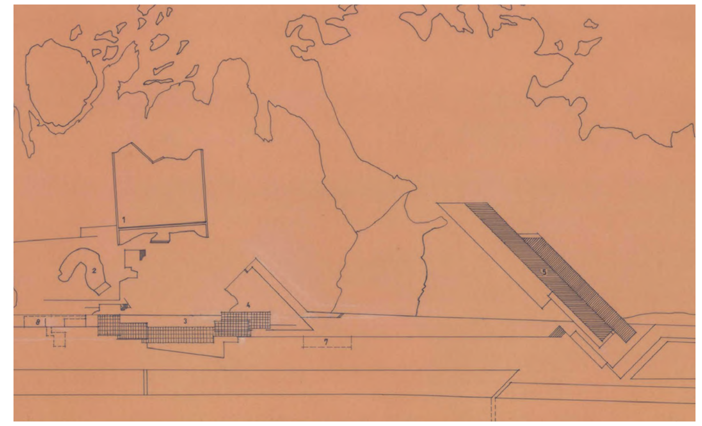
2.24

It was also in 1965 that Álvaro Siza presented the preliminary design of a restaurant located to the north of the complex, the need for which is based on the first months of operation experience of the swimming pool. This building is set on a rocky massif, forming a 45º angle with the retaining wall of the avenue to accentuate the boundary of the enclosure and shelter it from the prevailing winds (Siza, 1965, p. 1).

2.25 Restaurant site plan, 1965.
2.26 Sketches of the restaurant building, n/d.
2.27 Restaurant's first and second floor plans, 1965.



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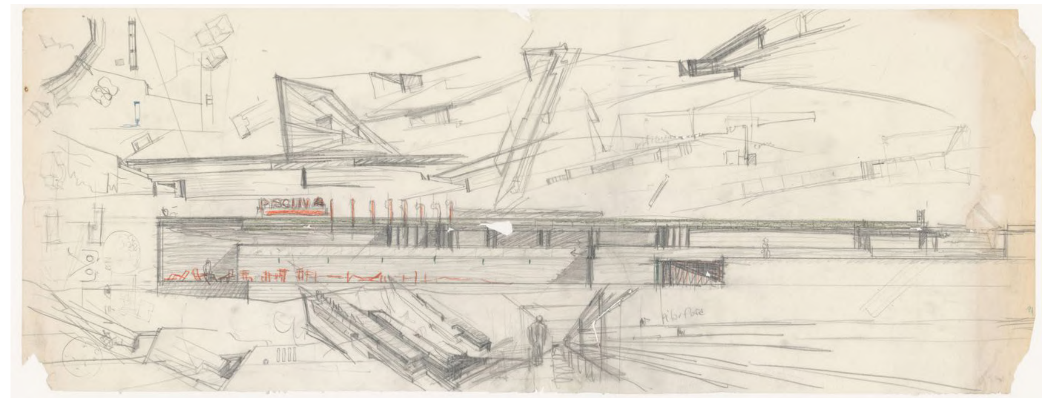

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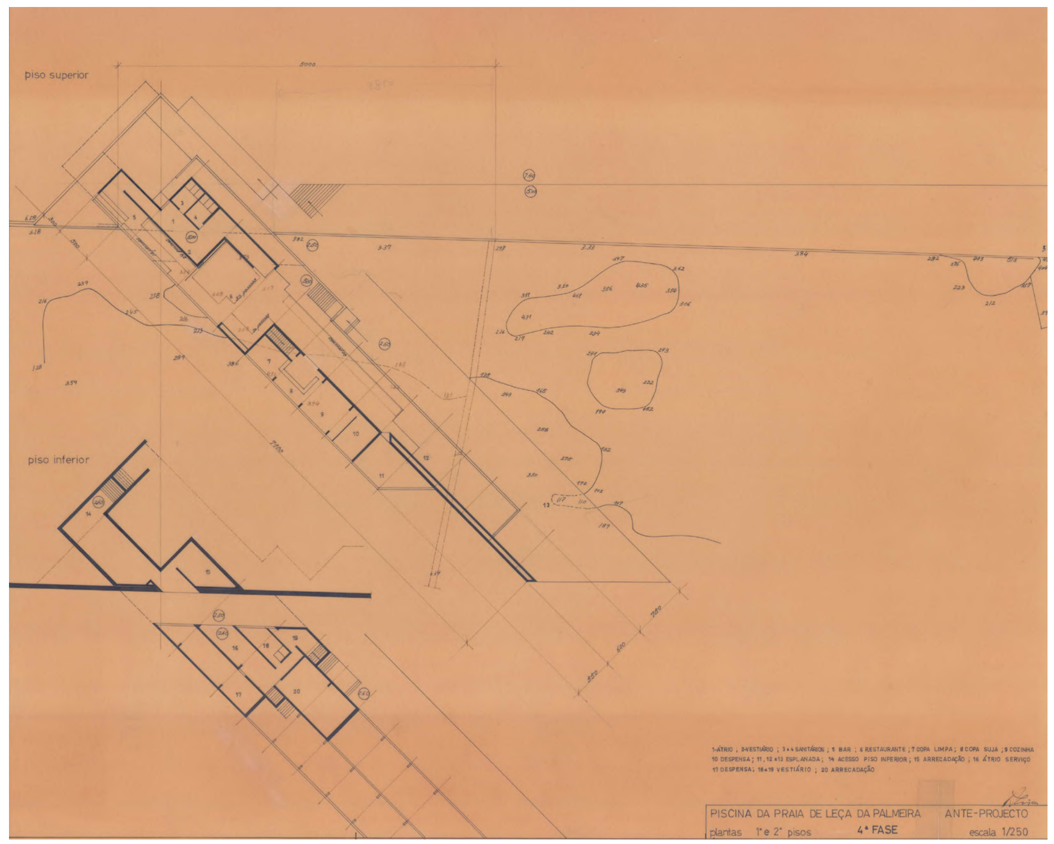


2.27

1966

The 1966 design envisages the enlargement of the enclosure at its northern and southern ends to solve the embedding of the buildings in the retaining wall of the avenue (namely the encounter between the exposed concrete and the granite masonry), as well as a programmatic and circulation clarification (Siza and Ferrão, 1966, p. 1). The previous lack of definition regarding the design of the bar and the bathrooms for shoed users led to its functioning in provisional structures. Having demonstrated the correctness of the bar setting, its definitive construction is planned on the same location, now equipped with a terrace protected from the prevailing winds by a wall oriented at a 45º angle in relation to the changing rooms building. This phase would also entail the construction of bathrooms for shoed users (to the north) and storage rooms (to the south) under the retaining wall of the avenue. As a result of several setbacks, namely the need to overcome the successive objections raised by the Water Sanitary Board (Junta Sanitária de Águas), the start of the construction work would only take place at the beginning of the following decade (1970).

2.28

2.28 Sketches of the bar's terrace, n/d.
2.29 Bar's terrace, n/d.

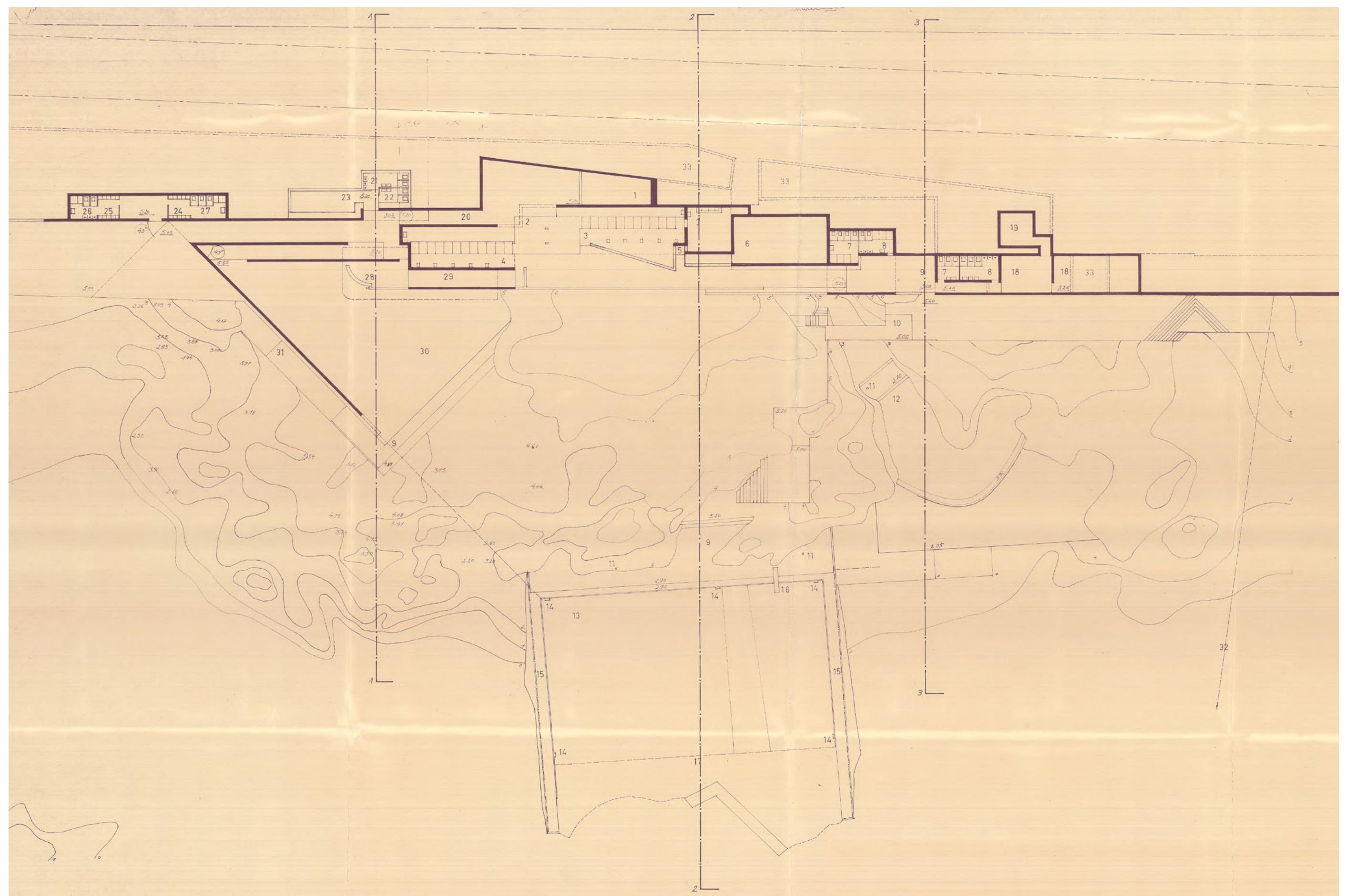
2.29

1973

The fact that the previously planned interventions had not yet been completed was at the origin of the project presented in 1973, which results from a review of the 1966 proposal in accordance with the opinions formulated by the competent authorities, as well as specific improvements resulting from the operating experience of the swimming pool (Siza, 1973, p. 1). Among them are the definitive installation of the shoed users' toilets (to the north) and storage and personnel areas (to the south) under the retaining wall of the avenue, as well as the definition of a wider service area and pantry associated with the bar. The southern end of the complex is also formalized through an amphitheater-shaped staircase that makes the transition between levels. The design also envisaged completing the complex to the north by extending the platform to the place where the restaurant would be located, a work that was never carried out.

2.30

2.30 South platform's amphitheatre, n/d.
2.31 Plan, 1973.



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1995

In 1993, the Municipal Council of Matosinhos awarded the restaurant's design and the technical supervision of the Ocean Swimming Pool's conservation works to Álvaro Siza. These works, carried out in partnership with the engineer João Sobreira, included, among other interventions, the complete replacement of the copper cladding, the repair of the swimming pool's concrete walls, and the cleaning and stripping of the wooden surfaces.

There is detailed documentation regarding the restaurant's architectural design (plans, sections, elevations, and details) as well as the engineering projects. The building was to be accessed by a ramp from the avenue and constructed with materials identical to those of the remaining buildings: exposed concrete (floors, walls, and ceilings) and wood, besides an exposed concrete roof slab with a reflecting pool, for aesthetic and cooling purposes (Siza, 1995). The sketches of the building's interior illustrate the spatial fluidity and the frank relationship with the landscape through a wide glazing on the south elevation and an almost entirely blind elevation to the north, to protect the set from the prevailing winds. For unknown reasons, the restaurant was never built, even though the executive drawings were delivered, approved, and awarded by the Matosinhos Municipal Council in 1995.

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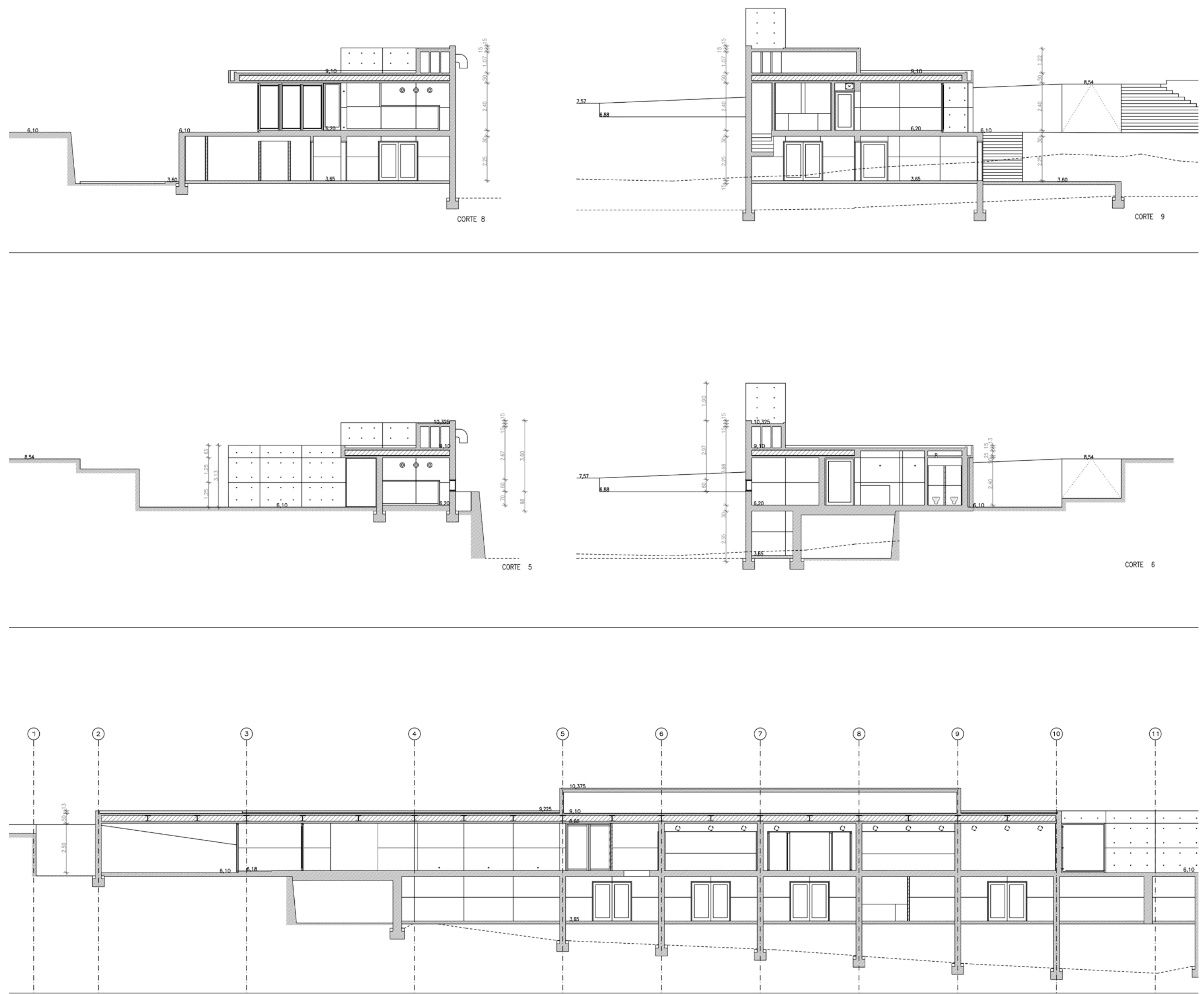

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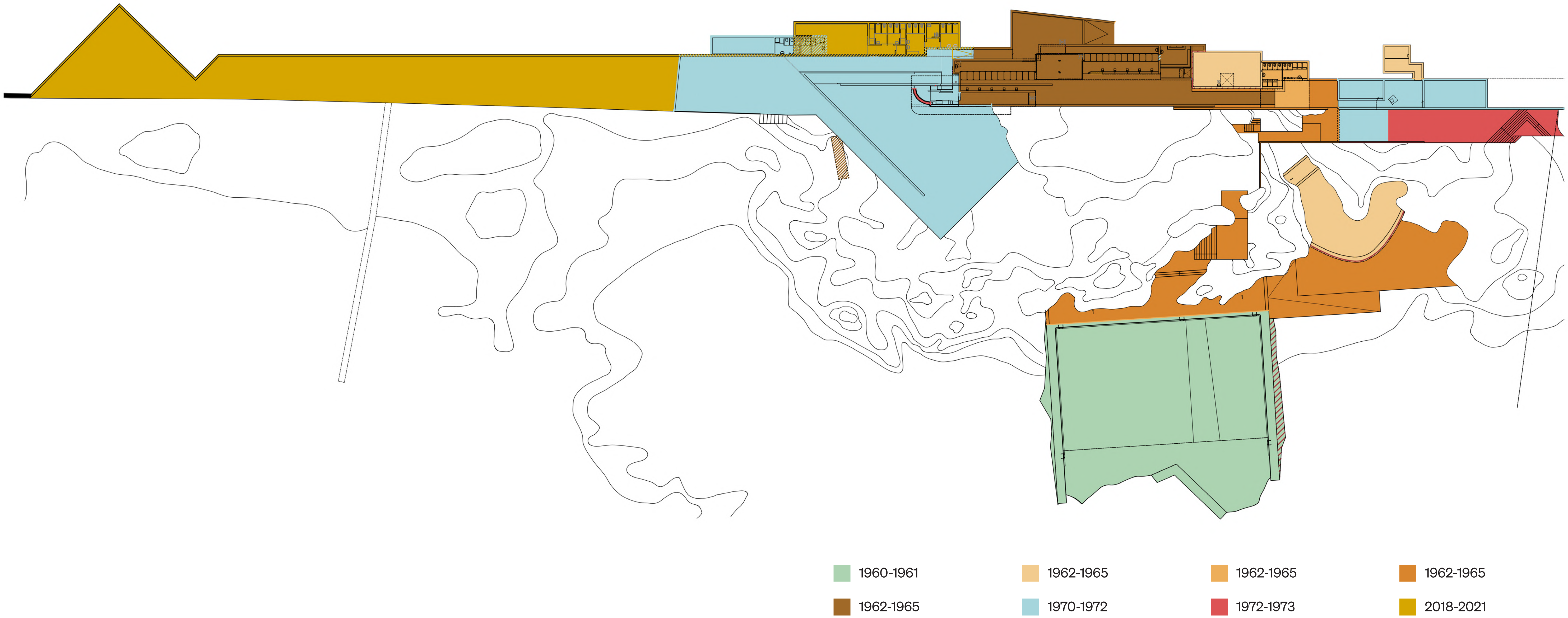
2.32 North volume concrete repair, 1995.
2.33 Roof after copper removal, 1995.
2.34 Copper sheet replacement, 1995.
2.35 Restaurant longitudinal and cross sections, 1995.
2.36 Ocean Swimming Pool's surrounding context, 2021 (following spread).



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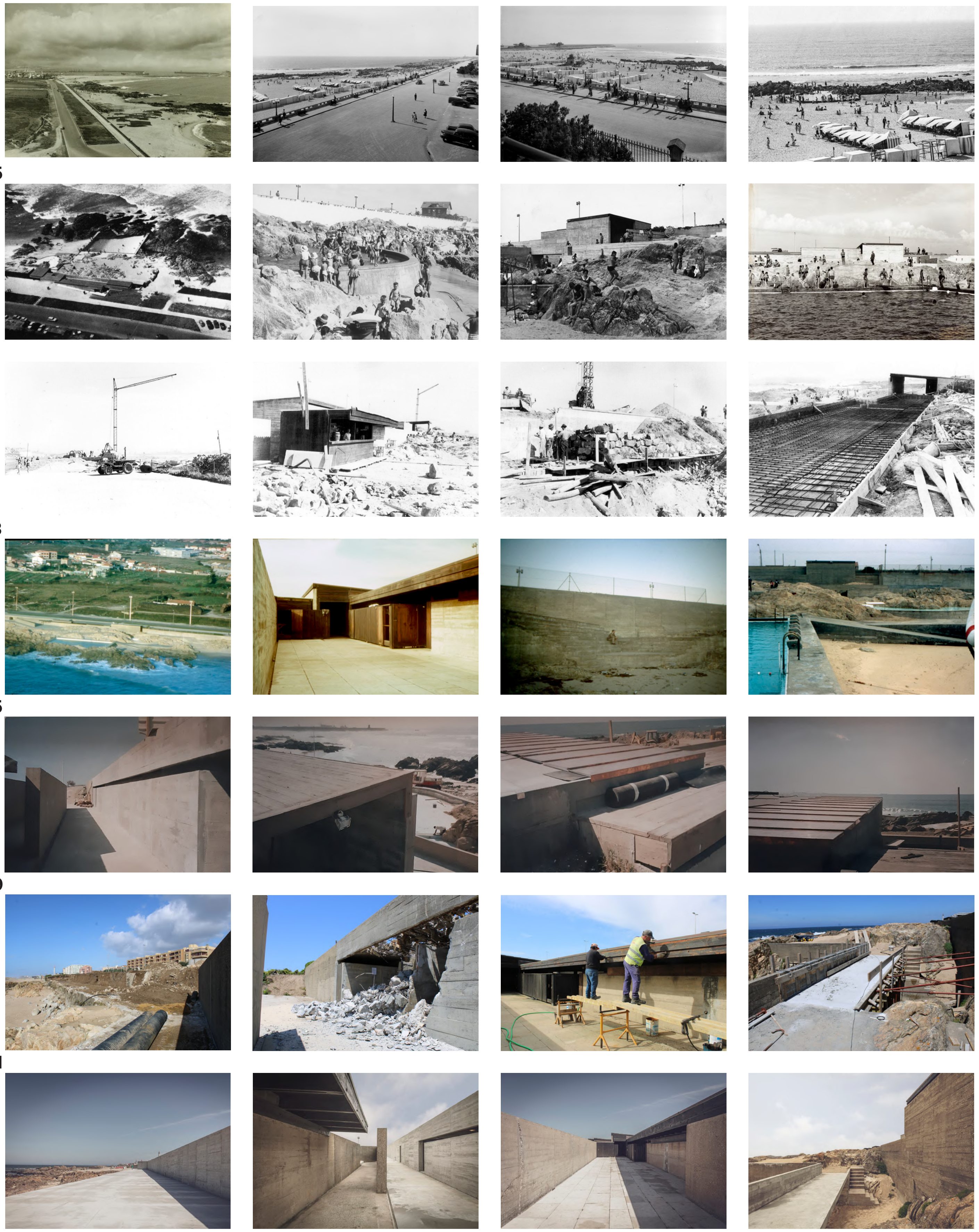
2.37 Ocean Swimming Pool construction phases.

1927
1960
1965
1971
1973
1995
2019
2021



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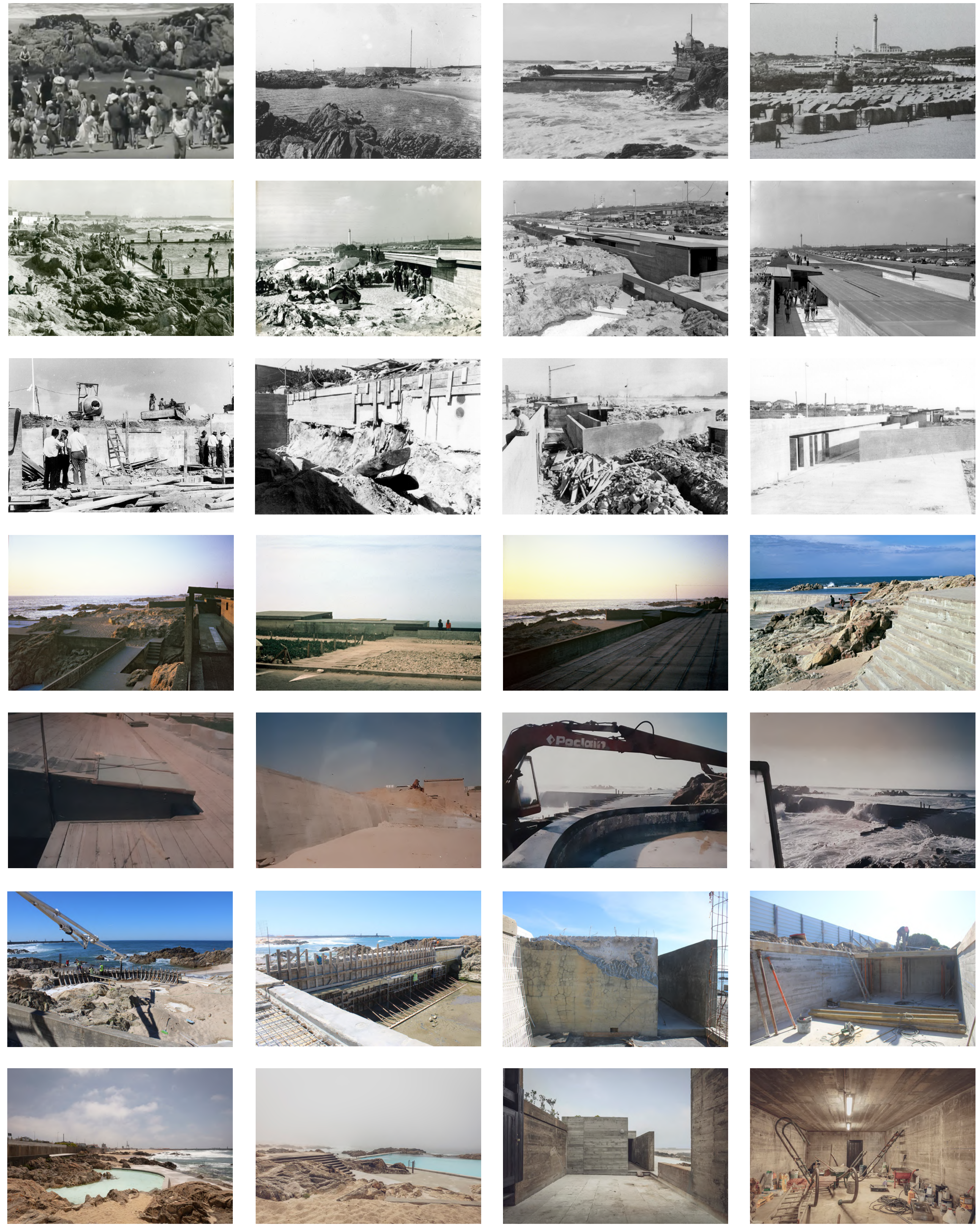


2.38 Photographic chronology, 1927-2021.

2.5.2 Design principles

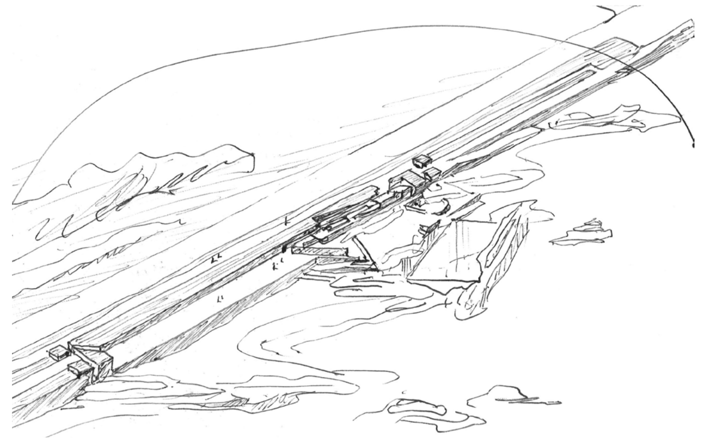
The design principles of the Ocean Swimming Pool aim to clarify Álvaro Siza's original design intent, being a permanent reference for the conservation of the building and an instrument to manage proposals for change. It should also be considered when establishing planning controls for the surrounding landscape, ensuring the preservation of visual relationships and future long-term improvements to the setting. As the Ocean Swimming Pool evolves to meet future needs, it is essential to strike a delicate balance between the building's functional effectiveness and the preservation of its architectural integrity for the benefit of future generations.

To remain faithful and respectful of Siza's thoughts and design approach, these design principles are based on his own words, namely on a selection of 'aphorisms' collected from his texts, design reports, and interviews dedicated to the Ocean Swimming Pool (fig. 2.38). The definition of 8 design principles is inspired by one of his very few texts on his work method called "Eight Points" (Siza, 1983). This work was the object of a dedicated book entitled *Design Principles. Álvaro Siza: Ocean Swimming Pool (1960-2021)* and published in 2023.

DOCUMENT TYPE	DATE	DOCUMENT
Design reports	1962	Siza, A. (1962) *Leça da Palmeira Ocean Swimming Pool: Design Report*
	1965	Siza, A and Ferrão, B. (1965) *Leça da Palmeira Ocean Swimming Pool - 2nd Phase - Project: Design Report*
	1966	Siza, A. and Ferrão, B. (1966) *Leça da Palmeira Ocean Swimming Pool - 3rd Phase - Project: Enlargement of the enclosure, including storage rooms, toilets, bar, terrace, platform and retaining walls to the north and south: Design Report*
	1967	Siza, A. and Ferrão, B. (1967) *Leça da Palmeira Ocean Swimming Pool: Design Report: Complete project process, including built phases and phases to be built*
	1970	Siza, A. (1970) *Construction Specifications Report*
	1973	Siza, A. (1973) *Design Report: Leça da Palmeira Ocean Swimming Pool: Intercalary draft of the 3rd and 4th phases*
	1995	Siza, A. (1995) "Ocean Swimming Pool Restaurant: Leça da Palmeira: 1993: Design Report" in Castanheira, C. and Porcu, C. (eds.) *As cidades de Álvaro Siza*. Lisboa: Figueirinhas, 2001
	2018	Siza, A. (2018) *Construction Specifications Report for the conservation and expansion works*
Texts and essays	1980	Siza, A. (1980) "Piscina de Leça da Palmeira" in Morais, C. C. (ed.) *01 textos*. Porto: Civilização, 2009
	1998	Siza, A. (1998) *Imaginar a evidência*. Lisboa: Edições 70
	2022	Siza, A. (2022) "The difficulty of restoration" in Ferreira, T. C. and Urbano, L. (eds.) *No place is deserted. Álvaro Siza: Ocean Swimming Pool (1960-2021)*. Porto: FAUP/Afrontamento
Interviews and conversations	2016	Siza, A. (2016) FRAMPTON, K. *Álvaro Siza Vieira in conversation with Kenneth Frampton: a pool in the sea*. Chicago: IITAC
	2018	Siza, A. (2018) Interview by Luís Urbano in Urbano, L. (ed.) *Circa 1963*. Porto: AMDJAC
	2018	Siza, A. (2018) Interview by Teresa Cunha Ferreira in *Construção Magazine*, 83, January 13, 2018
	2019	Siza, A. (2019) Interview by Magda Seifert and Pedro Baía, in Seifert, M. and Baía, P. (eds.) *Porto Brutalista*. Porto: Circo de Ideias
	2020	Siza, A. (2020) Interview by Teresa Cunha Ferreira, in Álvaro Siza's office, July 24, 2020
	2021	Siza, A. (2021) Interview by Teresa Cunha Ferreira, in the construction site, July 9, 2021
	2021	Siza, A. (2021) Intervention at the "Sharing Memories: Ocean Swimming Pool" webinar, September 9, 2021
	2022	Siza, A. (2022) Conference at the Symposium "Conserving Concrete", FAUP, July 1, 2022

2.39

2.39 Documents informing the identification of Álvaro Siza's design principles, 2022.
2.40 Sketch of the overall composition, 1973.



2.40

1. *Integration into the landscape*

"In these complementary works, the principles initially adopted regarding the integration of the building into the landscape are maintained; integral conservation of the conditions of the site, where possible; and the superimposition of built areas, where necessary." (Siza, 1966, p. 1)

2. *Optimize the conditions created by nature*

"Conversely, the idea of my project was to optimize the conditions created by nature, which itself had already begun to design its own pool. I thought it necessary to take advantage of the same rocks and restrict the use of walls to the absolute minimum to complete the containment of water. Thus, a far closer connection was established between the natural and built environment." (Siza, 1998, p. 25)

3. *Outline a geometry on that organic image*

"The aim was to outline a geometry on that organic image: to discover what was available and ready to receive geometricity. Architecture is geometrizing." (Siza, 1998, p. 25)

4. *When executing the design, there was no intention of originality*

"We would like to emphasize that, when executing the design, there was no intention of originality. The circumstance of originality mentioned in the report of the Water Sanitary Board naturally reflects the circumstance of a certain location and the integration in certain previously defined principles for the development of the area. It was about making up for inconveniences, in an area of beaches that was in many ways magnificent." (Siza, 1967, p. 9)

5. *Separation between shoed and barefoot people*

"In opting for the cabin system for changing clothes, with a central storage space and a separation between shoed and barefoot people, 24 cabins were found to be necessary, assuming that the number of hangers in the deposit should be close to 3/5 of the number of square meters of the pool, that the daily use of each cabin is 40 people, and that each cabin is used twice a day (Prof. Ernest Neufert, 'Architects' data')." (Siza, 1962, p. 1)

6. *Zigzag walkways, producing a contradictory sense of depth*

"At the same time, resolving the problem of access was essential. There was little depth as the road was very close to the coast. Moreover, there was a plastered wall over a kilometre and a half in length, which clearly separated the coast road level from that of the beach. (...) The solution was to design zigzag walkways, producing a contradictory sense of depth which was crucial in defining the access point to the enclosure." (Siza, 1998, p. 27)

7. *Raw use of materials*

"One of the characteristics of brutalism is the raw use of materials. Seeing the material for what it is." (Siza, 2019, p. 21)

8. *One never completely restores*

"One never completely restores (...) the worst that can happen is establishing a contrast with an ambition of impossible perfection. And then, always taking into account the factor of time, especially in a place like this, because time will take care of the fusion between what is old and what is new, in this case." (Siza, 2021)

2.5.3 Building materials and techniques

The Ocean Swimming Pool was built with very few materials and techniques: copper cladding, reinforced concrete, stone and wooden structures, and joinery. The wooden elements were assembled with brass screws and coated with boiled linseed oil to create a washable and waterproof surface. Regarding concrete and stone, Ferrão had performed previous research and practical works specifically focused on retaining walls (Ferrão, 1945). The buildings are anchored at the lower level of the seaside avenue. In this way, all the east side walls are retaining walls composed of two layers: an interior in cyclopean concrete, waterproofed with water-repellent plaster, and an exterior in exposed concrete with wooden plank formwork. A drainage curtain was made of dry stone on the back of these walls, and a perforated concrete drain was installed at the bottom (Mota, 1972, p. 28).

The exposed concrete walls required a careful execution of the formwork to define the horizontal lines. The formwork was made of pinewood, which could later be reused due to its thickness (4 cm) and the application of oil. These walls were lightly reinforced, with a 5 mm-thick mesh consisting of a 15 × 15 cm grid. 'MEYCO' rubbers were applied to the expansion joints instead of copper because the former material offered better resistance to the vibrator during concreting. The slabs were also separated from the walls to improve structural behavior (Mota, 1972, pp. 29-30).

The roof slabs were built without any interruption (to avoid joints), and the concrete was mechanically vibrated using a Wacker machine. The slabs were waterproofed with prefabricated plastic-asphalt membranes consisting of a polyethylene film covered on both sides with layers of special catalytic asphalt (Mota, 197, pp. 31-36).

The pavements of the north, south, and west platforms and the bar terrace were executed in troweled plaster on a foundation of cyclopean concrete. The floor of the access ramp, changing rooms, south bathrooms, and bar were made of 4 cm thick white concrete slabs, reinforced with steel mesh, and laid on a water-repellent screed foundation (Mota, 1972, pp. 37-38).

When exposed, the water supply network was made of copper and galvanized iron when embedded. All the faucets were in copper-plated brass, while the showers were in copper tubes.

For the construction works that took place until 1965, the contractor was a small local company, Ribeiro da Silva, Lda., owned by the engineer Bernardo Ferrão, who designed all the building's structures and infrastructures, while the works from that date onwards (1965-73) were conducted by the company Enobra. The construction staff consisted of one civil engineer (the contract director), one builder (serving as the liaison between the contract director and the site foreman), one foreman, eight stonemasons, five carpenters, two builders, and ten laborers. The building site included several areas for manufacturing and assembling materials (steel rebar, formwork, and masonry, among others). The steel assembly and cutting area was equipped with a folding table and manual cutting scissors. The amount of steel used between 1971 and 1973 (7000 kg) did not require the use of more efficient electrical equipment. Similarly, the formwork area was simple, with only one circular saw. Moreover, the site had two concrete mixers used to produce a total volume of 800 m³ of concrete (Ferreira, Barbosa and Fernandes, 2021).

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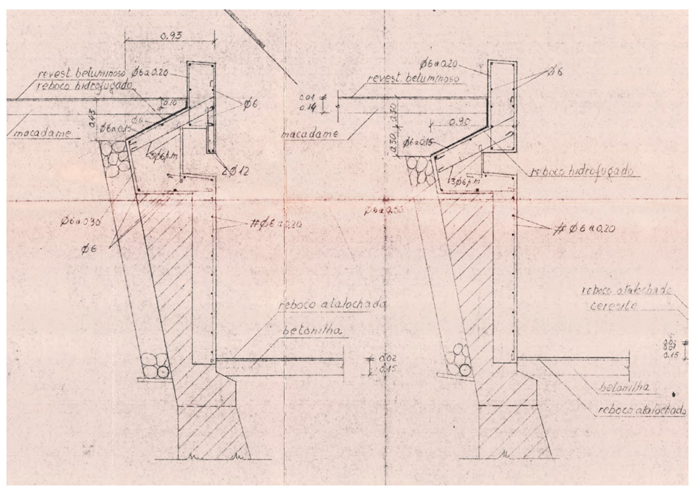

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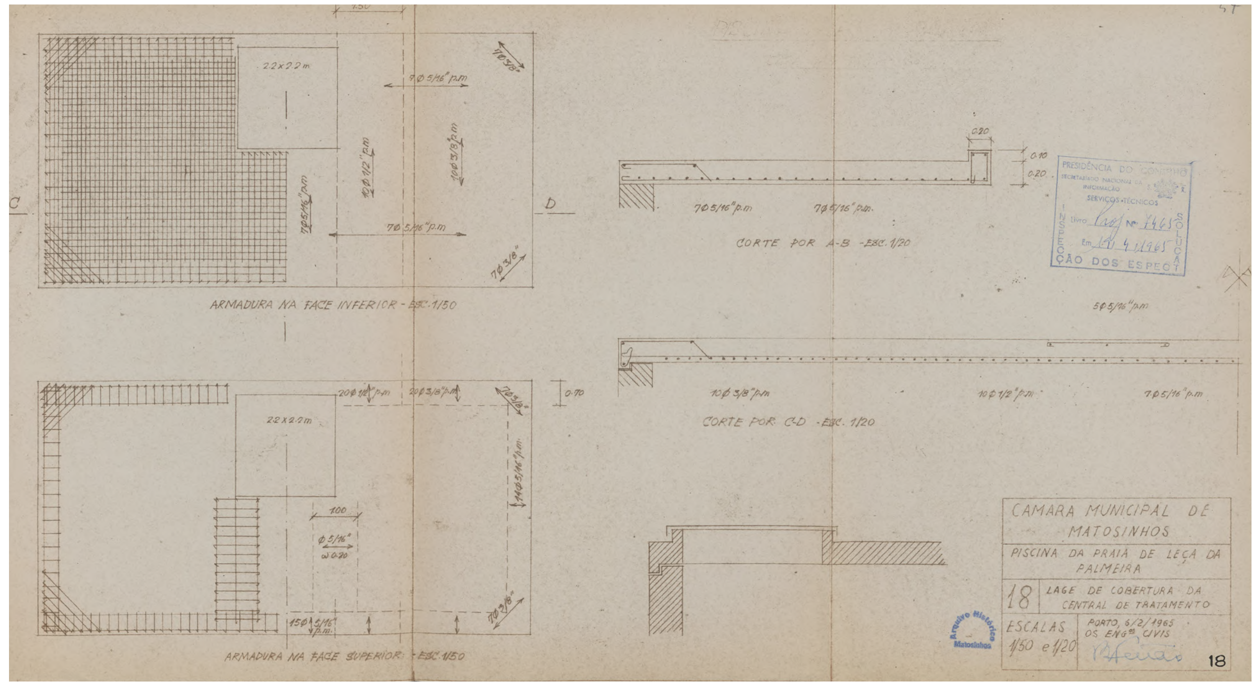
2.41 Detailing of the retaining walls, 1966.
2.42 Construction site, 1971.
2.43 Retaining walls (under construction), 1971.
2.44 Water treatment room's roof slab, 1965.
2.45 Roof slab (under construction), 1971.



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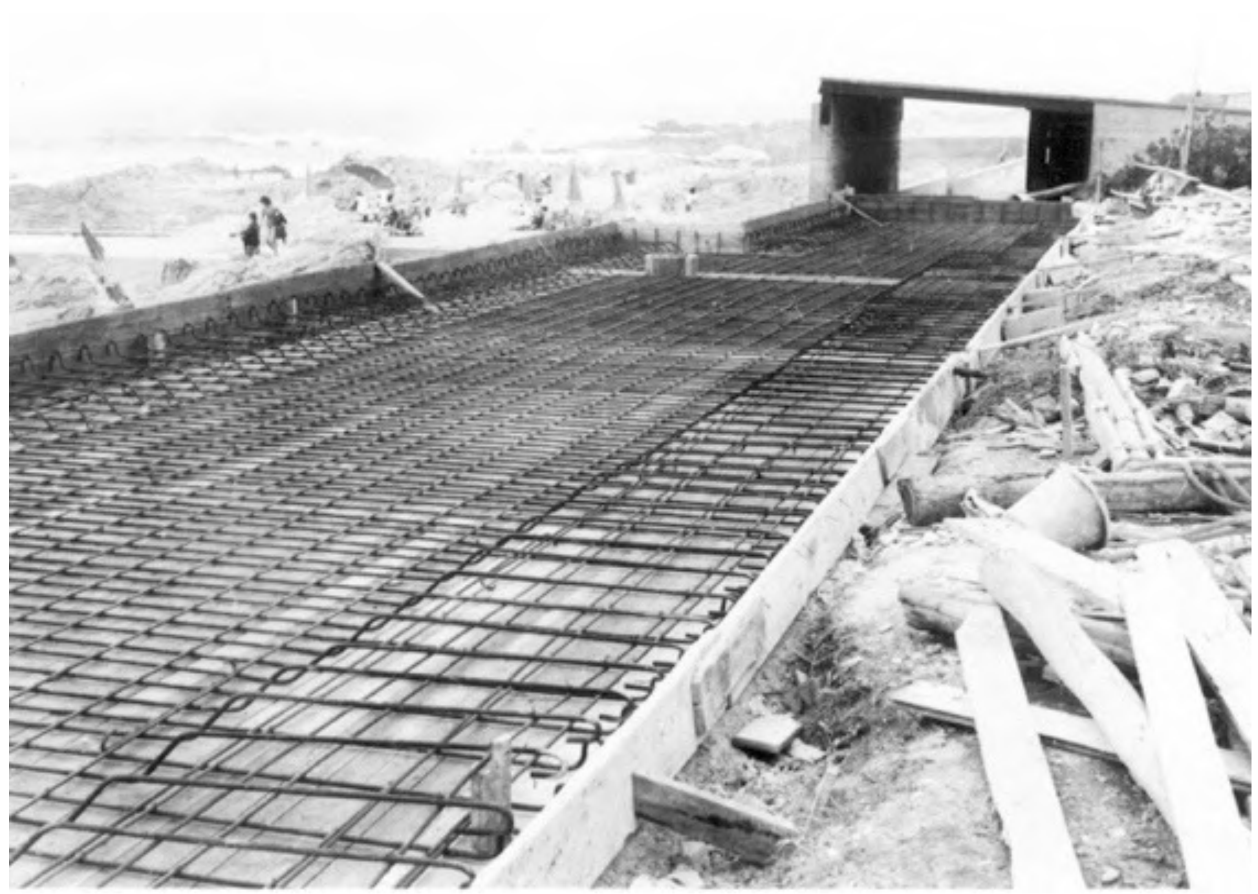

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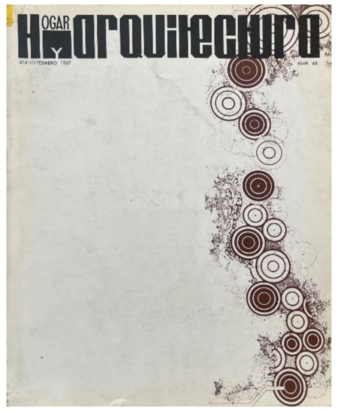
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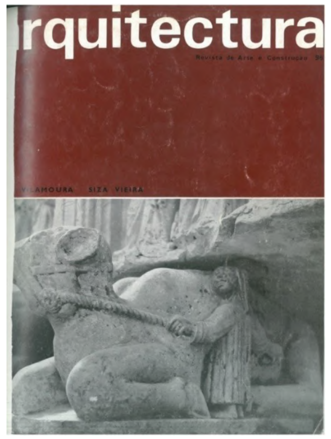

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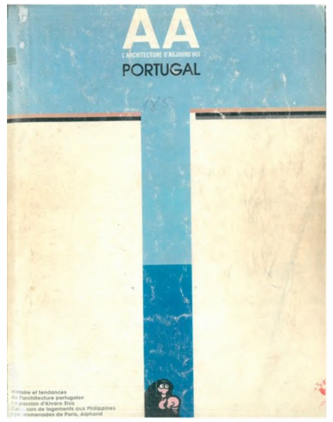

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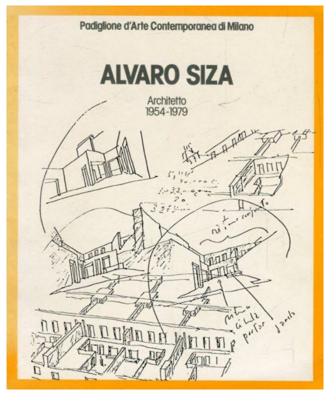

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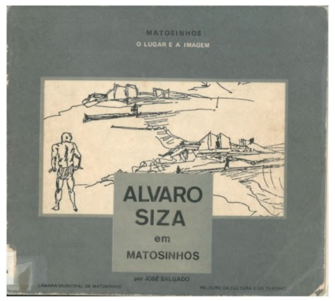

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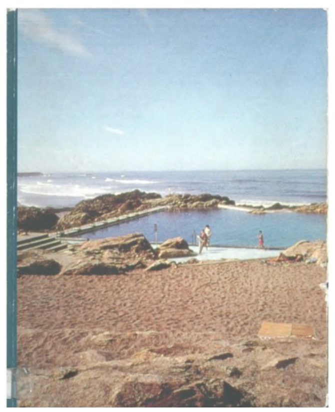
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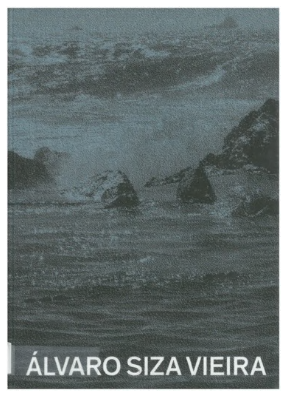

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2.46 Almeida, P. V. (1967a) "Un análisis de la obra de Siza Vieira", *Hogar y Arquitectura*, 68.
2.47 Almeida, P. V. (1967b) "Uma análise da obra de Siza Vieira" and "Três obras de Álvaro Siza Vieira: Cooperativa de Lordelo. Casa unifamiliar em Maia. Piscina de Leça", *Arquitectura: Revista de Arte e Construção*, 96.
2.48 Bohigas, O. (1976) "Álvaro Siza Vieira", *Bis*, 12.
2.49 Gregotti, V. and Bohigas, O. (1976) "La passion d'Alvaro Siza", *L'Architecture d'Aujourd'hui: Portugal*, 185.
2.50 Gregotti, V. (ed.) (1979) *Padiglione d'Arte Contemporanea di Milano: ALVARO SIZA Architetto 1954-1979*. Milano: Idea Books.
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2.54 Ganshirt, C. (2004) *1959-73 Swimming Pool on the Beach at Leça da Palmeira: Álvaro Siza*. Lisboa: Blau.
2.55 Toussaint, M. and Melo, M. (coord.) (2016) *Piscina na praia de Leça: a pool on the beach*. Lisboa: A+A Books.
2.56 Frampton, K. (2016) *Álvaro Siza Vieira in conversation with Kenneth Frampton: a pool in the sea*. Chicago: IITAC.

2.6 Critical reception

The Ocean Swimming Pool has been the subject of numerous essays and academic works, photographic reports, and even documentary films, becoming a place of pilgrimage for architects and scholars from all over the world, conveying the influence of Álvaro Siza as a key figure of 20th-century modernism. Indeed, the bathing complex was the object of over eighty publications in multiple languages (Portuguese, English, French, Spanish, German, Japanese, among others), including books, chapters, journal articles, and academic dissertations.

This interest started even before construction ended, with the comprehensive article published by the Portuguese architect and critic Pedro Vieira de Almeida in 1967, firstly in the Spanish journal *Hogar y Arquitectura* (Almeida, 1967a) and, only two months afterward, in the Portuguese *Arquitectura. Revista de Arte e Construção* (Almeida, 1967b). From a formal point of view, the author perceived the project as the beginning of a new stage in Álvaro Siza's work, in which an economy of expression definitely overcomes the references to the *Survey on Regional Architecture in Portugal* and the trivialization of the vernacular. In addition, Vieira de Almeida considers this to be the first time in Portugal that an architect is able to critically face and control the spaces along a route, revisiting the rationalist theme of the 'promenade architecturale'.

Less than a decade later, the Portuguese Revolution of 1974 and its consequences in the domain of architecture led to the publication of a dedicated issue by the influential journal *L'Architecture d'Aujourd'hui* (Gregotti and Bohigas, 1976) with essays by Vittorio Gregotti and Oriol Bohigas, including the Ocean Swimming Pool (being this edition adapted from an earlier publication in the Spanish magazine *Bis*). Despite Portugal's relative isolation, the interest sparked by Álvaro Siza's work derived from its contribution to the ongoing international debate on the critical revision of modern architecture, simultaneously integrating Bruno Zevi's contributions, Nathan Rogers' strategy of 'continuità' and the ethical and aesthetic premises of Brutalism as theorized by Reyner Banham.

Even if the Ocean Swimming Pool was not included in the selection of works presented in the journal *Controspazio* (1972), preceded with essays by Vittorio Gregotti and Nuno Portas on Siza's architecture, the bathing complex would be featured in the exhibition on Álvaro Siza, curated by Gregotti, at the Padiglione di Arte Contemporanea (PAC) in Milan (Gregotti, 1979). The Ocean Swimming Pool's international recognition will be fully consolidated (along with Siza's architecture) in the following decade, especially through the publication of a dedicated number of *Quaderns d'arquitectura i urbanisme* in 1983 (Mateo, 1983) and of *Álvaro Siza Poetic Profession* in 1986 (Siza, 1986), that counted on critical contributions by Kenneth Frampton, Nuno Portas, Alexandre Alves Costa, Pierluigi Nicolin, Oriol Bohigas, Bernard Huet, and Giovanni Chiaramonte's photographs of the swimming pool.

In the national context, in 1985, the Leça Swimming Pool was included by José Salgado in a monograph focused on Siza's designs for his hometown of Matosinhos (Salgado, 1985). The following year, an essay by Eduardo Souto Moura in the Spanish journal Arquitectura provided a critical comparison with Frank Lloyd Wright's Taliesen West and Mies Van der Rohe brick house (Moura, 1986).

An important stage in the international recognition of the Ocean Swimming Pool also derives from the numerous Exhibitions in which this work was systematically highlighted, namely in *Álvaro Siza* at the Centre Georges Pompidou (Costa and Siza, 1990), *Álvaro Siza: Obras y Proyectos* at the Galician Centre of Contemporary Art and other itinerancies (Llano and Castanheira, 1995), *Arquitectura do Século XX: Portugal* at the Deutsches Architektur-Museum (Becker, Tostões and Wang, 1997), *Alvaro Siza Architetto* at the Basilica Palladiana (Frampton, 1999), *Les universalistes. 50 ans d'architecture portugaise* at the Cité de l'Architecture & du Patrimoine (Grande, 2016) and, more recently, *Álvaro Siza: (In) Discipline* in the Serralves Museum (Grande and Muro, 2018), among others. The inclusion of the Ocean Swimming Pool in a vast set of monographs on Álvaro Siza should also be mentioned, being these intensified after he was awarded the Pritzker Prize in 1992, with the broad proliferation of publications on his work in the following decades and until this day (Testa, 1984; Gregotti, 1989; Fleck, 1992; Rodrigues, 1992; Santos, 1993; Cecilia and Levene, 1994; Trigueiros, 1997; Jodidio, 1999; Castanheira and Porcu, 2001).

Numerous essays by renowned authors would also require referencing, such as William Curtis, Rafael Moneo, and Manuel Aires Mateus (Curtis, 1994; Moneo, 2004; Mateus, 2009), deepening knowledge and highlighting the design lessons of Siza on this masterpiece of 20th-century architecture.

The first monograph exclusively dedicated to the Ocean Swimming Pool was published in 2004 – *1959-1973 Piscina na praia de Leça da Palmeira* (Ganshirt, 2004) – by Christian Gänshirt, a former collaborator in Siza's office, who is also the author of a dedicated chapter in Volume IV of *Twentieth-Century Architecture* (Ganshirt, 2017), where the Leça bathing complex features alongside with celebrated buildings such as the Villa Savoye, the Fallingwater, the Villa Mairea and Louis Kahn's Salk Institute.

In 2016, two books drew our attention to the bathing complex: *A Pool in the Sea: In conversation with Kenneth Frampton* (Frampton, 2016), which contains dialogues between Frampton and Siza, and Michel Toussaint's monography *Piscina na praia de Leça* (Toussaint and Melo, 2016) with texts of recognized authors in the Portuguese context. More recently, the Catalogue of the exhibition *NO PLACE IS DESERTED. Álvaro Siza: Ocean Swimming Pool (1960-2021)* (Ferreira and Urbano, 2022) presents the bathing ensemble as a palimpsest (since it was never conceived as a single gesture but is the result of several commissions and additions), while it provides critical essays, design reports and an illustrated chronology of the building's design and construction phases (Ferreira, 2022).

2.7 Programme distribution

The building has been in operation for almost sixty years, since its public opening in 1965. Simultaneously a leisure area and a meeting place for both local people and visitors, this has become a social and cultural landmark for the community, playing an essential role in its identity and collective memory.

The main users of the Ocean Swimming Pool are the bathers and visitors. If the former come mainly for the leisure experience of the swimming pool and the beach, the latter wish to get to know the building and wander around the site. For this reason, Siza's original design already had designated areas for shoed users, mainly for the visitors, which included the area to the north of the site, including the entrance, the bar's terrace, and technical areas. The rest of the spaces were meant for barefoot users. This separation was driven by hygienistic concerns to prevent shoed users from bringing dirt and other residues from the street to the areas where the bathers walked barefoot.

The site is currently in use without any significant change to its original program. The Ocean Swimming Pool is only open to the public during the bathing season, which lasts for three months every year from mid-June to mid-September.

The facilities that support the bathers' needs, such as the changing rooms, cloakroom, bathrooms, bar, and water treatment rooms, are located next to the entrance ramp. Access paths to the swimming pools along the beach fitted with foot wash basins ensure the separation between shoed and barefoot users.

The south area of the site houses technical functions that support the good functioning of the complex, such as the security room, the water collection room, and storage rooms. To the north, the bar has support facilities, such as storage rooms, waste management room, employee changing rooms, and bathrooms for visitors, bar users, and people with mobility impairments.


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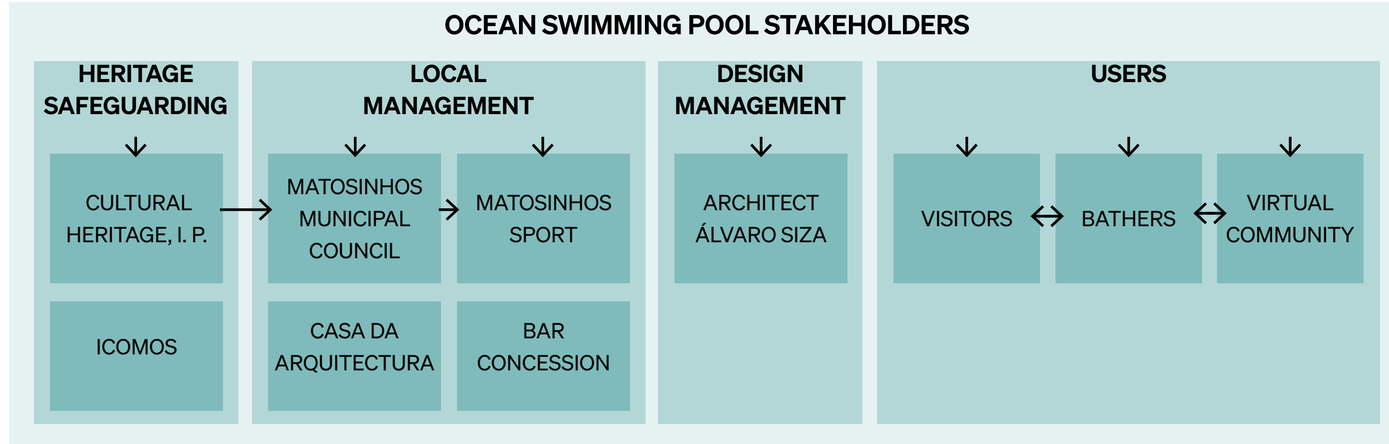
2.57 Ocean Swimming Pool during bathing season, 2014.
2.58 Ocean Swimming Pool organization scheme.
2.59 Ocean Swimming Pool stakeholders identification.

(1) adults' swimming pool; (2) children's swimming pool; (3) entrance ramp; (4) men's changing rooms; (5); women's changing rooms; (6) cloakroom; (7) changing rooms hallway; (8) collective changing room; (9) chlorine cabinet; (10) water treatment room; (11) south bathrooms; (12) access path and solarium; (13) south platform; (14) bar; (15) kitchen; (16) bar's terrace; (17) security room; (18) south storage room; (19) water collection room; (20) west platform; (21) north platform; (22) north bathrooms; (23) employee's changing rooms and bathrooms; (24) north storage room; (25) waste management room.
2.58

2.8 Stakeholders

To better plan the management and safeguarding of the Ocean Swimming Pool, it is crucial to understand the present dynamics behind the functioning and managing of the site by studying the different stakeholders involved and their relationship with the property. The stakeholders were identified and organized under four categories: entities responsible for heritage safeguarding, both on an international and national level; local management entities; the architect Álvaro Siza, responsible for the design management; the site's users, comprising visitors, bathers, and the virtual community. The following infographic presents the stakeholders and their interactions (black arrows).



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Heritage safeguarding

Cultural Heritage, I. P.

The Cultural Heritage, I. P. ensures the management, safeguarding, enhancement, and conservation of assets integrating Portugal's cultural heritage. It is responsible for implementing heritage protection legislation on a national level and the listing of national interest assets, such as the component parts. The licensing of any work, intervention or change of use concerning a listed property and in the Buffer Zone requires prior consent from the competent Regional Coordination and Development Commission and, subsequently, a binding decision will be made from Cultural Heritage, I. P.

ICOMOS (International Council on Monuments and Sites)

ICOMOS is a global non-governmental organization dedicated to promoting heritage conservation and protection. It is an advisory board of UNESCO's World Heritage Committee, ensuring the conservation status of properties and enforcing compliance with the World Heritage Convention of state parties.

Local Management

Municipal Council of Matosinhos

As the owner of the Ocean Swimming Pool, the Municipal Council is responsible for its management and maintenance during the period in which the equipment is closed to the public. Also, as the responsible entity for landscape and urban policies, it must abide to and enforce the Cultural Heritage, I. P. decisions on listed buildings and reflect them on the Municipal Master Plan.

Matosinhos Sport

Matosinhos Sport is a municipally owned corporation charged with managing and maintaining all municipal sports facilities. As the Ocean Swimming Pool is not open the entire year, Matosinhos Sport is only responsible for its management and maintenance during the bathing season.

Casa da Arquitectura

Casa da Arquitectura (Portuguese Centre for Architecture) is a non-profit cultural association that promotes architectural debate and collects architect's documental estates. It is responsible for the Ocean Swimming Pool's guided tours.

Bar concession

Every year, Matosinhos Sport promotes a public procurement procedure to select a supplier that will be in charge of the bar's management during the bathing season.

Design Management

Architect Álvaro Siza

All design decisions or modifications determined by management procedures should be discussed with Álvaro Siza and submitted to his approval.

Users

Visitors, bathers, and virtual community

Being a fully functioning facility, users and the values they assign to the site play an important role in defining management policies. Three main kinds of interactions from the general public with the site were identified: visitors, bathers, and the virtual community (online interaction).

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3. ASSESSMENT OF SIGNIFICANCE

3.1 Introduction
3.2 Recognition and listing
3.3 Comparative analysis
3.4 Communities' perception
3.5 Dissemination activities
3.6 Discussion of significance
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3.8 Statement of significance

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3. ASSESSMENT OF SIGNIFICANCE

3.1 Introduction

Chapter 3 assesses the cultural significance of the Ocean Swimming Pool, understood as the set of tangible and intangible qualities that make it a place of value to society (Kerr, 2013, p. 4). The precise identification of the heritage values and its assessment process is essential to inform the development of significance-based policies to guide the conservation, interpretation, and management of the site so that the significance of the place is retained.

The chapter opens with a section on recognition and listing (3.2), focusing on the listing process of the Ocean Swimming Pool as National Monument (2011) and its integration in the World Heritage Tentative List (2017) as a component property of 'Álvaro Siza's Architecture Works in Portugal'. The third section (3.3) entails the comparative analysis between similar heritage sites (among other Álvaro Siza's works, the World Heritage List, or similar typologies) by examining the criteria that sustained its heritage value and underlying how the exceptional attributes of the Ocean Swimming Pool fill an important gap in terms of cultural significance.

The fourth section (3.4) discusses the process and most relevant outcomes of the participatory activities, such as interviews, surveys, workshops, and social media analysis, undertaken to identify the perspectives of a broad spectrum of communities and stakeholders on the bathing complex. The fifth section (3.5) details all the research dissemination initiatives that indirectly contributed to identifying qualities. Furthermore, section 3.6 presents the comparative discussion between the values recognized by all the actors involved in the cultural significance assessment. As the contribution of each building area to the general significance is different, they were assessed according to their level of significance (3.7). Ending the chapter, the statement of significance (3.8) summarizes the key heritage values of the Ocean Swimming Pool as identified and assessed in the previous sections.

Cultural significance encompasses the values recognized by specific communities at a particular time, leading to the register or statutory listing as heritage. Identifying cultural significance through the physical investigation of the place, archive research, and actors' consultation is a critical component of a place's management process and the first step for decision-making, namely, over what should be preserved and what can be changed (ICOMOS Australia, 2013). Hence, it becomes crucial to implement cultural significance assessments by identifying what aspects (attributes) should be conserved and why (values) (Tarrafa Silva and Pereira Roders, 2012).

However, most cultural significance assessments and heritage listings have traditionally been performed by heritage-related experts, such as historians, archaeologists, architects, and art curators, reflecting their knowledge, disciplinary bias, and values system (Smith and Waterton, 2012). On the other hand, non-expert communities introduce different levels of empathy to assets and create their own "heritage lists", although the values identified by those, namely social, are often neglected in heritage assessment processes (Wagenaar *et al*., 2023). Both lists are likely to differ but without ceasing to be complementary, as long as they are equally addressed in consequent planning policies. The information gathered from non-experts' engagement and vision, complemented with the work of a multidisciplinary expert group, might be the key to a management and action plan that connects with the place, its people, and its identity (Court and Wijesuriya, 2015). Although and despite international recommendations such as the Faro Convention (CoE, 2005) or, most recently, the HUL Recommendation (UNESCO, 2011), the effective integration of community engagement initiatives among urban planning practices is still shallow and seldom in international and national contexts (Bandarin and Oers, 2014).

Engaging communities in a broad sense, thus, was a fundamental decision within the methodology adopted for the Ocean Swimming Pool CMP. Being a public facility continuously in use, primarily by local communities, made compulsory the integration of these voices, alongside government institutions, experts, and site managers, into the discussion of the future management of change. Besides, the involvement of communities also benefits the establishment of a greater sense of identity and connection with the place through their engagement in different activities (Court and Wijesuriya, 2015).

This multimethod approach, through implementing of different participation strategies (fig. 3.12), contributed to minimizing potential gaps and expanding the research representativeness. Document analysis of the statements of significance accompanying the inclusion of the property into national and international heritage registers and inventories provided the expert and official perspective. The semi-structured interviews with site managers were critical sources for understanding the perspective of the daily management actors. The interview protocol and the survey design applied to users and visitors were methodologically influenced by the experiences of referenced case studies (City of Ballarat, 2013), particularly the seminal "IMAGINE Ballarat" project.

The analysis of the values and attributes recognized in social media platforms enabled the sampling expansion, although limited as the research has no pretension of extrapolation to a broader reality. However, it stands as an unprecedented picture of the Ocean Swimming Pool users and visitors' community, revealing the potential outcomes of these approaches. Other techniques, such as seminars with experts, workshops with students, and activities with children, complement those mentioned above, being cross-cutting methodologies an added value for assessing cultural significance.

Regarding data analysis, namely the identification of recognized cultural values, the research followed the taxonomy developed by Tarrafa Silva and Pereira Roders (2012) exclusively for all different collection methods. The systematic nature of this content analysis methodology enabled further comparison between different sources and perspectives and the draft of a statement of significance representing the aspiring inclusiveness of the approach.

3.2 Recognition and listing
3.2.1 National recognition

National Inventories

The Ocean Swimming Pool is registered in the National Inventory of Architectural Heritage (Sistema de Informação para o Património Arquitectónico - SIPA), organized by the Directorate-General for Cultural Heritage (DGPC), under the number IPA.00020880. In the registration form, it is stated that the Ocean Swimming Pool:

"*stands out for its harmonious integration into the maritime landscape, without failing to assert the work's artificial character which the rigor of the geometric forms and the exposed concrete emphasize.*" (SIPA, 2011)

It also integrates the Inventory of 20th-century architecture in Portugal (Inquérito à Arquitectura do Século XX em Portugal - IAPXX), an online database developed between 2003 and 2006 by the Portuguese Association of Architects (Ordem dos Arquitectos) merging all information on built architectural heritage of this period in Portugal, under the number N200595. Specifically regarding the Ocean Swimming Pool, it is considered that:

"*The different built volumes and long walls are arranged longitudinally with punctual (angular) geometry deviations, often misaligned with respect to each other, configuring an organic whole. More than the definition of shapes, the building as a whole seems to be subordinated to the definition of pathways embedded between walls. Oriented towards a landscape dominated by the sea, the site holds a labyrinth that conceals more than what it reveals, unlike Le Corbusier's promenade architecturale.* (...) *The Ocean Swimming Pool's design is a formal (or topographical) extrapolation that seeks an intensified sensory experience of a location in its specificity.*" (IAPXX, 2006).

Even if the National Inventory of Architectural Heritage is more detailed than the Inventory of 20th-century architecture in Portugal, which simply identifies the author, the function, and the location, both lack information on the assessment of cultural significance (values and attributes).

National Listing

The Cultural Heritage, I. P. is responsible for proposing to the Portuguese Government a list of buildings of relevant cultural interest to be listed as National Monuments (the highest level in the Portuguese listing system), following the procedure of paragraph 3, article 2 of the Law for Cultural Heritage, with the general guidelines laid out in article 17 thereof:

"*the analysis of the building's scientific, heritage, and cultural value is made in accordance with the criteria of authenticity, originality, rarity, singularity, and exemplarity, which should be expressed in the way that they have been appropriated by the citizens, and in their symbolic relevance as places for the arts within the collective historical and political memory*" (Law No. 107/2001, 2001).

On May 25, 2011, under the terms of Decree No. 16/2011, after a long process that started in 2004, the Portuguese Government listed the Ocean Swimming Pool as National Monument, with the following description:

"(...) *the Leça da Palmeira Ocean Swimming Pool represents a remarkable accomplishment for its integration into the place without resorting to mimesis, instead frontally assuming the artificial character which the rigor of the geometric shapes and the exposed concrete emphasize.*

The buildings are set in a linear way along the beach wall, without interruptions in its volumes, but through the design of the paths and the geometry of the wall, it invites visitors to contemplate the maritime landscape. The ability to engage in a harmonious dialogue with the context, without denying its own artificiality, is one of the main characteristics of Siza Vieira's early work, which has in Leça Ocean Swimming Pool one of the best examples in Portugal.

Its listing as National Monument is justified by its architectural, urbanistic and landscape value, but also by the historical value of a work that is already an essential reference of modernist architecture and still remains in full use" (Decree No. 16/2011, 2011).

The definition of a Buffer Zone as a consequence of the listing process took place in two phases: a) firstly, in 2011, the definition of a General Buffer Zone (Zona Geral de Protecção) with

3.1

a 50 m radial perimeter as determined by the Portuguese legislation (fig. 3.1); secondly, on October 24, 2012, under the Ordinance No. 608/2012 a Special Buffer Zone (Zona Especial de Protecção) was defined including both listed National Monuments along the seaside of Leça da Palmeira: The Boa Nova Tea House and Restaurant and the Ocean Swimming Pool, integrating the seaside avenue and beaches between them as a means of protection of the coastal landscape (fig. 3.2). According to the Ordinance:

" (...) *both buildings, authored by Álvaro Siza Vieira and holding emblematic character in the framework of Portuguese architecture of the 20th century, have a remarkable setting in the coastal landscape* (...) *The joint definition of the Special Buffer Zone (ZEP), with each of the monuments enjoying the limits defined in the ZEP, attentive to the specificities of the place and its relationship with the building, results from the understanding of the unity of location, topography and visual relationships. The ZEP takes into account the setting of the buildings and their relationship with the land and sea surroundings, considering it as a determining part of the architectural design, and also recognizes the morphology of the land, the landscape, and the views, as well as the conditions defined by the current management and planning tools. The definition of the ZEP also aims at safeguarding the listed properties and their fundamental landscape, identified as the surrounding coastal area and coastal avenue, ensuring the continuity of the dialogue between the Boa Nova Tea House and the Ocean Swimming Pool in Leça and the coastal avenue, the beach and the sea*" (Ordinance No. 608/2012, 2012).

In summary, the Portuguese Government listed the Ocean Swimming Pool complex as National Monument, identifying the concrete shapes as the main attribute and recognizing its aesthetical, ecological, historic, and economic values. Other attributes were further mentioned, which, despite not directly related to any specific value, might be interpreted as contributing to the cultural values recognized for the whole bathing complex, namely the beach wall, as well as the intangible attributes related to the character and design options, such as the linear (form) along the beach wall without interruptions, the design of the paths and the geometry of the wall. The character inviting contemplation of the surroundings also indicates intangible attributes related to the place, namely the maritime landscape, reinforcing the ecological value of the complex.

3.2

3.1 General Buffer Zone delimitation, 2011.
3.2 Special Buffer Zone delimitation including the Boa Nova Tea House and Restaurant, 2012.

3.2.2 International recognition

International Inventories

The Iberian DOCOMOMO Foundation, responsible for pursuing the DOCOMOMO (Documentation and Conservation of buildings, sites, and neighborhoods of the Modern Movement) objectives in Spain and Portugal, maintains an online database of significant 20th-century architectural heritage which includes the Ocean Swimming Pool. The inventory entry includes the identification of the author, the location, the construction time frame, and an extensive set of photographs and drawings.

Together with ICOMOS ISC20 (International Scientific Committee on Twentieth Century Heritage) and the Iberian DOCOMOMO Foundation, the EU-funded research and innovation project Innova Concrete focused on the development of innovative techniques to preserve concrete-based monuments, included the Ocean Swimming Pool amongst the 100 most significant concrete-based 20th-Century Heritage Sites in Europe. The relevance of the selected entries for the history of architecture and engineering is further detailed in the description below:

"*All the selected sites are outstanding examples of architecture and engineering from the 20th century on technical, social, and aesthetic levels. They reflect innovation in building materials and structure, as well as in building methods, construction techniques, and detailing. They often exemplify new uses and typologies, characteristic of the social, cultural, and economic development of their time, and they are significant in the history of architecture and engineering.*" (Innova Concrete, 2019).

World Heritage Tentative List

The Ocean Swimming Pool is part of 'Ensemble of Álvaro Siza's Architecture Works in Portugal', submitted in 2017 by the Portuguese Government to the World Heritage Tentative List. It comprises a series of buildings that represent Álvaro Siza's oeuvre's exceptional, and incomparable attributes.

The ensemble components have been selected from his built works in Portugal, among an ongoing architectural production of over six decades that, consecutively and uninterruptedly, gained wide international recognition and the most prestigious awards (Pritzker Prize, Mies Van der Rohe, Alvar Aalto Medal, Golden Lion, etc.) for his more than 500 projects and built works in 16 countries and 4 continents.

The 'Ensemble of Álvaro Siza's Architecture Works in Portugal' is aligned with the UNESCO World Heritage Committee's request to State Parties to submit nominations for 20th-century heritage (ICOMOS, 2005). The nomination was submitted by the Permanent Delegation of UNESCO in Portugal under the Cultural Heritage criteria (ii) and (iv), with the following description:

"*The architectural work of Álvaro Siza Vieira is exceptional and of universal value for an ever-growing number of reasons, which overlap in an unusual manner. They make him one of the protagonists of contemporary architecture. His architecture is unmistakable, specific, and incomparable. The integrity and the physical, aesthetic, and historical characteristics of his work make it an example of unmatched authenticity and genuineness. The universal and exceptional value of his work is the result of that ensemble of characteristics and qualities.*" (Ensemble of Álvaro Siza's Architecture Works in Portugal, 2017).

This serial nomination for inscription on the World Heritage List was submitted in January 2024 under the title 'Álvaro Siza's Architecture: A Modern Contextualism Legacy'.

3.3 View towards the south platform , 2021 (following page).

3.3 Comparative analysis

3.3.1 Álvaro Siza's early works

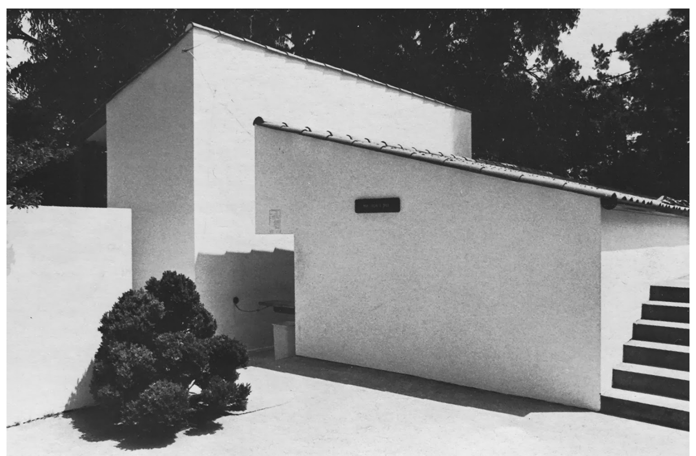
Some of Álvaro Siza's first work commissions were part of a broader urban plan for promoting tourism in the village of Leça da Palmeira, envisaged by Fernando Pinto de Oliveira (1911–1975). Among them, besides the Ocean Swimming Pool (1960-1973), are the Boa Nova Tea House and Restaurant (1956-1963) and the Quinta da Conceição Swimming Pool (1958-1965), all built between 1958 and 1973 and, in the case of the last two while Siza was still working at Fernando Távora's office.

The Boa Nova Tea House and Restaurant composition is based on three main principles, conceptually related to Portuguese vernacular architecture: an almost mimetic reinterpretation of the site topography, a respectful attitude in terms of the relationship with the preexisting chapel, and a constant correlation with the landscape, achieved through the intentional design of a 'promenade' built in Portuguese limestone (fig. 3.4). Hence, Siza proposes the use of a mixture of traditional tectonics (timber and ceramic tiles) and modern tectonics (reinforced concrete), seeking to combine vernacular constructive elements with the use of modern technologies. In contrast to the formal vernacular influence visible in the Tea House, the Ocean Swimming Pool displays an abstract language, being composed of a succession of walls in reinforced concrete, running parallel to the shoreline and covered with a low-slope copper roof (Ferreira and Fernandes, 2021, p. 1-3).

The Quinta da Conceição Swimming Pool, a public park designed by Távora (1956–60) on the grounds of an old convent, is implanted on an uphill path. One must, therefore, approach it from below and go around a white-walled hilltop, entirely closed when seen from the outside except for a narrow stepped opening. The pool enclosure is defined by a series of walled platforms open to the sky, revealing remarkable conceptual similarities with Boa Nova and the Ocean Swimming Pool in understanding and reinterpreting the topography. In this work, Siza once again used a combination of traditional construction culture (masonry walls, timber, and ceramic roof tiles) (fig. 3.5) and modern tectonics (reinforced concrete slabs and external walls) (Ferreira *et al.*, 2021, p. 2-3). Besides the tectonic differences, the building's perfect physical integration into its setting is taken to an extreme in the Ocean Swimming Pool: building and setting merge, incorporating and reinterpreting the preexisting seaside wall.

However, we cannot say that this tectonic shift, even if it has its best example in the Ocean Swimming Pool, started or ended with this project. Siza had already been experimenting with exposed concrete structures in a previous design for the Parish Centre in Matosinhos (1955-1960), which was, nevertheless, still very indebted to vernacular influences. It would only be in the Lordelo do Ouro Cooperative building (1960-1963) that a more brutalist language was clearly assumed. Almost entirely closed to the outside, this building comprises a series of clearly defined and sharp juxtaposed volumes. It is wholly built in exposed concrete with a very distinctive horizontal wood formwork, and the window frames were initially made out of very large wooden planks that gave it a particular material weight (fig. 3.7). The tectonic proximity with the Ocean Swimming Pool is undeniable, showing that this was something Siza was interested in pursuing at the time. Even so, in what has to do with the relationship with the surroundings, the two projects could not be more different, as the Lordelo do Ouro Cooperative does not seek to integrate or merge with the urban fabric, searching for some formal autonomy in a clear rejection of what exists around it. The fact that we can find this sameness and difference within contemporary works, ideas that seem divergent and contradictory, is, as Peter Testa puts it, revealing of *"Siza's non-ideological, non--dialectical thinking (...) setting in motion a deeper trajectory and methodology - a non-binary praxiography for architecture."* (Testa, 2022, p. 72).

3.4



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3.4 Boa Nova Tea House and Restaurant (1958-1963) designed by Álvaro Siza.
3.5 Quinta da Conceição Swimming Pool (1958-1965) designed by Álvaro Siza.
3.6 20th century post-war architecture in UNESCO World Heritage List.
3.7 Lordelo do Ouro Cooperative (1960-1963) designed by Álvaro Siza.

3.3.2 World Heritage List

In recent years, the World Heritage List has seen an increase in 20th-century post-war architecture with the inclusion of 10 properties due to their contributions to the development of 20th-century architecture and urbanism. As a component property of 'Álvaro Siza's Architecture Works in Portugal, which integrates the World Heritage Tentative List since 2017, the Ocean Swimming Pool represents an exceptional example for its modern typology (touristic, sports, and healthcare facility) as well as its landscape integration, constructive innovation, its representativeness in the collective memory and its contextual design framed within the critical revision of the Modern Movement as coined by Kenneth Frampton.

LISTED PROPERTY	CRITERIA	LISTING YEAR	LOCATION
Brasilia	(i, iv)	1986	Brazil
Ciudad Universitaria de Caracas	(i, iv)	2000	Venezuela
Luis Barragán House and Studio	(i, ii)	2004	Mexico
Le Havre, the City Rebuilt by Auguste Perret	(ii, iv)	2005	France
Sydney Opera House	(i)	2007	Australia
Central University City Campus of the Universidad Nacional Autónoma de México (UNAM)	(I, ii, iv)	2007	Mexico
The Architectural Work of Le Corbusier, an Outstanding Contribution to the Modern Movement	(i, ii, iv)	2016	Argentina, Belgium, France, Germany, India, Japan, Switzerland
Pampulha Modern Ensemble	(I, ii, iv)	2016	Brazil
Ivrea, industrial city of the 20th century	(iv)	2018	Italy
The 20th Century Architecture of Frank Lloyd Wright	(ii)	2019	United States of America

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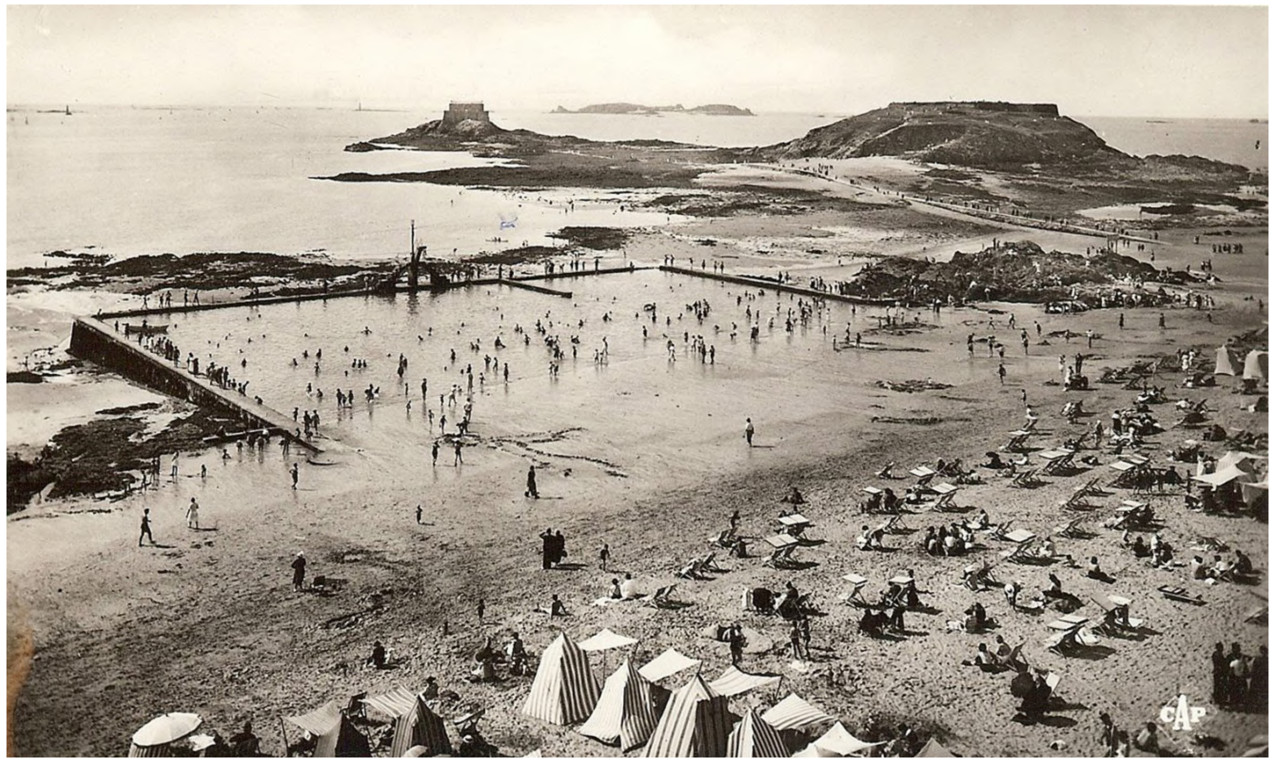

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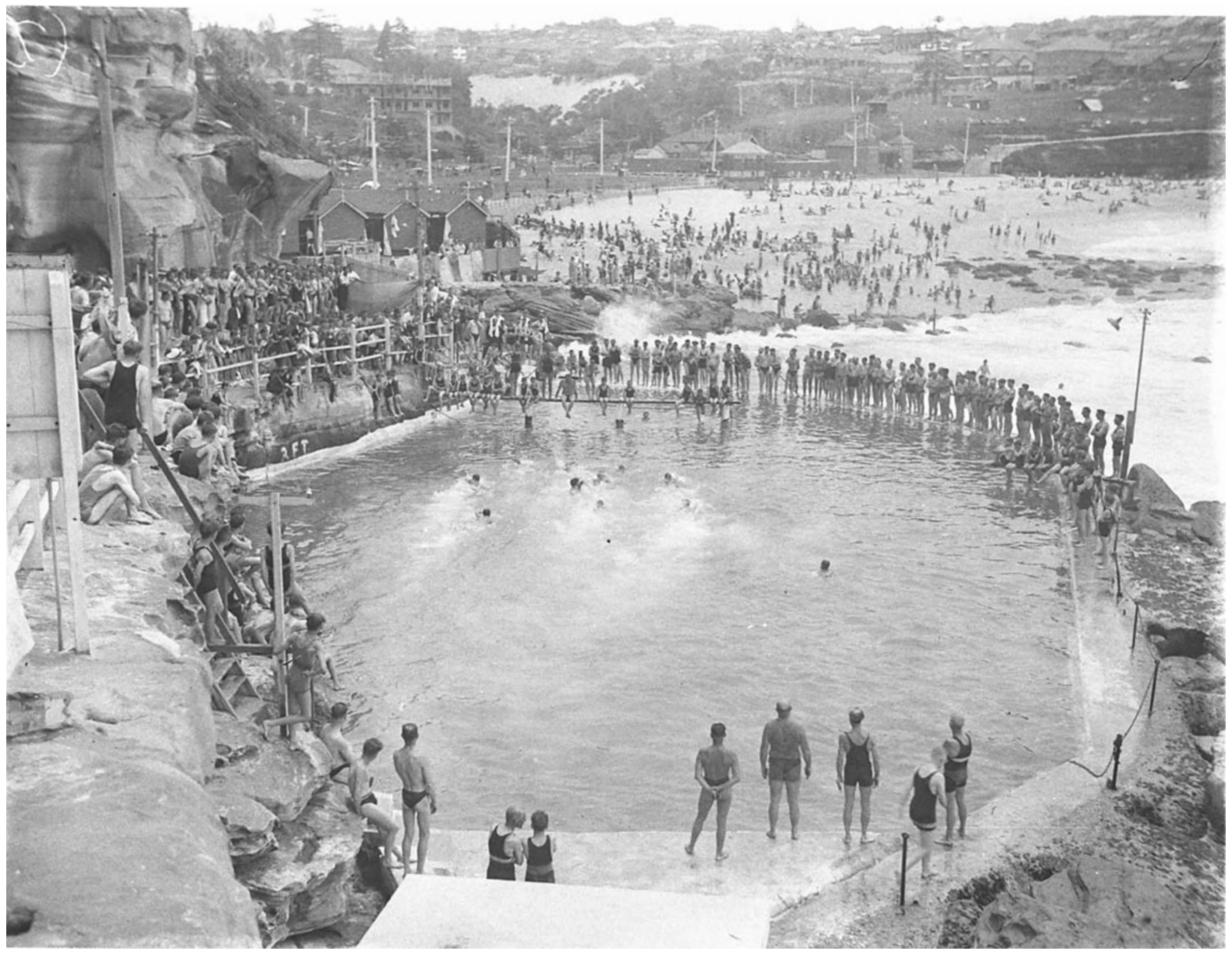


3.9

3.3.3 Ocean, natural and tidal pools

Even though natural pools filled with ocean water seem to have existed for thousands if not millions of years, sea bathing as a human activity is much more recent, in a first instance sparked by enthusiasm for physical fitness as it was believed to have medicinal properties. The existence of man-made ocean pools is particularly significant along the coast of New South Wales, in Australia, the first ones being built as early as the beginning of the 19th century (McDermott, 2012, p. 90). The hazards posed by surf, rip currents, and the abundance of sharks, combined with the bans that were in place at the time, forbidding public bathing in daylight, fostered the development of these pools. As the coast began to be understood as a recreational space, from the 1890s onwards, these structures became increasingly popular, hosting swimming competitions, with racing courses and places for spectators (fig. 3.9).

This enthusiasm for communal exercise went hand in hand with the first steps of the tourism industry all around Europe, as a new middle class emerged with the reduction of labor hours and the improvement of wages during the interwar period (Marsden and Spearritt, 2021, p. 138-139). In the 1920s and 1930s, numerous leisure infrastructures comprising saltwater swimming pools were built along the coast of the United Kingdom under the name of Lidos (after the Venetian lagoon's island) (McLachlan, 2019). These were, in many cases, enormous and flamboyant structures that went far beyond simple swimming pools, hosting live shows and all sorts of attractions to turn small coastal towns into mass tourist destinations (fig. 3.10). As it has become clear, the appearance of ocean pools is usually associated with locations where the sea's natural conditions are not fit for year-round bathing. Along the coast of Brittany, also a popular tourist destination, we can find swimming pools built during the 1930s that take advantage of rock outcrops along the beaches (fig. 3.8).

Even if we can trace the typological origin of the Ocean Swimming Pool in all of the above, none present the set of attributes of Álvaro Siza's masterpiece. Although the ocean pools in New South Wales are also built in a very close relationship with nature, taking advantage of the geological formations of the coast and minimizing man-made construction, they are usually located in remote areas and with minimal support facilities, in many cases precarious and not conceived as part of a whole together with the swimming tanks. In the case of British Lidos, one may say precisely the opposite, as support facilities take the predominant role and the swimming pools assume a much more artificial configuration. Its theme park appearance could not be further apart from Siza's strategy, very attentive to landscape integration, seeking to be invisible amongst the horizontality of the landscape. It is most likely that none of the above were known by Siza when he was designing the pool in Leça during the 1960s.

As we see it, the uniqueness of the Ocean Swimming Pool, amongst other examples of the same typology, resides precisely in the fact it is an architectural object that goes beyond the swimming tank, with support facilities that were designed and articulated as a whole, together with an almost seamless integration into the landscape that is not limited to the placement of the pool and extends to the surrounding area as a key piece of a broader plan. Furthermore, it was fundamental in the context of Álvaro Siza's early works as it expressed a tectonic shift from previous vernacular-inspired designs towards a more abstract language and expressively modern materiality. The exceptional attributes of the Ocean Swimming Pool, thus, fill an important gap in terms of cultural significance, especially if we consider how underrepresented are works from the second half of the 20th century in the World Heritage List, specifically from this transition period in the aftermath of the Modern Movement.

3.10

3.8 Bon-Secours swimming pool (1936), Saint-Malo.
3.9 Bronte Baths (1887), Sydney.
3.10 Tinside Lido (1935), Plymouth.

3.4 Communities' perception

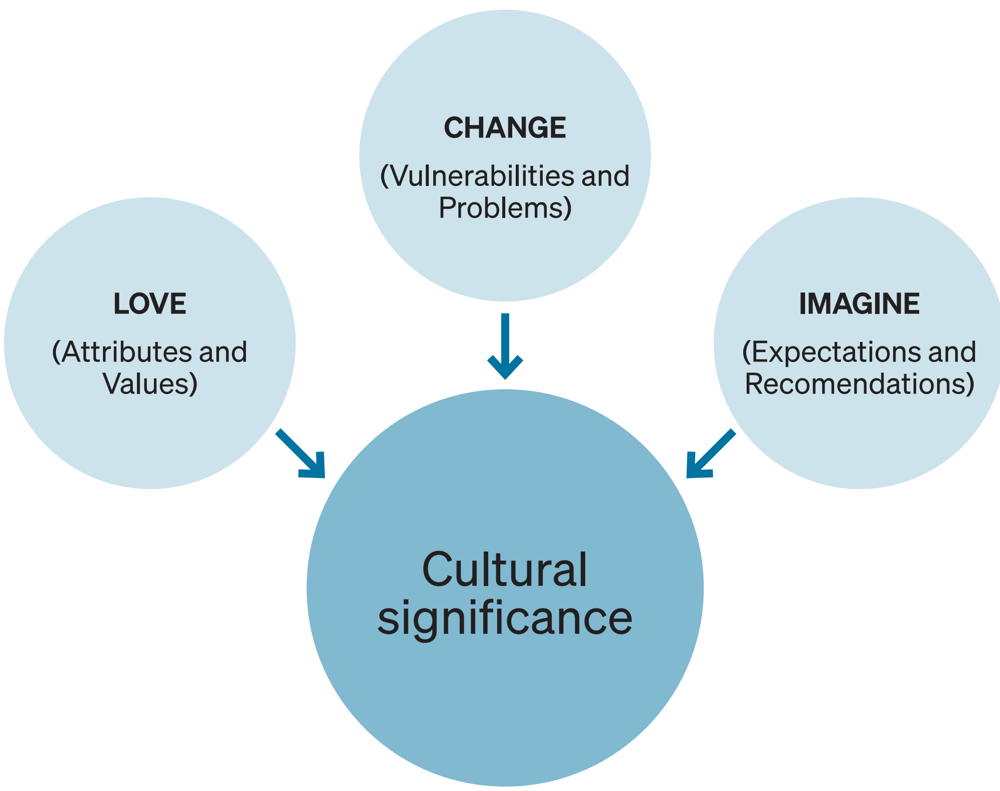
Community participation and stakeholder integration are among the best practices for heritage management and conservation, shifting from top-down, reactive, and regulatory approaches towards bottom-up, proactive, and participated approaches integrating communities throughout the process. This project attempted to overcome the traditional approaches that only consider citizens' involvement at the final validation stages of conservation planning. The variety and broadness of raised aspects related to the Ocean Swimming Pool demonstrated the potential of citizens' engagement to build more inclusive and democratic planning policies. Moreover, the broadness of the implemented methodology was one of the concerns of this research, combining the perspective of experts and governmental institutions with the building actors, site managers, and non-expert communities (e.g. users and visitors, including children). This multi-method approach, which included i) interviews, ii) surveys, iii) social media analysis, iv) workshops, and v) other activities, contributed to minimizing potential gaps and expanding the research representativeness (fig. 3.11).

WHO	HOW
Site managers and users	Interviews Surveys (Love, Change, Imagine)
Virtual community	Social media analysis
Students	Word cloud activity
Children	Drawing activity

3.11

The three key questions (fig. 3.12) of the 'Imagine Ballarat' methodology (City of Ballarat, 2013) formed the basis for the protocol design of the structured interviews with site managers and the surveys of visitors and users. Besides other practical questions, they were all inquired about i) What do they LOVE in the site (values and attributes), ii) What would they CHANGE (vulnerabilities and problems) and iii) How do they IMAGINE the site in the future (expectations and recommendations). One of the positive aspects of this method is that it entangles, very simply and efficiently, the cultural significance with policy planning. However, in some groups, the adapted 'Imagine Ballarat' LCI questions were partially applied, for the sake of clarity, time constraints, language, or other surveying restrictions. In these cases, it was given preference to the 'love' question, as cultural significance assessment precedes importance in developing a statement of significance.

The results of the participatory strategies were further analyzed through a coding technique supported by the taxonomy of cultural values of Tarrafa Silva and Pereira Roders (2012). This framework of eight cultural values - social, economic, political, historic, aesthetic, scientific, age, and ecological (fig. 3.13) – allowed the identification and further comparison with the results gathered with the above-mentioned community groups.



3.12

Especially in interviews with site managers and staff, quotations of key nucleons of their responses were selected, transcripted, and grouped for comparative analysis. Additionally, in surveys with the communities of users, in the first phase, a precoding technique was developed through interpreting nucleon sentences and words summarizing answers collectively, an issue especially critical for 'change' and 'imagine' questions. Since these questions were not supported by a thesaurus, this technique proved to be useful to build one preventively. During the second phase application stage, it allows the survey to be conducted by non-specialists and to speed up data analysis. Moreover, in addition to following the precoding categories, new ones could be created (post-coding), allowing broader information to be included.

The systematic nature of this content analysis methodology enabled further comparison between different sources and perspectives and the draft of a statement of significance representing the aspiring inclusiveness of the approach.

VALUE	DESCRIPTION
Social	It represents beliefs, myths, religions (organized or not), legends, stories, testimonials of past generations. It can evidence memory and personal life experiences, showing notions related to cultural identity, motivation, and pride, sense of "place attachment" and communal value. Integrates objects/places representative of some social hierarchy/status.
Economic	It shows the function of the asset, original or attributed. It can indicate the asset's expired function, which has its value in the past, that can be determined by its physical evidence (of materials), option on whether to make some use of it or not, and bequest value (for future generations). It can be identified by the role for the contemporary market, namely for the tourism industry, such as being oriented to a financial promotion of the property.
Political	Exhibits the education role that heritage assets may play, using it for political targets (nations' birth myths, glorification of political leaders, etc.). It might represent part of strategies and policies (past or present), to disseminate cultural awareness, and explored for political targets. Power, authority, and prosperity perceptions stem from the heritage asset.
Historic	It is a heritage asset with the potential to provide knowledge about the past as part of a few or unique testimonies of stylistic or artistic movements, which are now part of history, as well as the quality of an object that retains conceptual signs (architectural, urban planning, etc.), which are now part of history, or a fact that the object has been related with such as an important event in the past which might be connected with Ancient civilizations.
Aesthetic	It represents the original product of creativity and imagination, which might hold a creator's signature. It is the integral materialization of conceptual intentions, implying a conceptual background and representing the authentic exemplar of a decade, part of the History of Art or Architecture.
Scientific	Defines original result of human labor, craftsmanship, which shows technical and material skillfulness, representing an outstanding quality through the integral materialization of conceptual intentions.
Age	Exhibits craftsmanship value oriented towards the production period, evidencing a piece of memory, reflecting the passage/lives of past generations, showing marks of the time passage (patina) present on the forms, components, and materials.
Ecological	It represents harmony between the building and its environment (natural and artificial). Can evidence the identification of ecological ideologies on its design and construction, such as the use of manufactured resources which can either be reused, reprocessed, or recycled.

3.13

3.11 Identification of participants and participation strategies.
3.12 The three key questions of the 'Imagine Ballarat' methodology.
3.13 Taxonomy of cultural values (Tarrafa Silva and Pereira Roders, 2012).

3.4.1 Site managers and users

Site managers

When assessing cultural significance, it is important to have a broad perspective on the building's daily management and use by including different stakeholders (see section 2.8), such as the site managers. The management of the Ocean Swimming Pool is a shared responsibility between the Municipal Buildings Division and the municipally owned corporation Matosinhos Sport. The Municipal Council owns and is the main responsible for the maintenance of the Ocean Swimming Pool, a responsibility shared with other municipal departments that were also considered for the interviews. During the bathing season (June - September), Matosinhos Sport ensures its daily maintenance routines and determines the use regulations.

As regards the assessment of cultural significance, there was a common approach to all the actors related to the site's management which consisted of interviews based on the 'Imagine Ballarat' methodology. Hence, questions addressed the i) values and attributes recognized on the site (love), ii) identifying site vulnerabilities (change), and iii) expectations concerning maintenance and conservation (imagine). If the policymakers' (Municipal Council Departments) interview protocol included other questions related to the policies and site-related documents, the protocol adapted to the staff was more focused on their daily routines (see Appendices B and C).

The interviews conducted with the six heads of the Municipal Council Departments related to the site's general management (Culture, Heritage, Planning, Environment, Civil Protection, and Municipal Buildings), and the Matosinhos Sport ten staff members (head of division, technical coordinator, technical director, bar concessionaire, maintenance foreman, receptionist, lifeguard, security guard and cleaning assistant) took place on June 2021.

i) The collected answers indicated that the most valued aspects (what they love) by respondents correspond to the site's 'integration into the landscape' (50%), 'everything' of the site (13%), and with equal percentage the 'views of the sea', 'modern architecture' features and the 'significance of the building in the collective memory' (9%). The inquired also identified issues related to the 'fabric of the building' and the 'diversity of users' (5%).

Following the aforementioned taxonomy of cultural values, the results reveal that the site managers were able to identify predominantly aesthetic, ecological, and historic values, even if scientific and social values were also recognized.

ii) Among the aspects they would prefer to change, a large part of the respondents stated that they would change 'nothing' (40%), specifying in second place the need for 'more space for towels' (12%), 'accessibility improvements' (12%) and 'more safety measures for children' (12%). With a lower percentage but still mentioned by site managers is the need for 'more lighting in the changing rooms', the bar being 'in use during the entire year', the 'completion of the original design (restaurant)', and 'improved signage to facilitate access' to the building.

iii) Finally, respondents tend to imagine the building in the future as 'exactly the same' (72%), as a 'referential building of Matosinhos' (21%), and 'with a greater number of visitors' (7%).

ATTRIBUTE	VALUE	PARAMETER
integration into the landscape	Ecological	It represents harmony between the building and its environment (natural and artificial).
modern architecture	Historic	It is part of a few or unique testimonies of stylistic or artistic movements, which are now part of history.
views of the sea	Ecological	It represents harmony between the building and its environment (natural and artificial).
significance in the collective memory	Social	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of "place attachment" and communal value.
fabric of the building	Aesthetic Scientific	It represents the original product of creativity and imagination, which might hold a creator's signature. Defines original result technical and material skillfulness, representing an outstanding quality of work through the integral materialization of conceptual intentions.
diversity of users	Social	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of "place attachment" and communal value.

3.14

Users and visitors

As mentioned before, the involvement of communities includes the Ocean Swimming Pool users. Their vision, experience, and expectations are essential for the definition of this CMP's policies. As such, surveys to community users were conducted between June 2021 and July 2022, during the bathing season, and with the participants of the 'Open House' annual initiative in both years (figs. 3.15 and 3.16). Surveys containing all adapted 'Imagine Ballarat' LCI questions were distributed on-site, both through a printed version and an online one that could be accessed through a QR code. These were implemented in two different phases: a trial test with open-ended questions was first applied to a set of 20 respondents (June 2021), followed by a second set of inquiries (July 2021) which, based on the results of the first set, entailed multiple-choice questions (to help the inquirer) with the possibility of adding an open answer.

The precoding strategy enabled by surveys proved to be useful during the application stage, allowing it to be conducted by non-specialists and speeding up data analysis. Therefore, data analysis, in addition to following the precoding categories, creates new ones (post-coding) resulting from the additional information provided by the respondents.

The surveys to visitors and users counted a total of 115 respondents belonging to the communities in a broad sense, namely bathers (84%) and visitors or tourists (16%). Most of the inquired were Portuguese nationals (79%), with ages between 25 and 34 years old (27%) and 35 and 44 years old (20%).

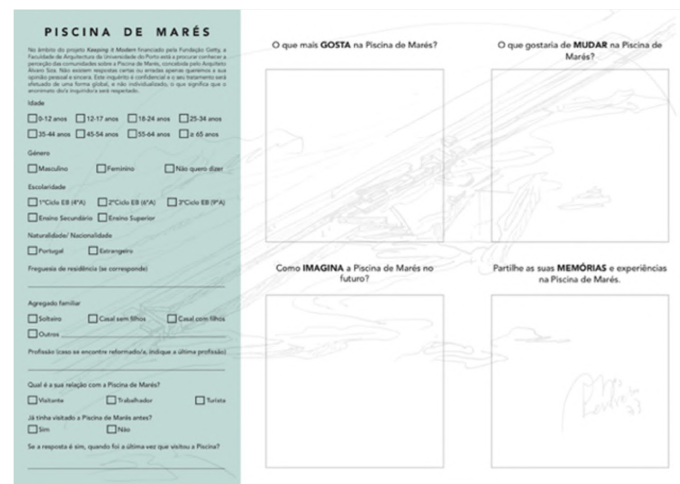
i) Survey results indicated that the most valued attributes (what they love) by respondents correspond to the site's 'integration into the landscape' (43%), the 'harmonious relationship with the rocks' (14%), and 'modern architecture' features (10%). The inquired also identified several attributes related to the 'views of the sea', the 'fabric of the building', the 'significance of the building in the collective memory', 'diversity of users', the 'privacy of the building' and the 'conservation of the original design'.

Following the aforementioned taxonomy of cultural values, the results reveal that users and visitors were able to identify predominantly ecological, aesthetic, and historic values, even if social, scientific, and age values were also recognized.

ii) Among the aspects they would prefer to change, a large part of the respondents stated they would change 'nothing' (42%), specifying in second place the need for 'more space for towels' (12%), the 'reduction of the entrance fees' (10%) and 'more lighting in the changing rooms' (10%). With lower percentage but still mentioned by users was the need for the bar to be 'in use during the entire year', the 'completion of the original design (restaurant)', 'accessibility improvements', 'signage improvements to facilitate access' to the building and 'more safety measures for children'.

iii) Finally, respondents tend to imagine the building in the future as 'exactly the same' (59%), in 'good conservation condition' (14%), and 'operational during the entire year' (8%). Other aspects that the users imagine for the future are the site as a 'referential building of Matosinhos', with the 'completion of the original design (restaurant)', 'more support infrastructure for visitors', 'with a greater number of visitors', the 'implementation of new technologies' and 'as National Monument'.

3.15



3.16

3.14 Justification of the values identification based on the cultural values taxonomy (Tarrafa Silva and Pereira Roders, 2012).
3.15 Open survey, 2021.
3.16 Open survey, 2021.

ATTRIBUTE	VALUE	PARAMETER
integration into the landscape	Ecological	It represents harmony between the building and its environment (natural and artificial).
harmonious relationship with the rocks	Ecological	It represents harmony between the building and its environment (natural and artificial).
modern architecture	Historic	It is part of a few or unique testimonies of stylistic or artistic movements, which are now part of history.
views of the sea	Ecological	It represents harmony between the building and its environment (natural and artificial).
significance in the collective memory	Social	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of "place attachment" and communal value.
fabric of the building	Aesthetic Scientific	It represents the original product of creativity and imagination, which might hold a creator's signature. Defines original result technical and material skillfulness, representing an outstanding quality of work through the integral materialization of conceptual intentions.
diversity of users	Social	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of "place attachment" and communal value.
privacy of the building	Aesthetic	It is the integral materialization of conceptual intentions, implying a conceptual background.
conservation of the original design	Aesthetic Age	It represents the original product of creativity and imagination, which might hold a creator's signature. Exhibits a piece of memory, reflecting the passage/lives of past generations, showing marks of the time passage (patina) present on the forms, components, and materials.

3.17

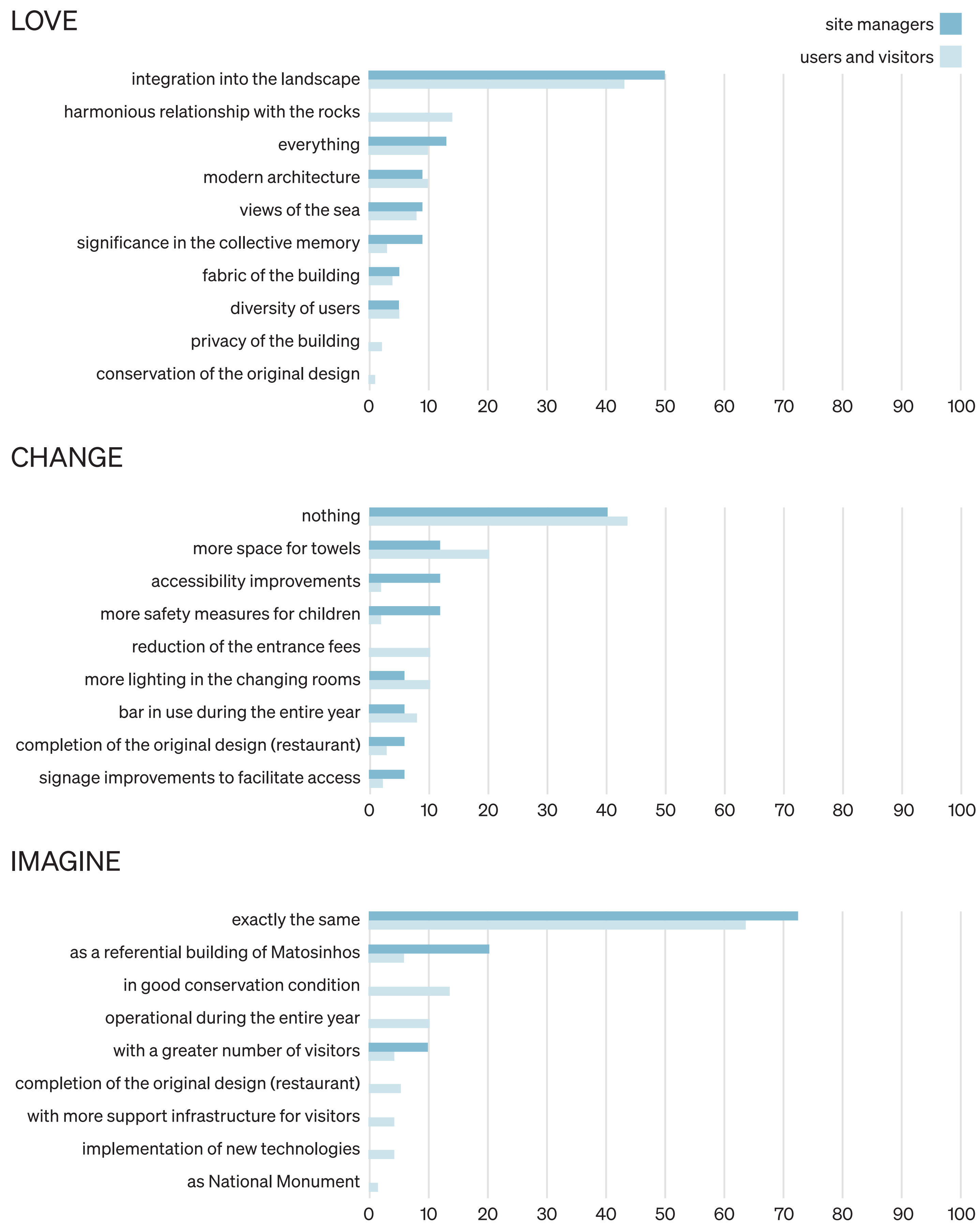
When comparing the results of the surveys to site managers and users it is clear that there is significant convergence between both groups regarding the identification of attributes, vulnerabilities, and expectations, even if there are some aspects in which they diverge, likely due to the different nature of the relationship each has with the asset (the institutional/operational perspective of the site managers and the user perspective of the visitors).

i) Regarding the most valued attributes (what they love), both respondent groups converge in the recognition of the 'integration into the landscape', 'modern architecture', 'views of the sea', the 'fabric of the building', and the 'diversity of users'. Site managers highlighted the 'significance of the building in the collective memory' while the 'harmonious relationship with the rocks', the 'privacy of the building', and the 'conservation of the original design' were attributes solely recognized by users and visitors.

ii) Among the aspects they would prefer to change, both respondent groups converge on the need for 'more space for towels' and the bar being 'in use during the entire year'. Site managers highlighted the need for 'accessibility improvements', 'more safety measures for children', the 'completion of the original design (restaurant)', and 'signage improvements to facilitate access', while users and visitors focused on the 'reduction of the entrance fees' and the need for 'more lighting in the changing rooms'.

iii) Finally, both respondent groups tend to imagine the building in the future 'exactly the same'. Site managers see it as a 'referential building of Matosinhos' with a 'greater number of visitors', while users and visitors seem to imagine it in 'good conservation condition', 'operational during the entire year', the 'completion of the original design (restaurant)', with 'more support infrastructure for visitors', with the 'implementation of new technologies' and continuing 'as National Monument'.

3.17 Justification of the values identification based on the cultural values taxonomy (Tarrafa Silva and Pereira Roders, 2012).
3.18 Imagine methodology cultural significance recognition results.



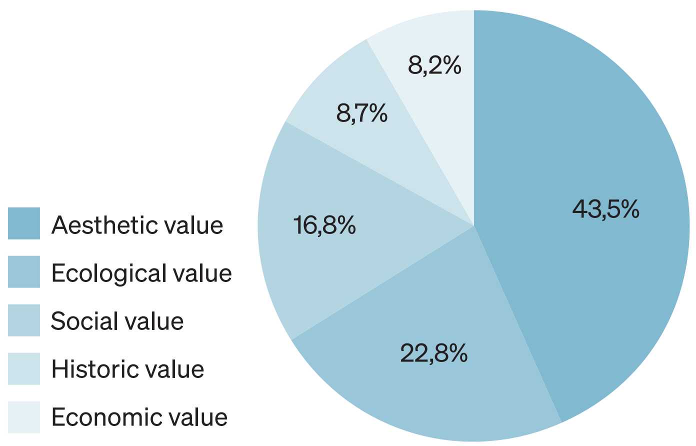
3.18

3.4.2 Virtual community

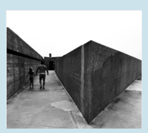
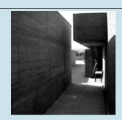
Nowadays, virtual communities play a relevant role in the assessment of cultural heritage, as well as in the definition of policies and the broader discussion about heritage sites. Hence, social media is a powerful tool that generates dialogues between the most diverse actors, delivering data that communicates valuable aspects of different heritage sites through experiences and memories exposed in these community interaction networks (Ginzarly *et al*., 2019, p. 1). The study of these platforms allows the identification of the landscape qualities spontaneously manifested by the community without directly relating the publication to heritage significance, which enables the emergence of values and attributes that might be hidden (Ginzarly *et al*., 2019, p. 3-4).

The approach to social media was considered only to expand the sample of the first question (love) of adapted 'Imagine Ballarat' LCI questions, enabling the integration of general public perception by using the social network Instagram. Using the search tool to identify and group photos with specific tags (#) related to the Ocean Swimming Pool, each element of open-access publications, namely photographs, tags (#), and related comments, was coded to assess values and attributes ascribed to the Ocean Swimming Pool (Dunkel, 2015; Ginzarly *et al*., 2019; Pettinati *et al*., 2021). In this case, four relevant tags were identified: #piscinadasmares (2,614 publications), #piscinadasmarés (824 publications), #piscinasdasmares (795 publications) and #piscinasdasmarés (205 publications). From these, one hundred images published over nine years (February 13, 2012 - March 26, 2021) were selected for analysis. Retrieved data was systematized according to: date of publication, URL of the publication, type of profile, photograph, tags (#), and description of the photograph's content.

Following the aforementioned taxonomy of cultural values, the attributes (tags) were translated to values, revealing that the virtual community was able to identify predominantly aesthetic, ecological, social, historic, and economic values.



3.19

INSTAGRAM PICTURE	ATTRIBUTE (TAGS)	VALUE	PARAMETER
	architecture pool building siza	Aesthetic	It represents the original product of creativity and imagination, which might hold a creator's signature.
	landscape sea views	Ecological	It represents harmony between the building and its environment (natural and artificial).
	memories community experience	Social	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of "place attachment" and communal value.
	modern architecture	Historic	It is part of a few or unique testimonies of stylistic or artistic movements, which are now part of history.
	pool use function entertainment tourism	Economic	It shows the function of the asset, identified by the role for the tourism industry, such as being oriented to a financial promotion of the property.

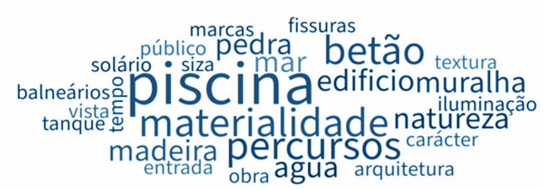
3.20

3.4.3 Students

A word cloud activity was developed with Architecture Master students from the Faculty of Architecture of the University of Porto resorting to the *Poll Everywhere* platform during a conference concerning the Ocean Swimming Pool's conservation works. The *Poll Everywhere* app is an online polling platform that enables the creation of a dynamic space to respond to open or multiple-choice questions enhancing class participation and understanding through discussion, and presenting the results in real time. The 'Imagine Ballarat' questions were adapted as follows: students were asked to identify the three elements they love the most about the Ocean Swimming Pool (attributes) and then give three reasons why they should be protected (values). The final result, displayed through word clouds, reveals the most recognized attributes and values (figs. 3.21 and 3.22) that were later coded to integrate with other participatory results.

The word cloud activity revealed that the swimming pool (*piscina*), the fabric (*materialidade*), concrete (*betão*), paths (*percursos*), and nature (*natureza*) were among the most identified attributes. Unlike the other participatory activities, besides being asked what they love about the Ocean Swimming Pool, students had to identify the reasons for the protection of the identified attributes. Therefore, the transposition for the Tarrafa Silva and Pereira Roders (2012) taxonomy of cultural values was, for this case specifically, based on the recognized values instead of the attributes. Following the aforementioned taxonomy of cultural values, the results reveal that the students were able to identify predominantly aesthetic and social values, even if historic, political, ecological, and age values were also recognized.

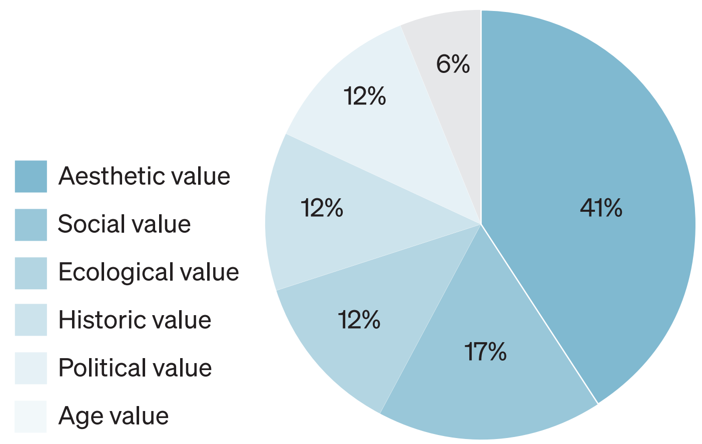
What do you LOVE the most about the Ocean Swimming Pool and what do you think should be protected? Identify 3 elements (attributes).



3.21

WHY do you love these elements and consider they should be protected? Identify 3 reasons (values).

3.22



3.23

3.19 Social media analysis cultural significance recognition results.
3.20 Justification of the values identification based on the cultural values taxonomy (Tarrafa Silva and Pereira Roders, 2012).
3.21 Word cloud activity results (attributes).
3.22 Word cloud activity results (values).
3.23 Word cloud activity cultural significance recognition results.

EXPRESSION	VALUE	PARAMETER
Heritage (Património)	Political	It represents part of strategies and policies, as well as strategies for the dissemination of cultural awareness.
Cultural	Social Historic	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of “place attachment” and communal value. It is a heritage asset that retains conceptual signs (architectural, urban planning, etc.), which are now part of history.
History (História)	Historic	It is a heritage asset that retains conceptual signs (architectural, urban planning, etc.), which are now part of history.
Aesthetical (Estético)	Aesthetic	It represents the original product of creativity and imagination, which might hold a creator’s signature.
Collective memory (Memória colectiva)	Social	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of “place attachment” and communal value.
Signs of time passage (Sinais do tempo)	Age	Exhibits marks of the time passage (patina) present on the forms, components, and materials.
Artistic (Artístico)	Aesthetic	It represents the original product of creativity and imagination, which might hold a creator’s signature.
Contrasts (Constrastes)	Aesthetic	It is the integral materialization of conceptual intentions, implying a conceptual background.
Light/dark (Claro/escuro)	Aesthetic	It is the integral materialization of conceptual intentions, implying a conceptual background.
Identity (Identidade)	Social	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of “place attachment” and communal value.
Interior/exterior	Aesthetic	It is the integral materialization of conceptual intentions, implying a conceptual background.
Spatial perception (Percepção espacial)	Aesthetic	It is the integral materialization of conceptual intentions, implying a conceptual background.
Artistic/cultural (Artístico-cultural)	Aesthetic	It represents the original product of creativity and imagination, which might hold a creator’s signature.
Simbolic (Simbólico)	Political	Exhibits the education role that heritage assets may play, using it for political targets.
Urban (Urbano)	Ecological	It represents harmony between the building and its environment (natural and artificial).
Landscape (Paisagístico)	Ecological	It represents harmony between the building and its environment (natural and artificial).

3.24

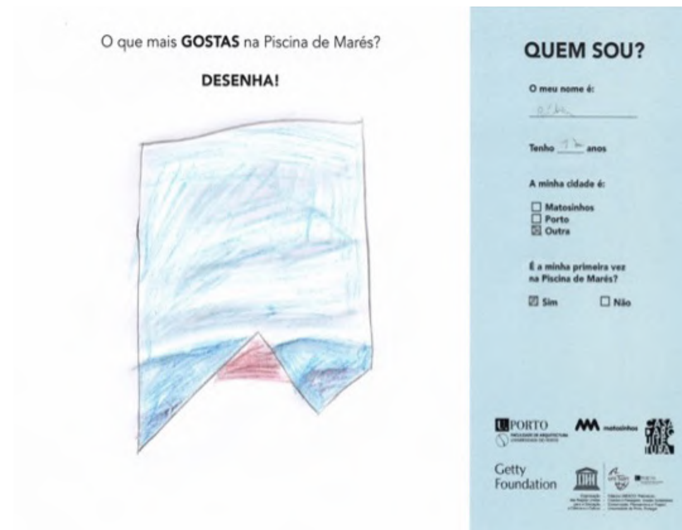
3.24 Justification of the values identification based on the cultural values taxonomy (Tarrafa Silva and Pereira Roders, 2012).
3.25 Drawing activity with children, 2021.
3.26 Drawing activity with children, 2021.
3.27 Justification of the values identification based on the cultural values taxonomy (Tarrafa Silva and Pereira Roders, 2012).

3.4.4 Children

The Ocean Swimming Pool is visited by many children during the bathing season, in the context of leisure, sports, school, and other activities among family and friends. For this reason, they are a public that cannot be ignored when assessing cultural significance. Children’s engagement with the identification of attributes and values took place through on-site drawing activities during the bathing season of 2021 (figs. 3.25 and 3.26). Hence, it was possible to approach children aged between 5 to 13 years old, which visited the site in summer activity groups, with schools, or accompanied by their families. In this case, only the ‘love’ question from the ‘Imagine Ballarat’ methodology was possible to retrieve. Despite that, this allowed us to include in the assessment of significance a group normally disregarded, but with an important and very direct unbiased perspective.

Results revealed a pattern related to the pool and its surroundings, highlighting their relationship. An extensive analysis of the activity results demonstrated that children enjoy natural elements such as water and rocks pointing its ‘integration into the landscape’ (50%), the ‘views of the sea’ (24%), evidencing also the ‘architecture’ (10%) of the site by showing the lines and geometry of the pool in the drawings. In addition, they often represented themselves enjoying the swimming pool in the company of friends and family engaging the ‘significance of the building in the collective memory’ (16%). The drawings express the desire to maintain the site as it is now, imagining it exactly as it is in the future. Therefore, it can be deduced that in this activity, kids highlighted the ecological, social, and aesthetic values as the main heritage values of the property.

3.25



3.26

ATTRIBUTE	VALUE	PARAMETER
integration into the landscape	Aesthetic Ecological	It is the integral materialization of conceptual intentions, implying a conceptual background. It represents harmony between the building and its environment (natural and artificial).
architecture	Aesthetic	It is the integral materialization of conceptual intentions, implying a conceptual background.
views of the sea	Aesthetic Ecological	It is the integral materialization of conceptual intentions, implying a conceptual background. It represents harmony between the building and its environment (natural and artificial).
significance in the collective memory	Social	It can evidence memory and personal life experiences, showing notions related to cultural identity, a sense of “place attachment” and communal value.

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3.5 Dissemination activities

Even if not specifically targeted at assessing significance as the aforementioned participatory activities, there have been numerous dissemination initiatives, such as a dedicated exhibition, guided visits, international symposiums, and publications, that have proven to be very important, not only for raising public awareness and discussion on the Ocean Swimming Pool, but also for collecting information to inform the significance assessment.

Sharing Memories webinar

The *Sharing Memories* webinar took place on September 9, 2021, organized by the Faculty of Architecture of the University of Porto together with the Municipal Council of Matosinhos and Casa da Arquitectura.

The webinar aimed at sharing different records and memories related to the Ocean Swimming Pool almost sixty years after its inauguration. Over thirty speakers were invited from various fields of study such as architecture, photography, history, and journalism: João Pedro Xavier, Fernando Rocha, Nuno Sampaio, Susan Macdonald, Álvaro Siza, Pierluigi Nicolin, Giovanni Chiaramonte, Dominique Machabert, Brigite Fleck, Nuno Grande, Peter Testa, Wilfred Wang, Christian Gänshirt, Jonathan Sergison, Luis Martínez Santamaría, Juan Domingo Santo, Michel Touissant, Luís Urbano, Alexandre Alves Costa, Joaquim Moreno, Eduardo Fernandes, Roberto Cremascoli, Filipa Guerreiro, José Cabral Dias, Ana Alves Costa, Teresa Novais, Carlos Machado, Pedro Leão Neto, Nuno Brandão Costa, Ana Tostões, Teresa Cunha Ferreira, and Rui Póvoas.

The webinar allowed to collect the participants' different testimonies, from period photographs and drawings to personal remarks and childhood memories of the building. This activity revealed multiple perspectives, impressions, and values of the Ocean Swimming Pool through the personal memories of each participant.

Following the webinar, the book *Sharing Memories. Álvaro Siza: Ocean Swimming Pool (1960-2021)* gathers the contributions of renowned national and international authors who, with different approaches, bring us their memories, experiences, and reflections. The volume is structured into five chapters - with unavoidable overlapping and contaminations - "Context and references", "From history to memories", "Critical perspectives", "Lessons from the Pool" and "Representations of the Pool", providing renewed perspectives and readings on this referential work of 20th-century architecture.

Exhibition

The Exhibition *NO PLACE IS DESERTED. Álvaro Siza: Ocean Swimming Pool (1960-2021)* draws upon Álvaro Siza's famous aphorism on the multiplicity of references (natural, topographical, built, immaterial) an architect finds on site that provides a creative catalyst for the design. It sought to illustrate the multiple lives of one of the most emblematic works of 20th-century architecture through a set of drawings, photographs, audiovisual materials, models, and objects – many previously unpublished – to put together a critical narrative of the design, construction, and conservation processes that have been taking place over the last six decades.

Documentary film

The documentary film *Life between Tides*, directed by Teresa Cunha Ferreira, collects a series of interviews with different building actors (Álvaro Siza), site managers (Manuela Batista, Pedro Machado), and academics (Paulo Lourenço, Nuno Mendes) as well as a detailed report on the recent conservation and extension works. It is structured in three parts embracing the complete life cycle of the building: i) original design, ii) recent conservation, iii) management and maintenance.

Guided visits

In the *Open House Porto* during a weekend, the public is invited, completely free of charge, to discover an itinerary proposed by the curator of the event. Each participant is able to create a tailor-made itinerary, exploring architecture and the city through a new perspective. In 2021 and 2022, under this initiative, the project leader Teresa Cunha Ferreira was invited to guide visits to the Ocean Swimming Pool focused on the design process and recent conservation interventions, as well as the work developed under the *Keeping It Modern* grant. At the end of the visits, participants were invited to fill in the aforementioned surveys (attributes, vulnerabilities, expectations).

3.28 *NO PLACE IS DESERTED. Álvaro Siza: Ocean Swimming Pool (1960-2021)* exhibition.
3.29 Exhibition detail, 2022.
3.30 Exhibition announcement, 2022.
3.31 Exhibition opening, 2022.
3.32 *Life between Tides* documentary film, 2021.
3.33 Ocean Swimming Pool guided visit during *Porto Open House*, 2022.


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Symposium Recognising and Managing 20th Century Heritage

The symposium *Recognising and Managing 20th Century Heritage* took place on June 30, 2022, at the Serralves Foundation library, organized by FAUP and the ICOMOS Twentieth Century Heritage International Scientific Committee (ISC20C), in partnership with ICOMOS Portugal and the Getty Foundation. The meeting was part of the *Keeping It Modern: Ocean Swimming Pool* project, funded by the Getty Foundation, the *Siza ATLAS: Filling the gaps for World Heritage* project, funded by the Foundation for Science and Technology (FCT), and the UNESCO Chair *Heritage, Cities and Landscapes. Sustainable Management, Conservation, Planning and Design*.

3.34 Recognising and Managing 20th Century Heritage Symposium announcement, 2022.
3.35 Recognising and Managing 20th Century Heritage Symposium, 2022.
3.36 Restaurer les bétons/ Conserving Concrete Symposium announcement, 2022.
3.37 Restaurer les bétons/ Conserving Concrete Symposium, 2022.
3.38 *Sharing Memories. Álvaro Siza: Ocean Swimming Pool (1960-2021)* book launch announcement, 2022.
3.39 *Sharing Memories. Álvaro Siza: Ocean Swimming Pool (1960-2021)* book launch, 2022.
3.40 Collection of publications on the Ocean Swimming Pool, 2022.

Symposium Restaurer les bétons/ Conserving concrete

The symposium *Restaurer les bétons/ Conserving concrete* took place on July 1st, 2022 at the Fernando Távora Auditorium, organized by FAUP and ICOMOS France, in partnership with the ICOMOS Twentieth Century Heritage International Scientific Committee (ISC20C) and ICOMOS Portugal. The meeting was part of the project funded by the Getty Foundation *Keeping It Modern: Ocean Swimming Pool*, the FCT project *Siza ATLAS: Filling the gaps for World Heritage*, and the UNESCO Chair *Heritage, Cities and Landscapes. Sustainable Management, Conservation, Planning and Design*. The symposium included a lecture by Álvaro Siza on the Ocean Swimming Pool.

Books and articles

Under the *Keeping it Modern* grant, the project leader Teresa Cunha Ferreira organized a collection of publications on the Ocean Swimming Pool, aiming at broadening knowledge and making the collected information available to the general public. Among them there is the catalogue of the exhibition that took place in the Faculty of Architecture of the University of Porto between May and July 2022, named *NO PLACE IS DESERTED. Álvaro Siza: Ocean Swimming Pool (1960-2021)* and co-edited by Luís Urbano; the collection of essays presented on the *Sharing Memories* webinar in September 2021, *Sharing Memories. Álvaro Siza: Ocean Swimming Pool (1960-2021)*; *Design Principles. Álvaro Siza: Ocean Swimming Pool (1960-2021)*; and *Conversations. Álvaro Siza: Ocean Swimming Pool (1960-2021)*, a critical exercise aiming at clarifying Siza's fundamental principles behind his designs to serve as a permanent reference for future readings or interventions on his works.

Besides these books, other articles have been published or submitted to public presentations in congresses, conferences, journals, or books. For further information on publications see the website (https://oceanswimmingpool.cargo.site to be migrated to https://sizaoceanswimmingpool.arq.up.pt).

3.6 Discussion of significance

3.6.1 Comparative discussion

The definition of cultural significance corresponds to the sum of the values attributed by the deemed actors of the heritage site. Hence, the declaration of cultural significance results from identifying the heritage attributes and values of the place, supported by content analysis techniques applied to evaluating related documentation, on-site information, and the analysis of the outcomes from the various participatory strategies presented previously. The identification of attributes of a place allows us to recognize its significance and facilitates the planning and establishment of policies and action measures in favor of maintaining the values defined by the different users. As a result, different measures are established to adapt and develop an action plan emphasizing the care of the site values.

Figure 3.41 summarizes the cultural significance recognized by all the actors involved in the current assessment, understanding attributes as the characteristics or qualities of the property, i.e., what should be conserved and the values supporting the conservation decision (why). This assessment resulted from a thematic analysis of all the data collected using various methods according to each actor, coding results according to the adapted cultural values taxonomy from Tarrafa Silva and Pereira Roders (2012).

The social, aesthetical, and ecological values emerged as the most referenced values identified by all the assessed groups in this paper. If, on the one hand, the identification of social values by both experts (site managers) and non-expert communities contradicts the theory formulated by Wagenaar *et al.* (2023), as exclusive for non-expert communities, on the other hand, the identification of aesthetical and historic values by the majority (the last except by children group) sustain the idea that the values traditionally associated with the Authorized Heritage Discourse (Smith & Waterton, 2012) can also be found in non-experts perceptions. The consensus over ecological value, from site managers to virtual community, along with the social and aesthetical values, may be related to the experience of landscape and the connection with the natural attributes. However, declarations of the virtual community tend to be more abstract – because they lack daily experience (or are based on single visits) – and, because of that, are more relatable with "common sense", which is prone to reinforce already listed justifications. This is somehow shared by students, which, in a similar way, are more attentive to design qualities and materials.

The scientific value was only identified in site managers and users and visitors revealing. The first emerged probably due to the nature of their professional link to the place, being more concerned with the need to ensure the correct functioning of the building. Along with the social, these values are embodied through their daily work by the recognition of the quality of the facility to embrace users' diversity and the outstanding technical innovation from the time the building was built. The identification of those technological values by users and visitors, mainly visitors, is probably related to the fact that some of the surveys were implemented during an experts-organized visit (Open House). This strong influence by expert perspective also may justify the exclusive identification of age values by the groups of users/visitors and the architecture students. On the other hand, users develop affectionate memories of family gatherings, events, and activities that enable the "sense of place" and sustain the "sense of time".

The economic and political values were only mentioned by one group each, virtual community and students, respectively. The economic value as related to property's use is highly valuable to the broader community, in the way that valorises the possibility of still visiting and using the place in its original function, which is also very relatable for tourists. Lastly, the exclusive identification of the political value by the students is also related to the bias and the pre-knowledge related to the works of the architect and the awareness of this importance in the conference that the poll was applied.

ACTOR GROUPS	ATTRIBUTES	VALUES							
		Social	Economic	Political	Historic	Aesthetic	Scientific	Age	Ecological
Institutional (listing justification)	Concrete shapes; Beach wall (linear and uninterrupted form, paths and geometry, landscape frame); Building (entire asset); relationship with the land and coastal context.								
Experts (architects and critics)	Role in the communities identity and collective memory; In continuous use for almost 60 years; Part of a political tourism driven transformation strategy; Significant contribution in the context of the revision of the Modern Movement; Design responsive to the specificities of place merged with a synthesis of international references; Pioneering use of exposed concrete in the Portuguese context; Patinas and concrete anomalies were maintained as signs of the passage of time; Landscape integration.								
Site managers (Municipal Council, Matosinhos Sport and building staff)	Integration into the landscape; modern architecture; views of the sea; significance in the collective memory; fabric of the building, diversity of users.								
Users and visitors	Integration into the landscape; harmonious relationship with the rocks; modern architecture; views of the sea; significance in the collective memory; fabric of the building; diversity of users; privacy of the building; conservation of the original design.								
Virtual community	Memories; community; experience; pool use; function; entertainment; tourism; modern architecture; architecture; pool; building; siza; landscape; sea views.								
Students	Pool; material; architecture; users; view; concrete; landscape.								
Children	Pool; landscape; sea; users; memories.								

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3.41 Ocean Swimming Pool cultural significance according to each of the inquired actor groups.

Social significance

Being an extremely popular leisure area and meeting place for both locals and visitors, the Ocean Swimming Pool has become a social and cultural landmark for the community. Its social significance is rooted in the strong relationship local communities have established with the place since its construction, being an indissociable element of their identities and occupying an unmistakable place in their collective memory and experience. As it became clear in the inquiries to all the actors groups, the site is seen as part of the city's identity and is present in the memories of multiple generations of locals, highlighting the importance of the social value.

Economic significance

The Ocean Swimming Pool has been in operation for more than fifty years under its original function, thus retaining its economic significance. Even though it is only fully open to the public during the bathing season, it is visited by more than sixty thousand people every year, representing an income source to the Municipal Council that is not negligible as bathers and visitors are charged entrance fees. During the rest of the year the site is only open for booked guided tours hosted by Casa da Arquitectura to answer the interest the building sparks both on a national and international level, being one of the most sought-after attractions in Matosinhos. Even though the actor groups' answers do not clearly identify the economic value, it is implicit as many of the values identified depend on the fact that the Ocean Swimming Pool remains in continuous use by the communities.

Political significance

The construction of the Ocean Swimming Pool, promoted by Fernando Pinto de Oliveira who was the President of the Municipal Council of Matosinhos from 1958 until 1970, was part of a broader redevelopment strategy of the seafront that aimed at transforming Leça da Palmeira into a relevant tourist destination. The understanding of the Municipal Council regarding the importance of the Ocean Swimming Pool to the city remained unchanged until today as the recent investment in the building conservation and extension works testify. Its political significance was enhanced by its listing as National Monument in 2011 by the Directorate-General for Cultural Heritage (DGPC), the national government agency responsible for the implementation of heritage protection legislation and the listing of national interest assets.

Historic significance

The Ocean Swimming Pool has a remarkable historic significance as it was a work in which Álvaro Siza introduced ideas not yet tried and closely related to the place. It reflects quite clearly the debates that were taking place at the time, revisiting Frank Lloyd Wright's fluidity and flexibility in the succession of spaces, or Le Corbusier's 'promenade architecturale' in the sequence of spaces thought of as a route, while employing, at the same time, a raw materiality in line with the brutalist movement, then emerging. Soon after its construction, it was considered a masterpiece by leading international architecture critics because of its modernity and organic integration into the surrounding landscape. There are more than eighty publications dedicated to it in different languages, transmitting the significance of the site and the international influence of the architect. Thus, the Ocean Swimming Pool stands out as a referential work in the context of the revision of the Modern Movement. Most of the inquired actors groups consider the historic significance one of the most relevant values of the place.

Aesthetic significance

The concept of aesthetical value is closely related to creativity, imagination, and the product of a creator (Tarrafa Silva and Pereira Roders, 2012). The Ocean Swimming Pool has a remarkable aesthetic significance given its direct association with the nationally and internationally acclaimed architect Álvaro Siza. He has approximately 500 designs and built works, 19 honorary doctorates, hundreds of dedicated publications, and more than 100 distinctions and awards (including the Mies Van der Rohe Award in 1988, the Alvar Aalto Medal in 1988, the Pritzker Prize in 1992, the Golden Lion for the Best Project in 2002 and the lifetime achievement award (Venice Biennale, 2012), the Royal Gold Medal for Architecture in 2008, the Luso-Spanish prize for Art and Culture in 2010, among others). This Ocean Swimming Pool, built between 1960 and 1973, was one of his first projects, being faithful to the architect's style and signature, where the combination of nature and modernist elements stand out. All inquired actors groups indicate the representation of Modernist aesthetic features as one of the most relevant values of the place.

Scientific significance

The Ocean Swimming Pool's scientific significance is related to the expertise of engineer Bernardo Ferrão who employed a series of innovative building solutions. It is one of the first exposed concrete constructions in Portugal, expressing engineering advances such as its hydraulic infrastructure and seawater collection system or the building tectonics of brutalist expression, using raw materials such as exposed concrete, Baltic pine, and copper. Despite its importance, the specificity of the scientific value makes difficult its immediate identification by most of the inquired actors groups.

Age significance

Built almost sixty years ago, the Ocean Swimming Pool emerged with a new vision of society and well-being manifested through modern programs such as tourism, leisure, and health infrastructures. The age significance is visible throughout the complex in the patinas that several materials exhibit as its material integrity has been maintained until today. Furthermore, during the recent conservation intervention, Álvaro Siza decided to keep all the concrete cracks that did not present any structural risks open as signs of the passage of time. Despite its importance, the specificity of the age value makes difficult its immediate identification by most of the inquired actors groups.

Ecological significance

The Ocean Swimming Pool's ecological significance rests upon its harmonious integration within the topography and surrounding landscape. The intervention takes into account the horizontality of the site and incorporates it in the design, with the building mediating the transition between the coastal road and the natural extension of beaches. The architect takes advantage of the site's natural configuration to insert the swimming pools amongst the rock outcrops with minimum intervention. This value was mentioned by all inquired actors, from experts to visitors, as one of the key features that should be preserved for further generations.

3.6.2 Integrity and authenticity

Integrity

The integrity of a heritage place encompasses a multiplicity of factors such as buildings, interiors and collections, immediate landscapes, and wider settings. The Ocean Swimming Pool retains a very high degree of integrity as it is maintained in good condition, including all elements necessary to express its values and significance. The building itself retains a high degree of original fabric, including interior fittings and fixtures. Even though the wider landscape has changed significantly, the immediate coastal setting too is largely intact.

The property limits defined by the Buffer Zone include all the necessary elements that express the significance of the Ocean Swimming Pool, namely the access ramp, the changing rooms' building, the beach pathways and platforms, the two swimming pools, and the immediate surroundings, essential to the property's distinctive setting. The building did not suffer any significant change during its lifetime aside from the reconstruction and extension of the north area (2018-2021) carried out by Álvaro Siza, respecting the original design and fabric.

The repair of concrete elements implied the removal of previous inadequate interventions that were affecting the integrity of the original texture and color. In some cases, the cracks were repaired with a carefully studied mortar to blend in with the original material. In other cases, when there were no structural implications, the cracks were left exposed as signs of the natural aging of the building. Only when strictly unavoidable were concrete elements replaced, with close attention to the preexisting concrete color and texture, as was the case of the south storage room's roof slab that presented a severe state of decay. These interventions, monitored by Álvaro Siza, had no impact on the building's integrity, given that the new concrete elements will blend in with the existing ones over time.

The Buffer Zone's limits include the extended landscape from the north jetty of the Leixões Port to the Boa Nova Tea House and Restaurant. In this way, the views from the site toward the surrounding landscape are protected. On the other hand, the urban development on the other side of the seaside has negatively affected these views, interrupting the horizontal relationship between land and sea. Currently, the Ocean Swimming Pool does not have development threats since the dismissal of the oil refinery that was located in the vicinity.

3.42

Authenticity

An authentic place is the honest product of its history, where there has been no adverse impact upon its fabric or the reasons for which it is considered significant. From the extensive archival sources documenting the design, construction, and subsequent developments until the present day, it can be concluded that the Ocean Swimming Pool has a very high degree of authenticity which must be respected when managing change. The Ocean Swimming Pool's authenticity was assessed according to the categories defined by the *Nara Document on Authenticity* (UNESCO, 1994):

Form and design: The Ocean Swimming Pool mantains the overall authenticity of form and design over time. The conservation works carried out recently by Álvaro Siza have followed the design principles of the original construction, while reversing some incorrect interventions that took place in the past, even if they never significantly affected the building's form and design.

Materials and substance: The Ocean Swimming Pool maintains most of the original materials. Although some materials had to be replaced due to degradation, all the works were monitored by Álvaro Siza in close collaboration with specialists, achieving a conservation work that maintains the substance of the materials and their shape. The materials that were added in the new project have been selected by the architect to be in keeping with the originals.

Use and function: The Ocean Swimming Pool maintains its original use and function with compatible contemporary adaptations. The pools fully maintain their original use and operation as they have such a specific program. Although today the pools carry out other types of events such as guided tours and some social events, the main function of the swimming pool remains unaltered.

Location and setting: The Ocean Swimming Pool urban context has undergone some changes due to real estate development. However, the Buffer Zone has protected the urban context from invasive interventions. Furthermore, its location bordering the sea assures visibility towards the coast and is maintained without the impact from external factors. The new interventions in the building have been carefully developed by the architect and are respectful of the specificities of the site.

Spirit and feeling: The Ocean Swimming Pool maintains an original and intimate relationship with nature, being in the rocky coastal area of Leça da Palmeira. The path that guides the visitors through different light intensities ensuring the transition between the urban and the natural is an important aspect in determining that the sensation and spirit that is lived in the building remains intact.

Traditions, techniques and management systems: The Ocean Swimming Pool maintains the original traditions, techniques and management systems. The building's technical installations have been updated, including the replacement of the water filters in the water treatment area, pipes, the electrical wires and artificial lighting.

3.42 View towards west over the bar terrace, 2021.

3.7 Levels of significance

The assessment of levels of significance is essential to plan and justify the decisions and actions to be taken. This evaluation establishes policies for conservation and treatment to maintain its tangible and intangible values.

However, the different spaces and components that contribute to its general significance have different levels of importance according to their attributes. For this purpose, the *Sydney Opera House Conservation Management Plan* (Croker, A. 2017) assessment of significance methodology was followed, adopting its five-level scale: i) Exceptional significance, which are the areas and elements fundamental to the cultural significance of the building, ii) high significance, areas and elements with a high cultural significance but not fundamental, iii) moderate significance, areas and elements that support other zones of greater significance, iv) some significance, zones of lesser support for significant areas and v) intrusive, which are invasive elements that change and alter the significant components of the place.

The definition of the levels of significance was informed by the interviews conducted with the Municipal Council Departments, document consultation, on-site observation, and the information collected in community surveys. This study methodology provides a global knowledge to determine an accurate definition of the building's cultural significance.

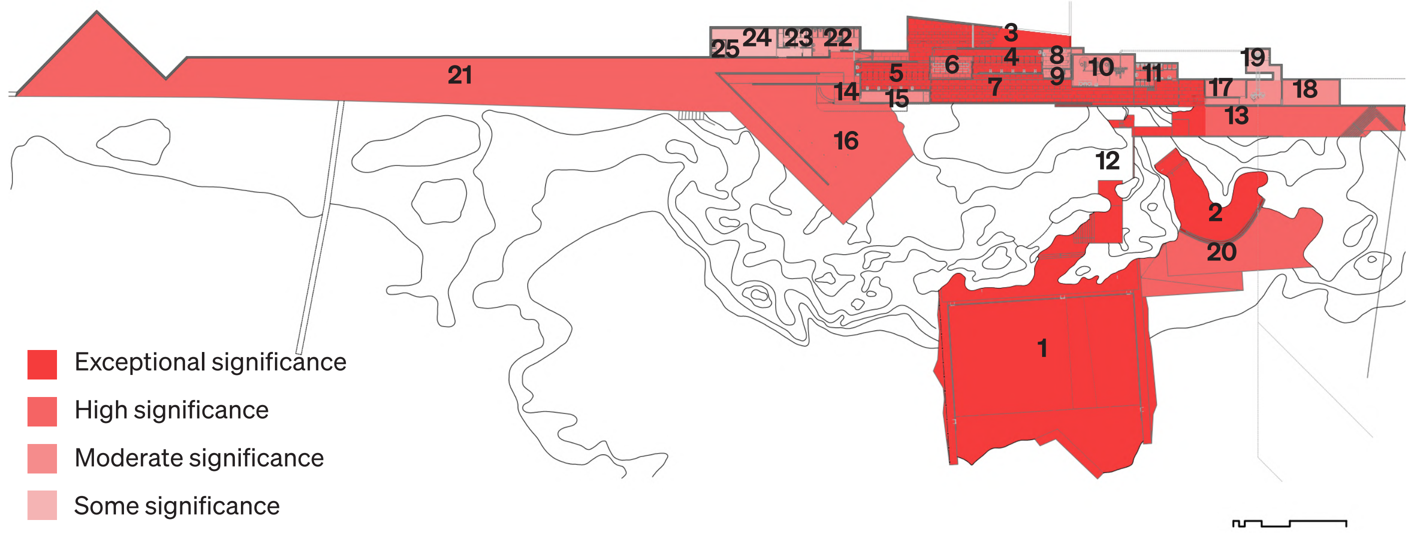
The spaces of exceptional and high level of significance are defined as the ones that respect original design and function at a high level showing a strong aesthetic and social value. In this case, the spaces correspond to the entrance ramp, changing rooms, changing rooms' hallway, adults and children swimming pools, foot washes, beach and access paths, cloakroom, south bathrooms, south platform, bar, terrace, west platform, and north platform.

The spaces of moderate and some significance in the building are defined as the spaces that have no relevance on their own but as a support area. These spaces correspond to the collective changing room, water treatment room and chlorine cabinet, security room, south storage rooms, kitchen, north bathrooms, water collection room, employee's changing rooms and bathrooms, north storage room, and waste management room.

Concerning the intrusive level, the Ocean Swimming Pool does not have any area that affects or diminishes its level of cultural significance. Furthermore, although invasive interventions were carried out on elements and components of the building, these actions were corrected in the last intervention carried out by Álvaro Siza. Therefore, today, there are no elements that negatively affect the building.

Having identified the levels of cultural significance according to spaces, it is now possible to develop the tolerance for change assessment that each one has. This evaluation will enable the definition of opportunities and future action plans for the adequate conservation of the property, creating an objective framework in the decision-making orientation on a scale of priorities seeking to maintain the integrity and authenticity of the place as much as possible.

3.43 Ocean Swimming Pool levels of significance.
3.44 Building areas according to the level of significance.



3.43

LEVEL OF SIGNIFICANCE	BUILDING AREAS
Exceptional significance	- Entrance ramp (3)
	- Changing rooms (4/5)
	- Changing rooms' hallway (7)
	- Adults swimming pool (1)
	- Children swimming pool (2)
	- Foot washes
	- Beach and access paths (12)
High significance	- Cloakroom (6)
	- South bathrooms (11)
	- South platform (13)
	- Bar (14)
	- Terrace (16)
	- West platform (20)
	- North platform (21)
Moderate significance	- Collective changing room (8)
	- Water treatment room and chlorine cabinet (10)
	- Security room (17)
	- South storage rooms (18)
	- Kitchen (15)
	- North bathrooms (22)
Some significance	- Water collection room (19)
	- Employee's changing rooms and bathrooms (23)
	- North storage room and waste management room (24)

3.44

3.8 Statement of significance

This statement of significance summarizes the key heritage values of the Ocean Swimming Pool as identified and assessed in the preceding sections.

The Ocean Swimming Pool is an outstanding work within the context of the revision of the Modern Movement, both on a national and international level. It reflects quite clearly the debates that were taking place at the time, revisiting modernist ideas while employing, at the same time, a raw materiality in line with the brutalist movement, then emerging.

The Ocean Swimming Pool was considered a masterpiece by leading international architecture critics because of its modernity and organic integration into the surrounding landscape. There are more than eighty publications dedicated to it in different languages, transmitting the significance of the site and the influence of the architect on an international level.

The Ocean Swimming Pool has become a place of international pilgrimage for architects and designers. Hence, since its construction, it has been extensively photographed, filmed, and written about, demonstrating the influence of Álvaro Siza in the context of 20th-century architecture.

The Ocean Swimming Pool is visited every year by an excess of sixty thousand people, being one of the most sought-after attractions in Matosinhos.

The Ocean Swimming Pool marked a turning point in Álvaro Siza's career by expressing a tectonic shift from regionalist inspired designs towards a more abstract language and innovative constructive solutions.

The Ocean Swimming Pool is one of the first constructions in exposed concrete in Portugal, employing innovative construction systems such as its plumbing and seawater collection system or the tectonics of brutalist expression, using raw materials. Hence, the constructive elements, together with the infrastructures, furniture, and details, were all conceived as a 'total work of art'.

The Ocean Swimming Pool showcases the emergence of modern programs such as tourism, leisure, and health infrastructures during the 1960s as a result of a new vision of society focused on well-being. It formed part of a broader redevelopment strategy of the seafront conducted by the Municipal Council that aimed at transforming Leça da Palmeira into a relevant tourist destination.

The Ocean Swimming Pool has a unique setting and reflects a harmonious integration within the topography and surrounding landscape. The architect took advantage of the site's natural configuration to insert the buildings and swimming pools amongst the rock outcrops with minimum intervention.

The Ocean Swimming Pool has been in full use for almost sixty years, becoming a social and cultural landmark for the community. Its popularity is deeply rooted in the strong relationship local communities have established with the building since its construction, occupying an unmistakable place in their collective memory.

The Ocean Swimming Pool's recent conservation and extension works (2018-2021) led by Álvaro Siza represent an exceptional case of an architect preserving his own work while enhancing its significance by remaining faithful to the building's attributes and the design principles behind the original design.

The Ocean Swimming Pool's material integrity has been maintained, despite its significant exposure to extreme weather phenomena. During the recent conservation intervention, Álvaro Siza decided to keep the signs of the passage of time such as patinas and cracks as evidence of the material history of the building.

The Ocean Swimming Pool is included in the Tentative List for World Heritage Status as a component property of 'Álvaro Siza's Architecture Works in Portugal' and is listed as National Monument for its architectural, urbanistic, and landscape values.

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4. CONDITION ASSESSMENT, CONSERVATION AND RISKS

4.1 Introduction
4.2 Inspection and diagnosis
4.3 Conservation interventions
4.4 Hazards, vulnerabilities and risks

94—157

4.1 Introduction

Chapter 4 assesses the physical condition of the Ocean Swimming Pool and identifies the vulnerabilities and hazards that may affect its future management and conservation. It is intended to provide an overall summary of the fabric's current conditions and a clear understanding of external factors, such as environmental or use-related pressures, which may affect the heritage significance of the place. The information gathered aims at informing the CMP's policy development which must address the identified vulnerabilities.

The chapter opens with a section on inspection and diagnosis (4.2), aimed at surveying damage, estimating material and geometric properties, and identifying degradation mechanisms. The third section (4.3) details the conservation interventions that took place between 2018 and 2021, including different pilot demonstrations for concrete repair. Finally, the last section focuses on the identification of hazards, vulnerability scenarios, and risk levels.

Inspection and diagnosis of the site's fabric was led by the engineers Paulo B. Lourenço, Nuno Mendes, and Javier Ortega from the University of Minho between 2020 and 2021. Besides a preliminary damage survey developed by the Faculty of Architecture of the University of Porto, evaluation of the out-of-plane deformations of the walls, and non-destructive and laboratory testing were conducted. The experimental campaign included: i) concrete carbonation testing; ii) laboratory tests to determine the mechanical properties of the concrete and steel rebars; iii) chloride content testing; iv) water penetration testing; v) concrete testing with Schmidt hammer; vi) sonic testing; vii) color analysis based on spectrophotometry and viii) Ground Penetrating Radar (GPR) testing.

Álvaro Siza selected specific locations for concrete repair, which were submitted to two different methodologies. The first were intervened using the Gray Concrete Restoration Method (GCR-Method) (Miranda, *et al.*, 2021) to characterize the concrete surface, including the color and texture of the surface, to design the restoration mortar, to define the application and finishing procedures and to assess the intervention. This intervention was performed by a team from the Civil Engineering Research and Innovation for Sustainability (CERIS), composed of Judite Miranda, Jonatas Valença, Hugo Costa, and Eduardo Júlio. The second localized concrete repairs were conducted by the specialized conservator-restorer Pedro Antunes (Cinábrio Restauro).

The adopted risk, vulnerability, and hazard identification approach falls into the category of qualitative methods and combines the likelihood and severity of the selected hazard scenarios with the vulnerability levels that were identified to establish the risk levels. Although in a qualitative form, the vulnerability levels that are identified consider physical impacts and impacts on the cultural significance and values of the site.

4.2 Inspection and diagnosis

4.2.1 Condition survey

The inspection and diagnosis were aimed at surveying damage, estimating material and geometric properties (concrete, cement paste, steel rebars, and timber), and identifying material degradation mechanisms. This task involved visual inspection, scanning of the structure with a laser scanner and drone, as well as in-situ non-destructive and minor destructive tests and laboratory tests of samples extracted from the structure (concrete, cement paste, steel rebars, and timber). The in-situ tests and the samples were conducted and collected in parts of the structure built in different phases.

The visual inspection allowed us to verify that the building is in a reasonable state of conservation, without interventions that have substantially altered its original form (figs. 4.2 and 4.3). However, the building is at risk because of its maritime location which has aggravated concrete decay. Salt water and salt fog chlorides penetrate the concrete and cause rebar corrosion, which consequently causes the cracking and spalling of concrete. Furthermore, repair campaigns conducted by the Municipal Council of Matosinhos since the 1980s have led to problems such as delamination, pattern cracking, and staining.

The building and the swimming tanks are mainly built in good quality lightly reinforced concrete. In contrast, the beams and slabs are more heavily reinforced, which is where the main corrosion problems and subsequent spalling have been observed. Spalling also occasionally occurs at the top of the walls or in the swimming pool tanks, namely at the points where the tanks connect with the rocks. Regarding the concrete used in the building site there were different compositions: i) the cyclopean concrete walls were composed of granite stones, filled with 300kg cement per m³; ii) the foundation, the platforms pavements, and the bar's triangular terrace is made out of concrete with 250kg/m³ cement; iii) the concrete walls are reinforced with 10kg/m³ of steel in the retaining walls and 15kg/m³ in the remaining walls; iv) the concrete roof slabs in the north and south storage rooms have 52kg/m³ and 130kg/m³ of steel, respectively; v) in the north area, there is a concrete beam (which extends to the retaining wall) that is reinforced with 190kg/m³ of steel (Mota, 1972).

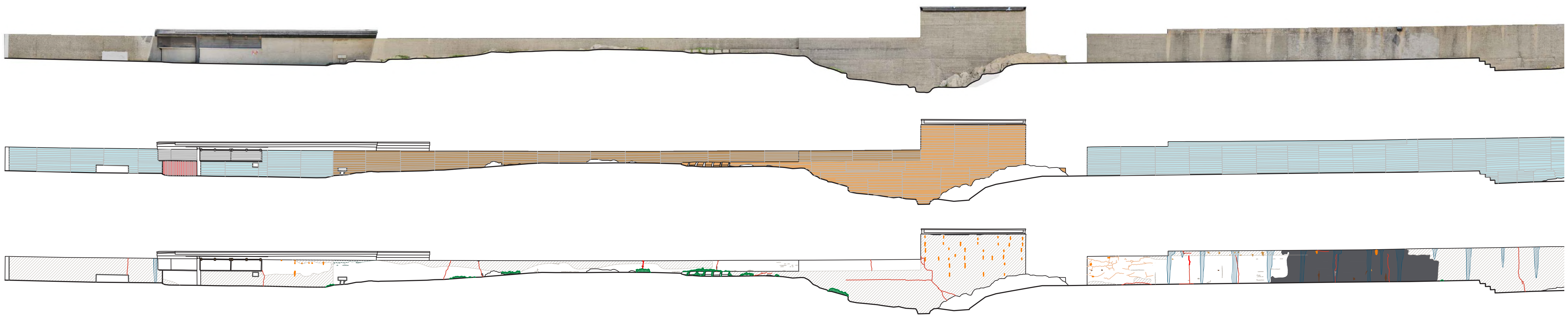
The most evident signs of deterioration in the concrete walls are in the form of cracks, creating visible discontinuities in its surface. Most of these cracks are not related to steel corrosion. The vertical cracks in the longitudinal walls seem to be caused by shrinkage and/or thermal movements, as a result of the absence of movement joints in the original design. These were worsened by interventions performed by the Municipal Council, namely the filling of the cracks with incompatible mortar (Portland cement mortar with limited compatibility, reversibility, or aesthetic integration concerns) (fig. 4.11). Moreover, some concrete surfaces have small red/brown stains from metal oxidation inside the concrete, which has deposited on the surface. In some beams, there are signs of spalling caused by the corrosion of steel rebars (fig. 4.4). The bottom surface of the south storage room's roof slab was severely affected by rebar corrosion (fig. 4.8). There is also damage associated with pattern cracking (taking the form of a polygonal net, similar to a spider's web) caused by the addition, in the 1980s, of a 4 cm concrete layer (with light mesh) over some walls, because of incompatibility with the preexisting concrete or shrinkage (fig. 4.5).

Some of the walls show signs of efflorescence in the form of a textured white stain, which is caused by the infiltration of water in the concrete. The building also suffers from localized spots displaying a chromatic change, caused by the rainwater running off the surface and leaving a deposit. There are also the effects of biological colonization growing on the concrete surface, which changes its texture and color.

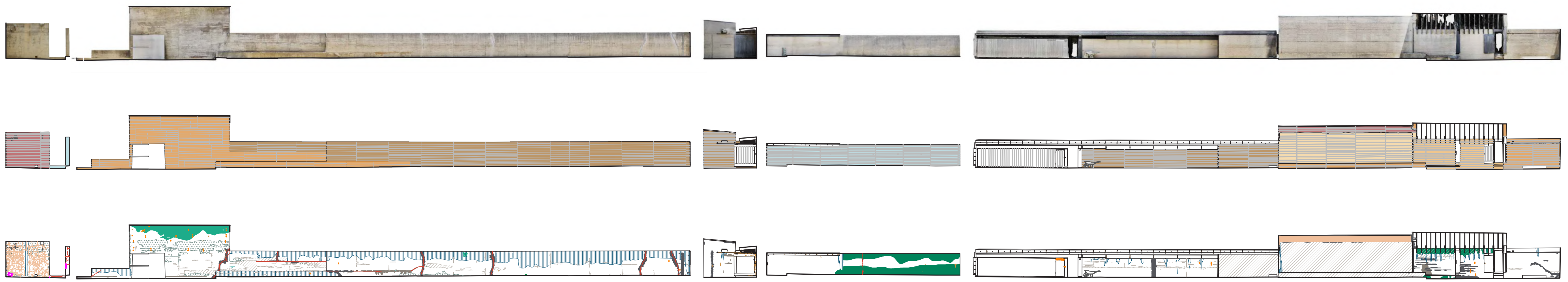
The roof's copper cladding presents a green color due to oxidation and leakages have been identified, resulting from weather exposure and lack of maintenance. The roof's timber structure and the changing rooms' partition walls present localized detachment of the coating and an oily texture, which results from the excessive amounts of linseed oil used in its maintenance. The screws used for the timber structure show signs of oxidation, with brown textured spots on their surface.

Finally, the most notable deficiency in the building's use is related to the plumbing system, as many of the pipes of the water system have either been destroyed by corrosion or are clogged with sand, which means that they were compromising the Ocean Swimming Pool's functionality (closed to the public in 2018 and reopened in 2021).

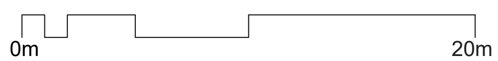
4.1 Formwork texture of the east façade.
4.2 Ocean Swimming Pool west elevations damage mapping (following spreads).
4.3 Ocean Swimming Pool east, south and terrace elevations damage mapping (following spreads).



West elevation (facing the beach)



West elevation (facing the changing rooms hallway)

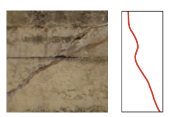


1960-1961
Construction of the adults swimming pool in cyclopean concrete.

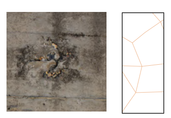
1962-1965
Construction of the children swimming pool and the changing rooms building in lightly reinforced concrete, Baltic pine and copper roof.

1965-1972
Construction of the bar, north and south storage rooms, redefinition of the retaining walls and platforms in concrete and screed.

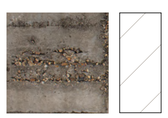
1972-1973 / 1995
Construction of the bar counter and south platform amphitheatre / conservation works on the copper roof and concrete walls.



Cracking
Complete or partial separation of material.
Causes: executive procedures, absence of movement joints, ground movement.

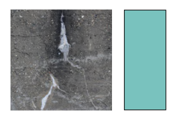


Pattern cracking
Poligonal web shaped separations of material.
Causes: mortar incompatibility, alkali-silica reaction.



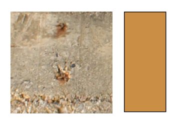
Erosion
Loss of superficial matter.
Causes: rainwater flow, action of the marine aerosol.

Mineral deposit (dust)
Atmospheric dust deposit, formation of dark grey areas.
Causes: atmospheric particulate.

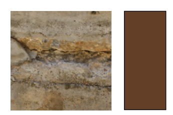


Efflorescence
White areas over dark grey background.
Causes: infiltration of water into the structure.

Patch
Application of concrete to close cracks or facilities traces.
Causes: human action, incorrect intervention.

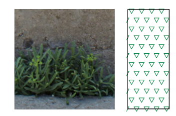


Rust spots
Red/brown areas at the rebars.
Causes: carbonation of concrete, atmospheric agents, corrosion of rebars.

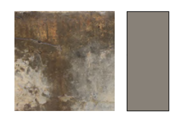


Spalling
Detachment of concrete fragments.
Causes: carbonation of concrete, presence of chlorides, rebar corrosion.

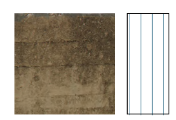
Biological colonization
Presence of light and dark green areas.
Causes: porosity, elevated humidity indices, atmospheric agents.



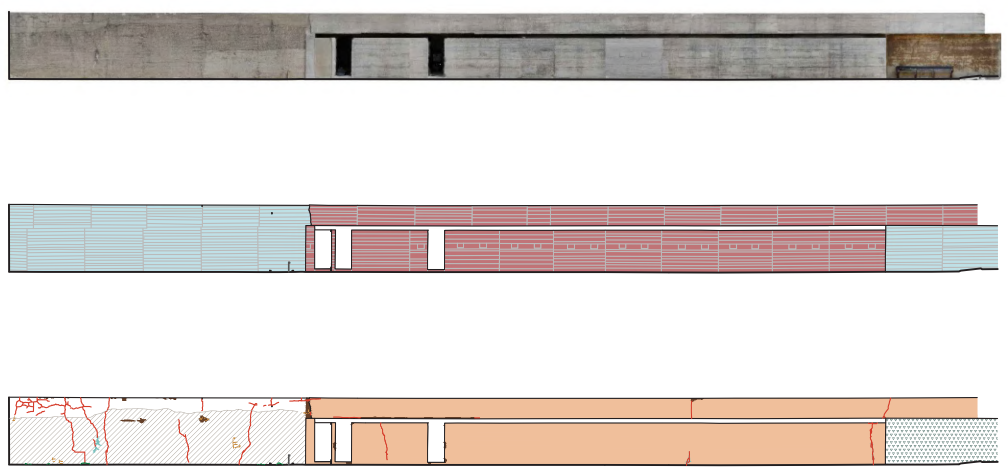
Weed vegetation
Presence of vegetation on the surface.
Causes: porosity, elevated humidity indices, attack by autotrophic organisms.



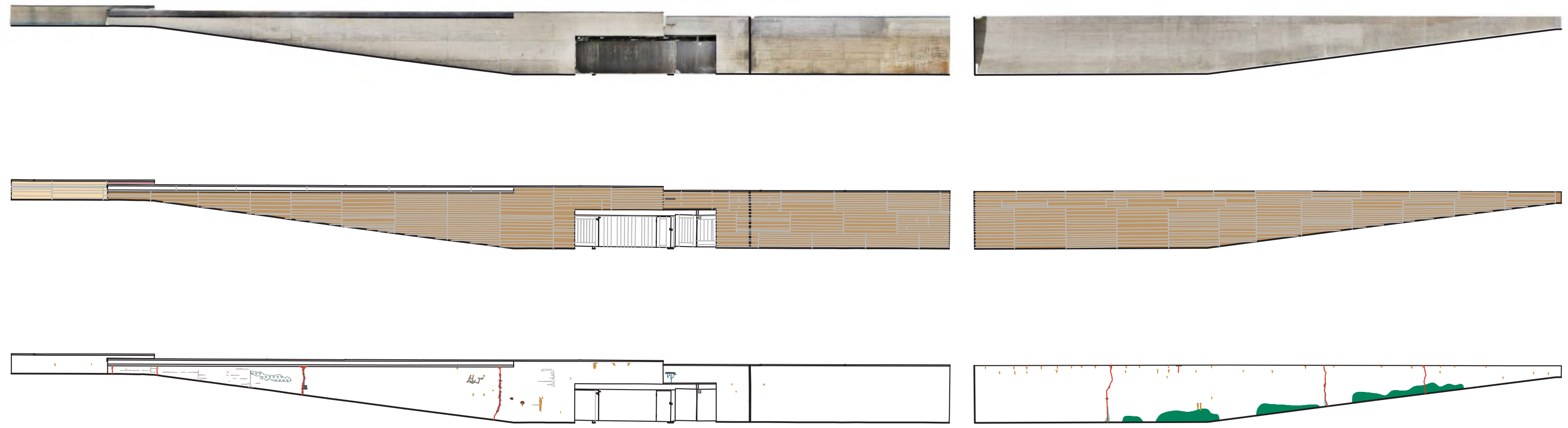
Spot
Irregularly shaped area and diverse color with faded edges.
Causes: humidity by condensation.



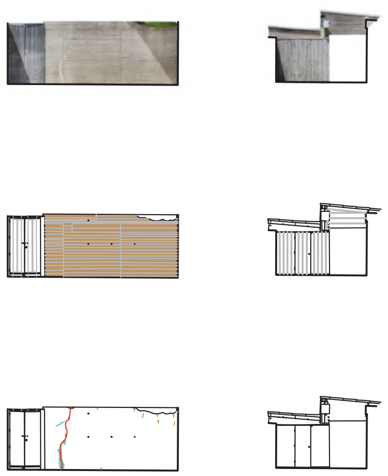
Trickling
Superficial vertical tracks of diversified color.
Causes: building morphology, atmospheric agents, air pollution.



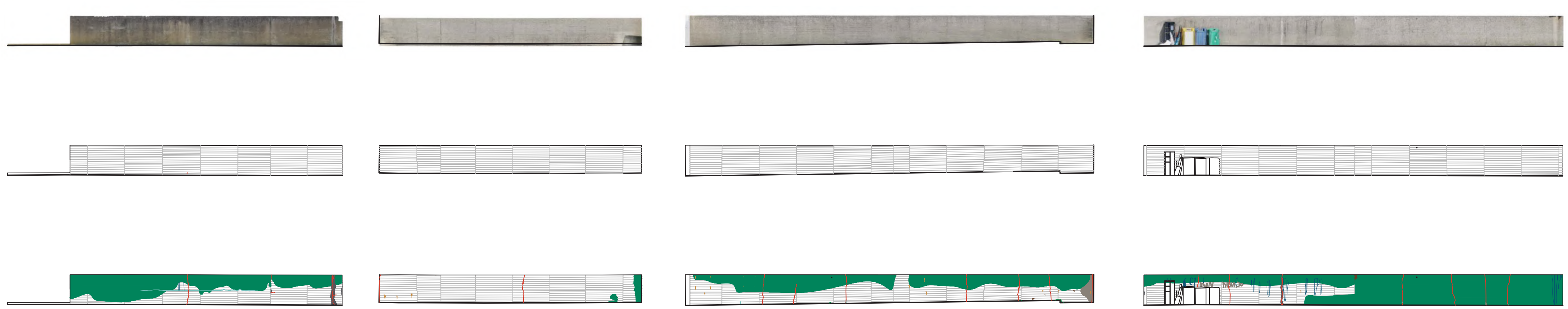
West elevation (facing the beach)



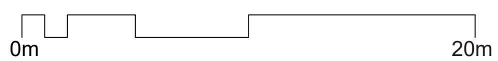
East elevation (facing the avenue)



South elevation



Terrace wall elevations



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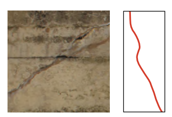
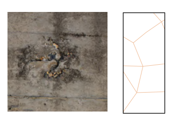
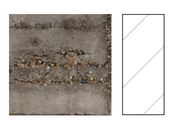


Cracking
Complete or partial separation of material.
Causes: executive procedures, absence of movement joints, ground movement.



Pattern cracking
Poligonal web shaped separations of material.
Causes: mortar incompatibility, alkali-silica reaction.



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Loss of superficial matter.
Causes: rainwater flow, action of the marine aerosol.

Mineral deposit (dust)
Atmospheric dust deposit, formation of dark grey areas.
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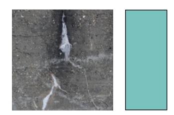

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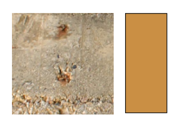
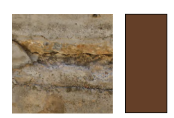
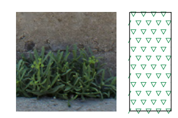


Rust spots
Red/brown areas at the rebars.
Causes: carbonation of concrete, atmospheric agents, corrosion of rebars.

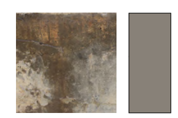


Spalling
Detachment of concrete fragments.
Causes: carbonation of concrete, presence of chlorides, rebar corrosion.

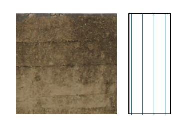
Biological colonization
Presence of light and dark green areas.
Causes: porosity, elevated humidity indices, atmospheric agents.



Weed vegetation
Presence of vegetation on the surface.
Causes: porosity, elevated humidity indices, attack by autotrophic organisms.



Spot
Irregularly shaped area and diverse color with faded edges.
Causes: humidity by condensation.



Trickling
Superficial vertical tracks of diversified color.
Causes: building morphology, atmospheric agents, air pollution.

4.4

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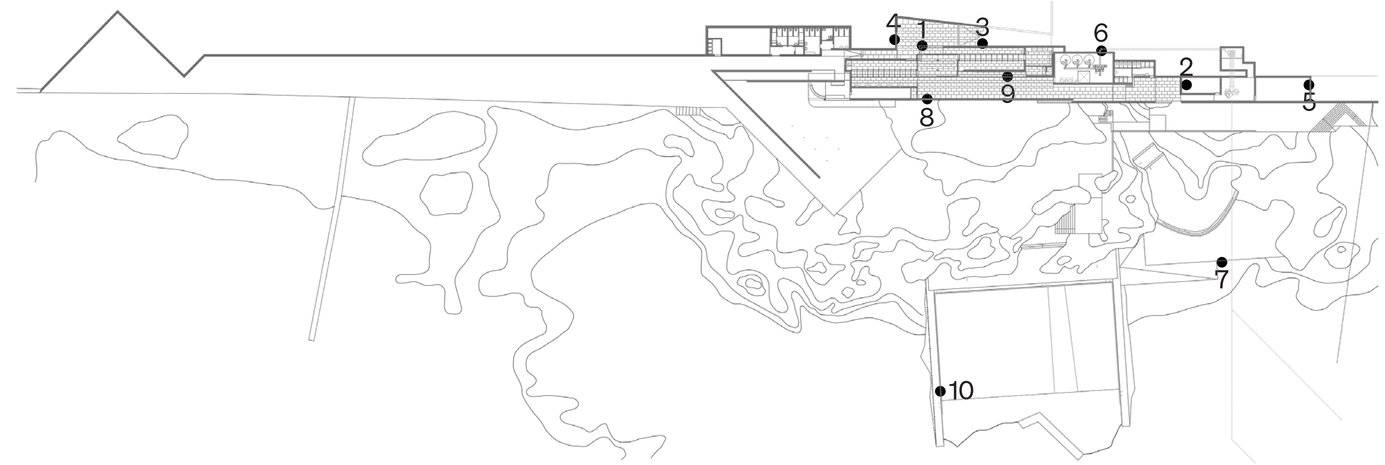
4.4 Concrete spalling (1).
4.5 Distributed crack pattern (2).
4.6 Vertical crack (3).
4.7 Efflorescence (4).
4.8 Exposed corroded rebars (5).
4.9 Rainwater run-off stains (6).

4.10

4.11

4.12

4.13



4.14

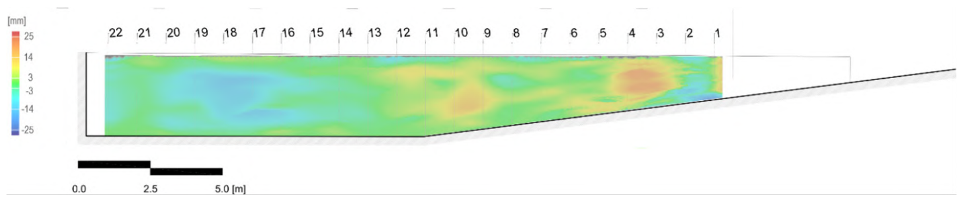
4.10 Biological colonization (7).
4.11 Incorrect repair interventions (8).
4.12 Corroded screws and oily texture of wooden elements (9).
4.13 Corroded water pipes (10).
4.14 Condition survey photographs location.

4.2.2 Non-destructive and laboratory testing

Evaluation of out-of-plane deformations

The diagnosis of the building included a laser scanner survey, which was used to evaluate the out-of-plane deformation of the concrete walls. In this first analysis, the out-of-plane deformations of the retaining wall and the main façade's North were evaluated. It is noted that the deformations were evaluated with respect to a theoretical vertical plane passing through the base of the wall, using colormaps and 2D cross-sections.

The results of this first analysis allow us to verify that the maximum out-of-plane deformation of the retaining wall is equal to 28 mm and occurs at the cross-section W1_4 in the east direction (inwards) (fig. 4.15 and 4.17). The maximum out-of-plane deformation in the west direction (outwards) is equal to 12 mm (cross-section W1_18). In the main façade's North, the maximum out-of-plane deformation is equal to 34 mm and occurs at the cross-section W3_18 in the west direction (fig. 4.16 and 4.18). In the opposite direction, the maximum deformation of this wall is equal to 27 mm (cross-section W3_6). Although these deformations are low, the out-of-plane deformation of the other walls may be also evaluated in the future for further documentation.



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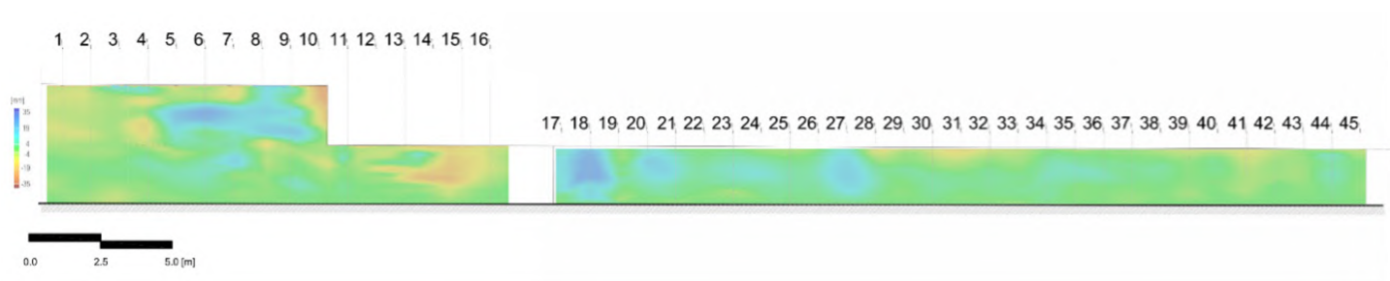

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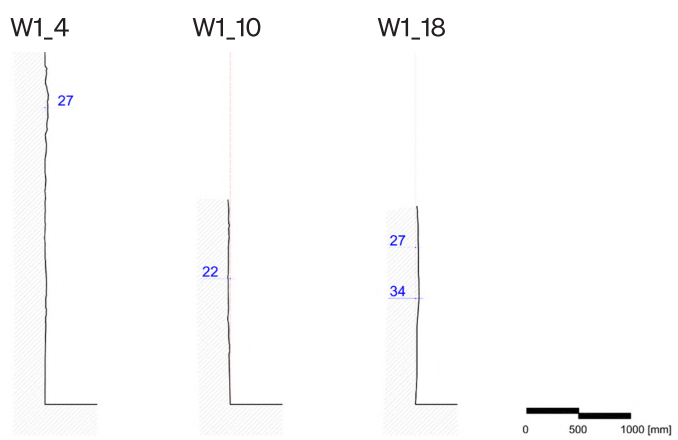

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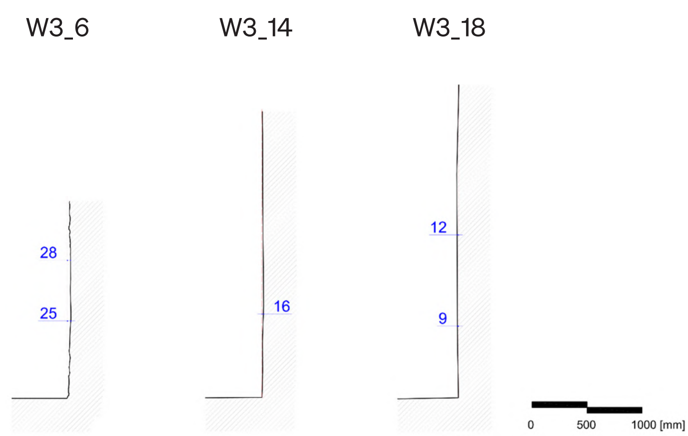


4.18

4.15 Colormap of the retaining wall out-of-plane deformation (section AA).
4.16 Colormap of the main façade north out-of-plane deformation (section BB).
4.17 Cross sections of the retaining wall with the highest out-of-plane deformation.
4.18 Cross sections of the main façade north with the highest out-of-plane deformation.

Concrete carbonation testing

Carbonation is a chemical process that causes a reduction in the alkalinity of the concrete and, consequently, corrosion in the steel rebars and damage to the concrete. This chemical process occurs when atmospheric carbon dioxide reacts with the calcium hydroxide of the cement paste, producing calcium carbonate and reducing the pH. Typically, the cement paste no longer provides a passive environment, which protects the steel rebars, when the pH of the concrete reduces to about 9. In general, for very dry or saturated concrete, the carbonation process is slow. It is noted that young concrete is a highly alkaline material with pH values around 12-13, protecting the steel rebars against corrosion.

In the diagnosis, three zones of the building were selected to carry out in-situ concrete carbonation tests: (1) adults' tank (Phase 1 - exterior); (2) children's tank (Phase 2.1 - exterior); (c) water collection area (Phase 2.1 - interior). The tests involved the extraction of three concrete cores and the application of a phenolphthalein solution on the core's surface, aiming at determining the carbonation depth in the concrete. The carbonation depth is determined based on the reaction of the phenolphthalein solution with the concrete (color of the surface), i.e. pink means non-carbonated concrete and grey means carbonated concrete. The concrete cores were extracted using a drilling machine with 110 mm of diameter (fig. 4.19 to 4.21). The phenolphthalein solution was prepared according to EN 12390-12:2020 (CEN, 2020).

Figure 4.22 presents the concrete cores sprayed with the phenolphthalein solution, and it is possible to observe that the entire surface of all the concrete cores is pink, meaning the concrete in these zones of the building is not carbonated. However, the concrete elements are located in an environment with high relative humidity and the carbonation testing with the phenolphthalein solution (simplified method) includes uncertainties. Thus, cement paste samples were collected and tested at the laboratory to conclude the carbonation of the concrete.

4.19

4.20

4.21

4.22

4.19 Concrete cores extraction in the adults tank.
4.20 Concrete cores extraction in the children tank.
4.21 Concrete cores extraction in the water collection room.
4.22 Extracted concrete cores after the application of the phenolphtalein solution.

Concrete and steel mechanical properties testing

The concrete cores extracted for the carbonation tests were used in the laboratory tests to determine the mechanical properties of the concrete. Ten cylindrical concrete specimens were prepared based on the EN 12390-1:2012 (CEN, 2012) (fig. 4.23), namely three specimens of the adults´ tank (T1.1; T1.2; T1.3), four specimens of the children's tank (T2.1; T2.2; T2.3; T2.4) and three specimens of the water collection area (I1; I2, I3). The area and density of the concrete specimens are presented in the table below (fig. 4.26). Two types of tests were carried out: (1) tests to determine Young's modulus based on the LNEC E397:1993 (LNEC, 1993) (fig. 4.25); (2) tests to determine the compressive strength based on the EN 12390-3:2019 (CEN, 2019). In the test planning, one concrete specimen of each zone was first tested in compression (destructive test) to estimate the compressive strength needed to perform the tests to determine Young's modulus. Then, these tests were performed for the remaining specimens, with the exception of the specimen T2.3_1, due to its low length. Finally, the specimens were tested in compression. The table below (fig. 4.26) presents the results of the laboratory tests carried out on the concrete specimens. The mean compressive strength is equal to 36 MPa, 24 MPa, and 23 MPa for the concrete of the adults' tank, children's tank, and water collection area, respectively. The compressive strength of the specimens with an l/d ratio (length/diameter) lower than 2 was corrected based on the correction factors presented in the ASMT C 42/C 42M (ASMT, 2013). The mean Young´s modulus is equal to 39 GPa, 27 GPa, and 38 MPa for the concrete of the adults' tank, children's tank, and water collection area, respectively. It is noted that high values for the mechanical properties of the concrete specimens are expected since the concrete of these parts of the building corresponds to cyclopean concrete, with large stone aggregates. The external concrete walls present another type of concrete. However, no concrete cores could be extracted from the external walls, not to affect the original materials in visible areas.

Samples of steel rebars were also collected, namely at the top of the retaining wall, the adults' tank, and in the slab of the South's storage room. In the laboratory, one steel specimen of the rebar of the retaining wall (P1.1), three steel specimens of the rebars of the adults' tank (T1.1; T1.2; T1.3), and two steel specimens of the slab of the south storage room (A1; A2) were prepared and tested, aiming at determining the tensile strength of the steel (fig. 4.25). The tensile tests were carried out based on EN 10002-1:2001 (CEN, 2001). The P1.1 specimen presents corrosion (minimum diameter equal to 5.72 mm) and a tensile strength significantly lower (ultimate strength equal to 253 MPa) than the other specimens (fig. 4.27). The steel specimens of the adults' tank have a mean diameter equal to 6.30 mm (smooth rebars without significant corrosion) and ultimate strength equal to 397 MPa. The mean yield strength (fy,0.6fu) of these steel specimens is equal to 238 MPa (fig. 4.27), which allows us to conclude that this steel corresponds to the class A235 (Portuguese steel class for smooth rebars of normal ductility and yield strength equal or higher than 200 MPa). Finally, two rebars of the slab of the South's storage room present corrosion and have a mean diameter of 9.44 mm. The mean yield strength (fy,0.6fu) of these two steel specimens is equal to 294 MPa.

4.23 Concrete specimens.
4.24 Tests to determine the concrete Young's modulus and compressive strength.
4.25 Tests to determine the steel rebars tensile strength.
4.26 Properties of the concrete specimens.
4.27 Properties of the steel rebars specimens.

4.23

4.24

4.25

Location	Specimen	Area [cm²]	Density [kg/m³]	Average density [kg/m³]	F_{max} [kN]	f_c [MPa]	f_m [MPa]	E [GPa]	E_m [GPa]
Adults tank	T1.1	86.39	2345	2365	325.90	37.72	36.09	-	39.36
	T1.2	86.61	2361		326.30	37.67		39.80	
	T1.3	86.41	2390		284.10	32.88		38.92	
Children tank	T2.1	104.88	2298	2209	268.70	25.62	23.83	27.18	26.69
	T2.2	104.92	2127		331.10	27.25		-	
	T2.3_1	104.93	2131		273.30	22.22		-	
	T2.3_2	104.99	2281		212.50	20.24		26.19	
Water collection room	I1	104.81	2271	2298	250.30	23.20	23.03	34.18	38.28
	I2	105.03	2292		250.20	23.29		42.33	
	I3	104.86	2331		257.20	22.60		-	

(**F_{max}**: maximum force; **f_c**: compressive strength; **f_m**: mean compressive strength; **E**: Young's modulus; **E_m**: mean Young's modulus)
4.26

Specimen	Diameter [mm]	Area [cm²]	F_{max} [kN]	f_u [MPa]	$f_{y,0.6fu}$ [MPa]	$f_{y,0.2\%}$ [MPa]
P1.1	5.72	0.26	6.49	252.56	151.54	143.52
T1.1	6.40	0.32	13.59	422.77	253.66	301.69
T1.2	6.16	0.30	11.16	375.00	225.00	294.75
T1.3	6.34	0.32	12.47	394.65	236.79	276.90
Average	6.30	0.31	12.41	397.48	238.49	291.11
A1	9.16	0.66	32.60	493.94	296.36	465.31
A2	9.71	0.74	36.09	487.70	292.62	487.47
Average	9.44	0.70	34.35	490.82	294.49	476.39

(**F_{max}**: maximum force; **f_u**: ultimate tensile strength; **$f_{y,0.6fu}$**: yield tensile strength assuming the proof stress equal to 0.6 of the ultimate strength; **$f_{y,0.2\%}$**: yield tensile strength assuming the proof stress associated to the strain equal to 0.2%)
4.27

Chloride content testing

Under normal conditions, concrete provides protection that prevents the corrosion of the steel, mainly associated with the high pH of concrete and low electrical conductivity. However, during the lifetime of the reinforced concrete structure, external actions, such as the penetration of chlorides, can promote the electromechanical corrosion of the rebars, causing a reduction of the effective cross-section of the steel rebars and damage in the concrete. The penetration of chlorides is associated with environmental factors, such as the exposure of the building.

Since the building is located very close to the sea (sea water, salt fog, winds, and high relative humidity), samples of the concrete paste were collected and the chloride content was estimated based on chemical tests performed at the laboratory. The samples were collected at the adults' tank (T1.10; T1.20; T1.30), the children's tank (T2.10; T2.20; T2.10.B; T2.20.B), the water collection area (C10; C20; C30) and the bar (B10; B20; B30). The cement paste samples were collected using a drilling machine at different depths (from 10 cm to 30 cm, from the external surface), without contamination of the samples (fig. 4.27). In general, three samples of each zone were collected, with the exception of the children's tank where four samples were extracted (two at the external mortar layer, namely T2.10 and T2.20, and two at the original concrete, namely T2.10.B and T2.20.B). The collection of samples causes minor damage and, consequently, no concrete paste samples were collected at other parts of the building, such as at the external walls. It is noted that, during the collection of samples, the wall of the bar (external wall) was cut, due to the intervention that was being carried out, and the cement paste samples were collected orthogonally to the cross-section of the wall without causing damage in the external surface, but not according to the typical procedure (from the external surface to the interior of the wall).

The following table (fig. 4.29) presents the results of the chemical tests with the estimation of chloride content in the cement paste. In general, the results present a significant chloride content (higher than 1% - upper limit defined by EN 206-1 (CEN, 2000), which decreases in depth. In contrast, the samples of the adults' tank present an increase in the chloride content in depth. It is noted that it corresponds to a cyclopean concrete with large stone aggregates and, consequently, the samples can also include stone, influencing the percentage of chlorides in the sample. The samples of the bar also present an unexpected evolution of the chloride content in depth. However, as it was previously referred to, the collection of these samples did not follow the typical procedure. It is also noted that the concrete of the water collection area (interior wall) presents a significant reduction of the chloride content in the cement paste at the 30 cm depth (0.18%).

4.27

4.28

Location	Sample	Depth [mm]	Chloride content in the cement paste [%]
Adults tank	T1.10	10	1.32
	T1.20	20	1.68
	T1.30	30	1.86
Children tank (external mortar layer)	T2.10	10	2.96
	T2.20	20	2.00
Children tank (concrete)	T2.10_B	10	1.84
	T2.20_B	20	1.36
Water collection room	C10	10	0.78
	C20	20	0.40
	C30	30	0.18
Bar[1]	B10	10*	2.16
	B20	20*	2.11
	B30	30*	3.35

[1] Samples collected using an indirect procedure. * depth is parallel to the wall face.

4.29

4.27 Cement paste sample collection.
4.28 Cement paste samples.
4.29 Results of the chemical tests to estimate the chloride content in the cement paste.

Water penetration testing

The in-situ water penetration tests with Karsten's tube aim to estimate the amount of water that penetrates the concrete over time, which is also an indirect measure of the superficial porosity or permeability. In this test, Karsten's tube (glass tube with a graduated scale) is glued to the concrete surface, without causing damage, and filled with water. The water exerts pressure on the surface, simulating wind-driven rain speeds up to 98 mph (pressure equal to 1140 Pa).

In the diagnosis of the building, four water penetration tests were carried out, namely at the interior surface of the wall of the water treatment area (Q1), the external surface of the wall of the water treatment area (Q2), the external surface of the wall the South's corridor (CA) and the external surface of the wall of the changing rooms (PV) (fig. 4.32). The penetration of the water into the concrete was measured every 5 min for 20 min.

The following table (fig. 4.31) presents the results of the water penetration tests, in which it is observed that the surfaces of the tested walls present significantly different performances. The highest water absorption (permeability of the concrete) occurs at the wall of the water treatment area (1.6 ml and 1.1 ml at the interior and external surface, respectively, after 20 min), which corresponds to a water absorption coefficient of 1.00 kg/m^2.min0.5 after 20 min (for example, the expected range for traditional cement-based renders is 0.2-1.5 kg/m^2.min0.5). The tested surface of the wall of the South corridor showed low permeability and no water absorption was observed at the tested wall of the changing rooms, during 20 min of the test. The results are according to the expected since the external surfaces of the concrete walls present a significantly different appearance.

4.30

Time [min]	Decrease of the water level in the Karsten's tube [ml]			
	Q1	Q2	CA	PV
5	0.3	0.3	0.1	0
10	0.7	0.6	0.2	0
15	1.1	0.8	0.3	0
20	1.6	1.1	0.3	0

4.31

4.30 Water penetration testing.
4.31 Results of the water penetration tests.
4.32 Concrete testing with the Schmidt hammer..
4.33 Results of the tests with the Schmidt hammer.

Concrete testing with Schmidt hammer

Non-destructive tests were also carried out at the external concrete walls (where it was not possible to extract concrete cores) and the tanks, such as tests with a Schmidt hammer. This type of non-destructive test is based on the surface hardness, in which the rebound number provided by the Schmidt hammer is correlated with the compressive strength. Thus, this type of test is only representative of a layer of about 5 cm depth and the results can be affected by steel rebars, large aggregates, carbonation, and moisture.

The concrete tests with the Schmidt hammer were performed according to the EN 12504-2 (CEN, 2013), in several areas of the building, with ten test repetitions in each location, aiming at evaluating the dispersion of the results (fig. 4.32).

The following table (fig. 4.33) presents the resume of results, namely the mean compressive strength (fcm) and the coefficient of variation (CoV). The original concrete of the adults' tank presents an average compressive strength equal to 42 MPa (15% higher than the value obtained from the laboratory tests). On the other hand, the original external mortar of the children's tank presents an average compressive strength equal to 54 MPa. The average compressive strength of the new concrete applied in the tanks during the intervention is equal to 25 MPa. The compressive strength estimated by the tests with the Schmidt hammer of the original concrete of the external walls ranges from 38 MPa to 77 MPa, in which the high values can be related to the hardening of the concrete over time, and the presence of aggregates and rebars at the testing points. Finally, the tests showed that the compressive strength of the concrete of the retaining wall ranges from 30 MPa (new concrete) to 54 MPa (Phase 3). Again, the high values can be affected by the presence of steel rebars close to the testing points.

4.32

Location	Point	f_{cm} [MPa]	CoV [%]
Adults tank	T1_P1	48	18
	T1_P2	37	25
	T1_P3[1]	30	18
Children tank	T2.P1[2]	54	11
	T2.P2[1]	25	12
Changing rooms	PV.P1	79	7
	PV.P2	70	8
Main façade south	PS.P1	68	15
	PS.P2	68	17
Main façade north	PN.P1	68	11
	PN.P2	38	26
South corridor	CA.P1	77	10
Bar	B.P1	57	31
Retaining wall	P.P1	54	13
	P.P2[1]	30	14

(f_{cm}: mean compressive strength; **CoV**: coefficient of variation) [1] New concrete. [2] External mortar.
4.33

Sonic testing

Sonic testing is a non-destructive technique that allows to determine the velocity of the wave propagation (V) from a transmitting transducer to a receiving transducer:

$$V = \frac{s}{\Delta t}$$

where s is the distance between the transmitting and the receiving transducers, and Δt is the time that the wave takes from the transmitting transducer to the receiving transducer. The velocity of the wave is associated with the elastic material properties and can be used to evaluate the material homogeneity of the structure.

In this experimental campaign, direct tests were carried out based on the ASTM C597-02 (ASTM, 2002), using a piezoelectric accelerometer with a sensitivity of 10 V/g (receiving transducer), an instrumented hammer (transmitting transducer), an acquisition board with 24 bits resolution, coaxial cables, and software developed by the University of Minho. The sonic tests were performed on five concrete walls: (1) three points of the wall of the South corridor (CA); (2) three points of the wall of the South bathrooms (CS); (3) four points of the main's façade South (PS, two points above and below the horizontal crack, fig. 4.34); (4) three points of the wall of the changing rooms (PV); (5) three points of the wall of the water treatment area (Q). The distance between the transducers is equal to the thickness of the walls (0.298-0.300 m) and the Δt was determined from the P waves of the direct sonic tests. At each point, six repetitions of the direct test were performed.

The results of the direct sonic tests (fig. 4.35) show that the average velocity of the waves ranges from 2326 m/s (main's façade South) to 2898 m/s (changing rooms), in which the coefficient of variation is equal to 8%. The tested walls of the South corridor, South bathrooms, and Water treatment area present similar results (velocity about 2580 ms/s; coefficient of variation of 1%), leading to the conclusion that the concrete of these walls does not present significant differences in the elastic properties.

4.34

Location	Point	Mean velocity [m/s]	Average velocity [m/s]
South corridor (CA)	P1	2195	2598
	P2	2737	
	P3	2862	
South bathrooms (CS)	P1	2231	2560
	P2	2728	
	P3	2720	
Main façade south (PS)	P1	2524	2326
	P2	2317	
	P3	2078	
	P4	2387	
Changing rooms (PV)	P1	2760	2898
	P2	3052	
	P3	2881	
Water treatment room (Q)	P1	2474	2582
	P2	2797	
	P3	2474	

4.35

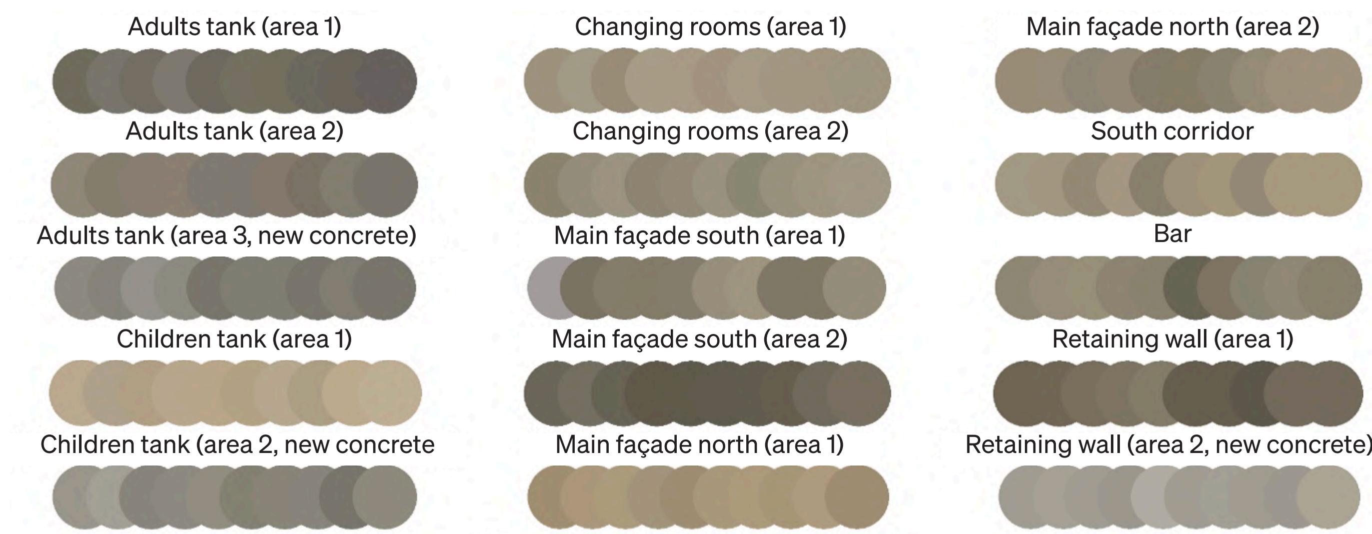
Color analysis based on spectrophotometry

The color analysis of the concrete was performed using a spectrophotometer Konica Minolta CM-2600d (fig. 4.36). The spectrophotometer provides the parameters L (lightness), a (redness-greyness of the color) and b (yellow-blueness of the color) (CIELAB color space) for a testing point, which allows evaluating the color difference between testing points, based on the ΔE distance (Eq. 2). In general, it is considered that the color difference is perceivable by the human eye when ΔE is higher than 2.0. ΔE higher than 5.0 and 6.0 mean significant color difference and different colors, respectively.

The tests with a spectrophotometer were carried out at ten locations of the building, including original concrete and new concrete applied in the intervention (fig. 4.37). Moreover, ten test repetitions were considered in each location. The results were evaluated in terms of ΔE and represented using the Adobe RGB 1998 and sRGB color spaces (fig. 4.38). As expected, the results present a high dispersion, with the color ranging from beige to dark gray. The lighter colors were detected in the children's tank (T2_e1, original concrete) and the main façade South's (PN_e1). The new concrete (T1_e3; T2_e2; P_e2) presents also different color with respect to the original concrete (T1_e1, T1_e2; T2_e1; P_e1).

4.36

4.37



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4.34 Results of the direct sonic tests.
4.35 Sonic testing of the west wall.
4.36 Colour analysis of the changing rooms wall.
4.37 Colour analysis of the bar wall.
4.38 Results of the colour analysis.

Ground penetrating radar testing

Ground Penetrating Radar (GPR) tests were carried out in several locations of the building. The main objective of the GPR tests was to determine the type of connection existing between the cantilever beams located over the changing rooms. GPR tests were also carried out on other reinforced concrete walls, aiming to verify the spacing of the vertical and horizontal reinforcement.

The tests were carried out using the RAMAC/GPR system from MALA (Guideline Geo). Given the objective of the works and the estimated thickness of the structural elements under analysis (around 30 cm), the tests were carried out using a 1600 MHz antenna. The GPR method is based on the emission of high-frequency electromagnetic waves (radar waves) into a building element using a dipole antenna. The waves are generated by a transmission antenna placed on the surface of the analyzed object. The wave propagates through the material and part of it is reflected back to the testing surface (where the reception antenna is also located) when discontinuities are observed. Discontinuities correspond to a change in the dielectric properties of the medium, which happen when they reach an interface between different materials, namely the end of an element (backside of a wall), a metallic element (reinforcement bars), voids, etc.

The time between the emission and reception of the reflection can be measured, which allows the determination of the location and depth of the anomaly observed. The transmission and reception antennas are within the same device, which is also a cart. Thus, the antennas can be moved along the surface of the element under investigation, producing radargrams. Radargrams are charts that show the position of the antenna against the travel time of the wave. If the velocity of propagation of the radar waves within the media is known, the location and depth of the different obstacles (interfaces, rebars, the backside of elements, etc.) can be estimated. For reference, it is noted that the average radar-wave velocity in concrete is 10 cm/ns, according to the literature (Daniels, 2014).

A series of GPR profiles were carried out in the three beams that compose the entrance of the changing rooms. The main objective was to understand the connection between the beam with no evident supports (B) and the two perpendicular cantilever beams (A and C) (fig. 4.45). Assuming the likely presence of dowels connecting the beams, vertical GPR profiles were carried out each 10 cm (close to the connection) and each 20 cm (around the center of beam B). The test aimed to determine two specific construction details: (1) the number of dowels connecting the beams; (2) the length of the dowels. Figure 4.45 shows schematically the number and location of the profiles carried out.

The thickness of the beam is known (30 cm). Thus, the velocity of the waves in the concrete could be defined for this specific case. A velocity of 11 cm/ns was found, which is within the common range recommended in the literature (ASTM, 2002). Once the velocity was calibrated, the depth of the steel reinforcement bars and ties can be determined from the radargrams.

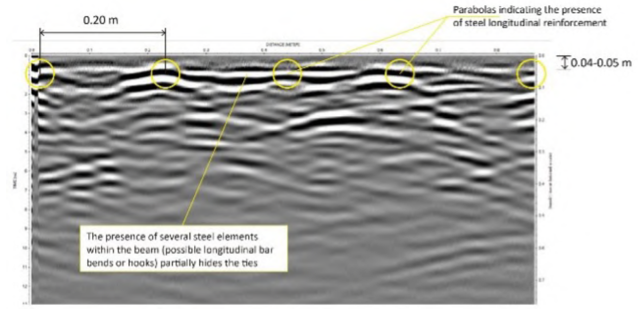
The first radargram (fig. 4.39) was obtained at the head of beam A. The radargram shows parabolas that indicate the presence of steel reinforcement elements, separated approximately 20 cm. These reinforcement elements can be more clearly detected in the second radargram (fig. 4.40), carried out on beam B, 30 cm from the joint between beams A and B. Therefore, there seem to be five longitudinal reinforcement elements in beam B. Among these five rebars, some of them should go through the joint and penetrate the perpendicular cantilever beam (beam A) to make the connection between the two beams. These five bars are spaced 20 cm in height and are located at a depth of approximately 4-5 cm within the beams.

Radargram 3 (fig. 4.41) was carried out 50 cm away from the joint between beams A and B, confirming the presence of the five reinforcement bars) and indicating that their length within beam B is greater than 50 cm. The tests performed at a location further than 50 cm from the joint no longer show the presence of the five bars. In radargram 4 (fig. 4.42), carried out 110 cm away from the joint between beams A and B, only three steel reinforcement elements can be detected. In conclusion, the dowels that connect beams A and B seem to have a length of 50 cm within beam B and there are two of them. The three reinforcement elements located seem to be the longitudinal reinforcement of beam B, located at the top, bottom, and middle of the height given the beam's large size.

Radargram 5 (fig. 4.43) was carried out 180 cm away from the joint between beams A and B and 30 cm away from the joint between beams B and C. The radargram shows again five reinforcements, indicating the presence of dowels in the interior of beam B at this end of the beam to connect with beam C. The reinforcement details thus seem to be similar at both ends of the beam. The tests carried out led to determining that two dowels were used to connect the beams. These dowels are separated by 40 cm, located approximately 40 cm from the top and 40 cm from the bottom of the beam. They have a length of approximately 50-60 cm within beam B (beam with no vertical supports).

Several radargrams were carried out on the interior face of the beam, leading to similar conclusions. The results indicate that the same reinforcement detail was used at both faces of the beams.

In conclusion, the hypothesis shown in fig. 4.46 indicates the probable presence of two dowels connecting the perpendicular beams in each face (in dark red), making it four in total. It also shows an approximate distribution of the stirrups (in light blue) and the longitudinal reinforcement bars (in orange) of beam B, again in each face. The probable location of the three longitudinal reinforcement bars in beams A and C (in dark blue), and in each face, is also shown. The arrangement is assumed to be symmetric from the vertical axis of the beams.



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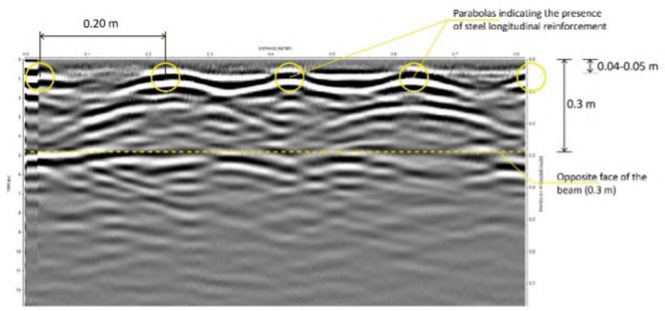

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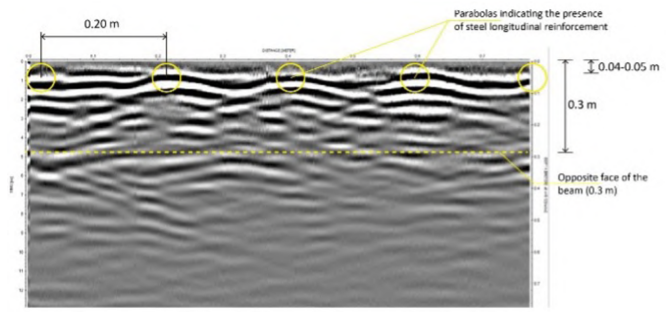

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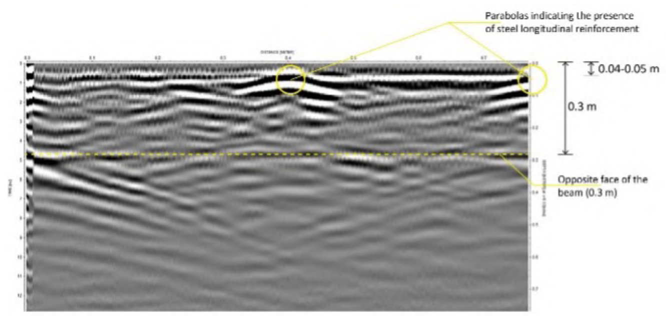

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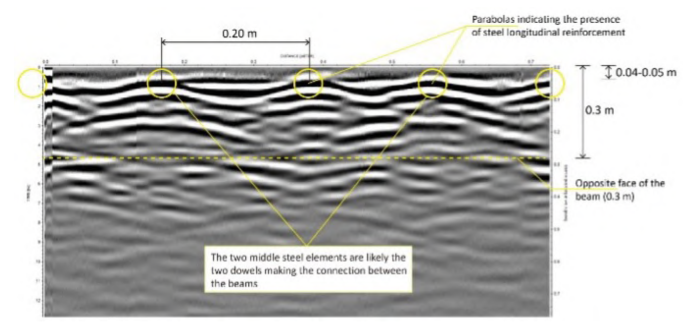

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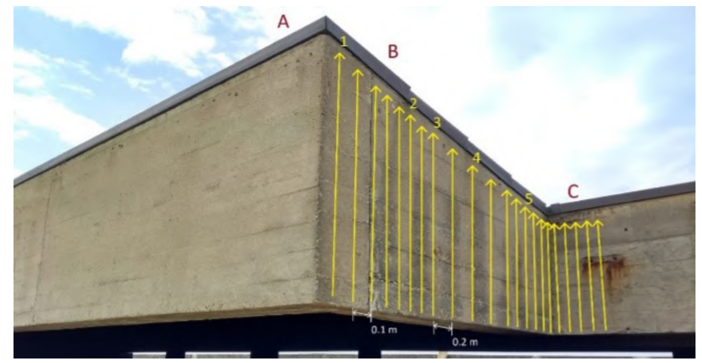

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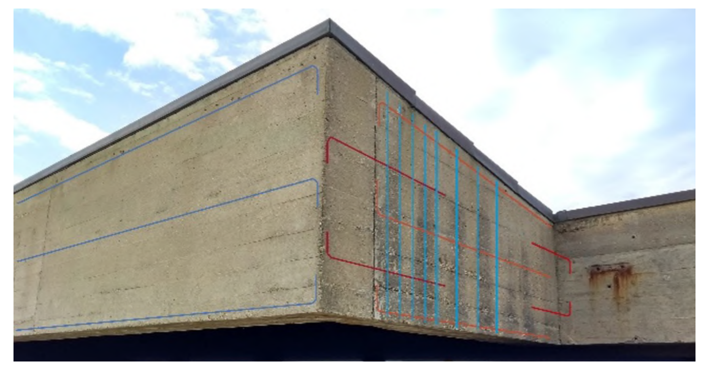

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4.39 Radargram 1 of beam B.
4.40 Radargram 2 of beam B.
4.41 Radargram 3 of beam B.
4.42 Radargram 4 of beam B.
4.53 Radargram 5 of beam B.
4.44 GPR testing of the cantilever beams over the changing rooms entrance..
4.45 Location of the GPR profiles of the cantilever beams over the changing rooms entrance.
4.46 Likely reinforcement details of the connection between the cantilever beams over the changing rooms entrance.

Laboratory tests on a timber specimen

A timber specimen (2×12×3 cm³) was taken from the structure to be inspected and tested in laboratory conditions. From an initial visual inspection (fig. 4.47), the plank did not present any superficial defects, e.g. knots or splits and cracks. There was no slope of grain and the growth rings are regular. From the color and the dimension of the rings, it is believed that the species of the specimen is Baltic pine (pinus sylvestris). The density of the specimen was obtained according to standard ISO 13061-2 (2014), in which 10 specimens were cut with dimensions of 20×20×25 mm³. The specimens were measured and weighed. A wood density of 635.41 kg/m³ (CoV of 9.8%) was obtained.

Resistograph tests were performed on the timber specimen to determine the quality of the timber, and the presence of possible cavities or decayed parts in the timber specimen not detected by a simple visual inspection. The resistograph is an equipment that drills with a 1.5 mm drill into the wood at a speed of 8000 rpm (fig. 4.48). The plan was to perform 4 holes in the timber specimen. However, due to the high quality of the specimen and its high density, as well as its low moisture content, only one hole was made, breaking the needle while performing the second hole, due to the high values of resistance. The resistographic measurement (RM), valid for sound and defect-free timber, is given by the ratio between the area underneath the curve and the drilling depth (in this case, 12 cm). A resistographic measurement of 93.27% was found. From the graph (fig. 4.49), it is clear that throughout the section, the timber has a good quality, maintaining a uniform resistance. The second hole, which broke the needle, showed even higher values of momentary drill resistance.

There is a direct relationship between RM and the compressive strength of sound timber, i.e. timber without defects (Henrique *et al*., 2011), showing that the higher the RM the higher the compressive strength of wood.

Laboratory tests on cement paste samples

Paste cement samples were collected from the structure, including the concrete cores, namely at: (1) adult's tank (T1.1); (2) children´s tank (T2.1); (3) water collection area (I1); (4) water treatment area (Q); (5) changing rooms (PV); (6) bar (B1); (7) South's storage room (A). The samples were used to perform the following tests and analyses in the laboratory: (1) thermal gravimetric analysis (TGA); (2) nanoindentation; (3) energy dispersive X-ray analysis (EDS); (4) X-ray diffraction (DRX); (5) scanning electron microscopy (SEM); (6) mercury intrusion porosimetry tests.

For further detail on thermal gravimetric analysis, nanoindentation, energy dispersive X-ray analysis, X-ray diffraction, scanning electron microscopy, and mercury intrusion porosimetry tests see Appendix D.

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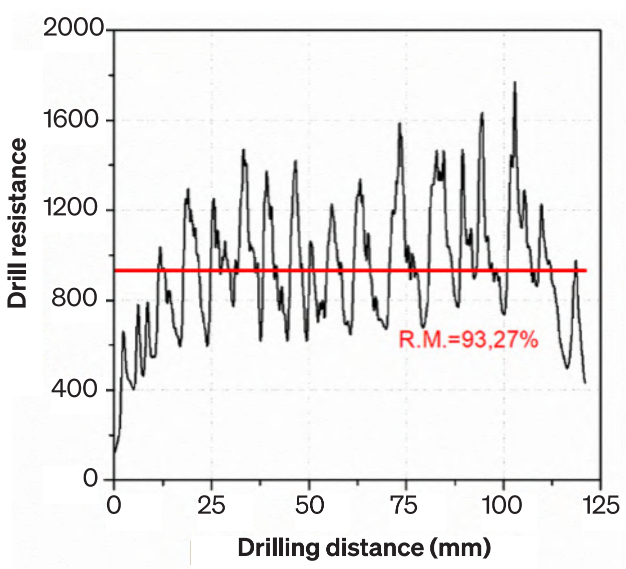

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4.2.3 Conclusions

The inspection and diagnosis allowed us to conclude that the building presents moderate damage, namely several discrete cracks at the concrete walls, distributed cracking in some walls, and corrosion of the steel rebars with detachment of the concrete. The most severe steel corrosion was located at the bottom surface of the slab of the south storage room. The tanks (Phases 1 and 2.1) are made of cyclopean concrete with large stone aggregates (fig. 4.23). The walls (Phases 2.2-2.4) present differences in terms of deterioration of the surfaces, color, and permeability. The external surface of the tested wall of the changing rooms presented the lower water absorption (fig. 4.33), the highest compressive strength (estimated by the Schmidt hammer, see fig. 4.35), and the velocity of the P waves (obtained from direct sonic tests, see fig. 4.36). The highest water absorption coefficient (1.00 kg/m².min0.5) occurs at the wall of the water treatment area (fig. 4.33). However, and for example, it is within the expected range for traditional cement-based renders (0.2-1.5 kg/m².min0.5). A significant chloride content was detected in the concrete of the tanks and the walls of the water collection area and bar (fig. 4.31), higher than the upper limit defined by EN 206-1 (1%). The two evaluated walls (the retaining wall and the main façade North) do not present significant out-of-plane deformations. The GPR tests allowed us to estimate the connection between the upper beam and two orthogonal cantilever beams of the changing rooms (probable presence of four dowels, namely two dowels at each face, connecting the upper beam to the two orthogonal cantilever beams), and conclude that the walls present a low percentage of steel rebars. The test for determining the tensile strength of the steel allowed us to conclude that the mean yield strength (fy,0.6fu) of steel specimens of the adults' tank (Phase 1) is equal to 238 MPa (fig. 4.28), which corresponds to the steel of class A235 (Portuguese steel class for smooth rebars of normal ductility and yield strength equal or higher than 200 MPa). The two tested rebars of the slab of the South's storage room (Phase 3) present corrosion and mean yield strength (fy,0.6fu) of 294 MPa. The tests carried out in the timber specimen at the laboratory allowed us to conclude that the species of the timber seems to be Baltic pine (pinus sylvestris) and presents high quality, resistance and density, and low moisture content.

The results obtained from the laboratory tests on cement paste samples allowed us to obtain detailed data on the cement pastes, such as their chemical characterization, phases, and pore size. The highest critical pore, estimated from the mercury intrusion porosimetry tests, was obtained in the sample collected at the slab (bottom surface) of the south storage room, which presents steel corrosion. These tests allowed us to conclude, as opposed to the results obtained from the concrete carbonation tests with phenolphthalein on-site, that the concrete of all samples is carbonated. The sample collected from a surface previously covered with a switchboard of the water treatment area (closed area) presents low carbonation. Moreover, they allowed us to validate the results obtained from the first tests, namely the presence of high chloride content in the cement paste of the children's tank and bar, which is also expected for all external surfaces of walls. It is also concluded that the physical, chemical, and mechanical properties of the concrete of the building present high dispersion, which is expected since corresponds to concretes made on-site and made in different phases, with different exposures (tanks, exterior walls, closed areas) and different damage severity. However, it should be noted that the low percentage of steel rebars is a crucial aspect so that the damage associated with the corrosion (carbonated concrete and presence of chlorides) is not most severe. Finally, the presence of dilation joints at the connection between walls and slabs prevented the occurrence of damage, at these connections, associated with deformations caused by thermal actions.

4.47 Cross-section of the timber specimen.
4.48 Timber specimen testing with the resistograph.
4.49 Resistograph result of the timber specimen testing.

4.3 Conservation interventions

4.3.1 Conservation and building extension

Recent conservation interventions designed by Álvaro Siza (2018-2021) represent an exceptional case of an architect preserving his own work, respecting the building's values and character through conservation and the addition of a new extension to enhance the site's viability and functionality. Its main focus has been infrastructural, namely the hydraulic network, as most of its pipes had been destroyed by salt or were clogged with sand. Moreover, this same intervention envisaged the reconstruction of the north buildings to improve the bar's facilities. Hence, the current legal requirements governing the operation of catering areas called for changes to be made regarding the bar's conditions, as well as its services and support spaces.

Siza's conservation works respected the integrity and authenticity of the preexisting building, restoring the original interior layout while also maximizing the preservation of existing materials – including their texture and patina – replacing them only when strictly necessary.

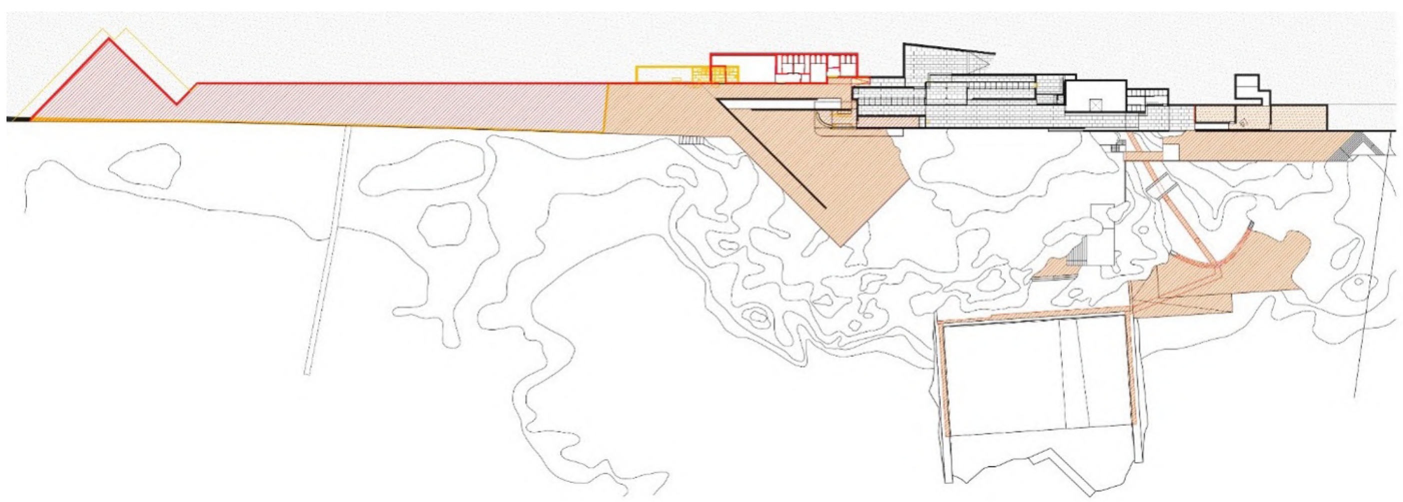
One of the greatest challenges in terms of conservation was the update of the installations to meet the current requirements (water, electricity, internet, etc.). Existing electrical cables were replaced and inserted in exposed copper tubes carefully fixed to the building's structure to respect the original layout. For the water network, technical galleries were created to enable access to the water pipes of the swimming pools, which had previously been embedded in the concrete slab. Furthermore, access to the already existing galleries was improved. In the adults' swimming pool, new water inlets were created. To perform these changes, the pool tanks had to be partially reconstructed. Additionally, the equipment of the water treatment room and the water supply network were replaced.

All preexisting elements in Baltic pine were inspected, cleaned of their former linseed oil coating, and varnished to restore their original appearance. Some doors, metal fittings, furniture, and sanitary installations had to be replaced, respecting the original design and materials as much as possible.

To improve functionality (as well as to assure compliance with current legal requirements regarding such facilities), recent interventions involved the demolition of the bar's bathrooms and the extension of the building to the north (including public bathrooms for people with mobility impairments, employees' changing rooms, storage, and waste management rooms).

The new building is located under the coastal avenue, revealing a concrete retaining wall with small horizontal openings, interior partitions, joinery, and details that follow the design principles of the preexisting building. In this intervention, the platform at the northern end was finally extended to the place where the restaurant would be located, culminating in a 45º inflection, in line with the compositional principles of the set. This way, while preserving his own work, the architect finally and definitively completes the design of the building complex enhancing its significance for future generations.

4.50 Conservation and extension works plan with red (new/rebuilt) and yellows (demolished) of the intervention.
4.51 Plan of the new north volume.
4.52 Elevations and sections of the new north volume.
4.53 Joinery details of the bar window.



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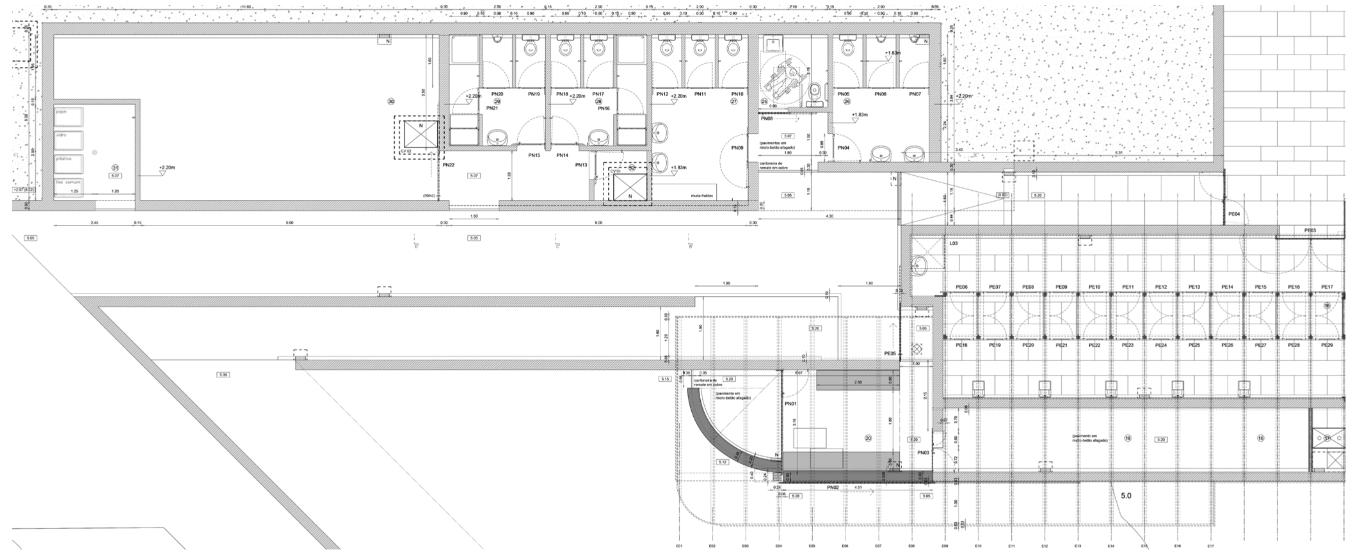

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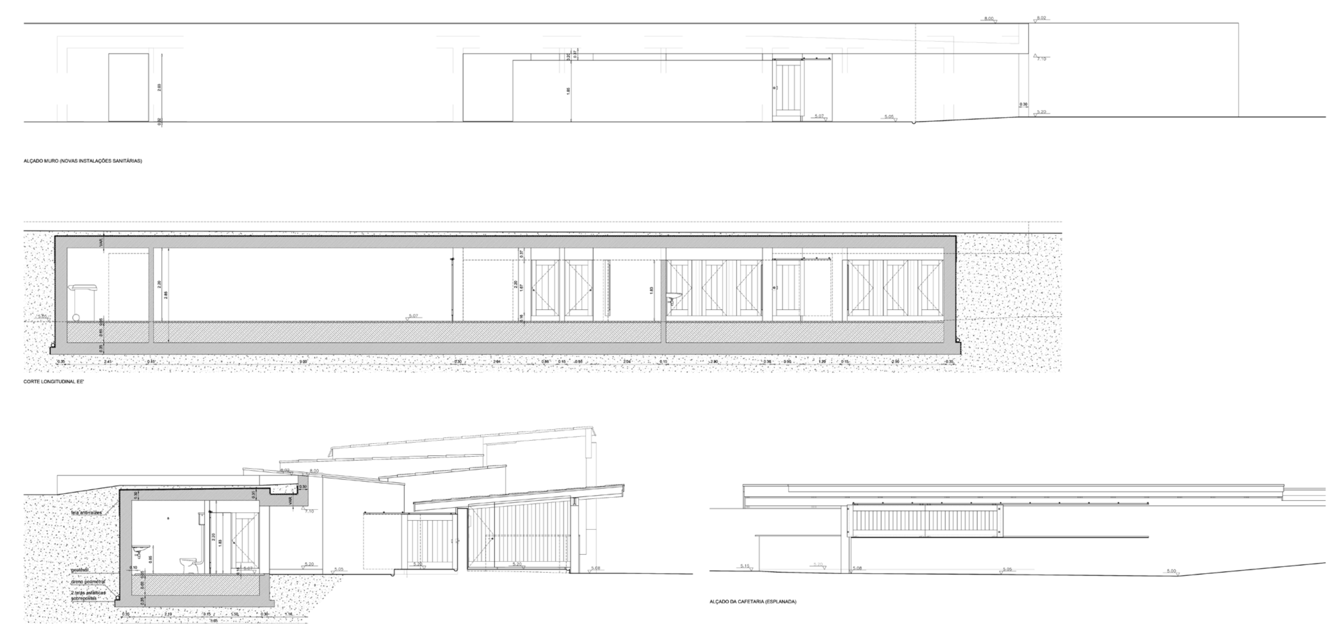

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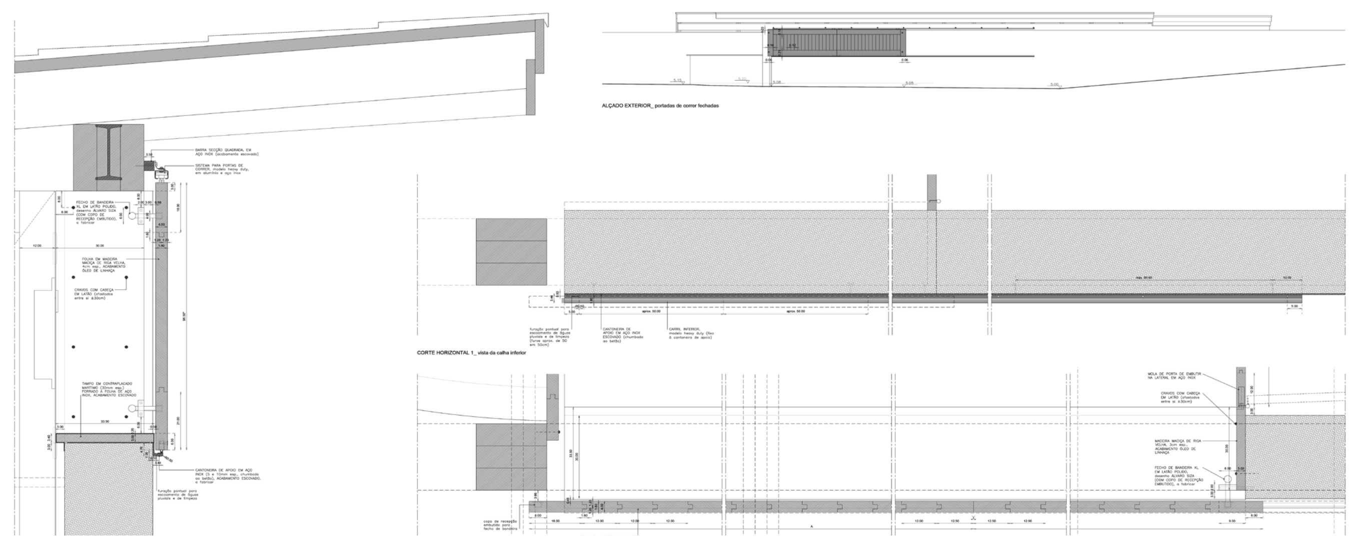

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4.54 Bar terrace wall and north platform before the intervention.
4.55 North limit before the intervention.
4.56 North volume before the intervention.
4.57 Changing rooms' hallway before the intervention.
4.58 Water treatment room before the intervention.
4.59 South storage room before the intervention.
4.60 Walkway before the intervention.
4.61 Foot wash before the intervention.
4.62 Children swimming pool before the intervention.
4.63 Adults swimming pool before the intervention.


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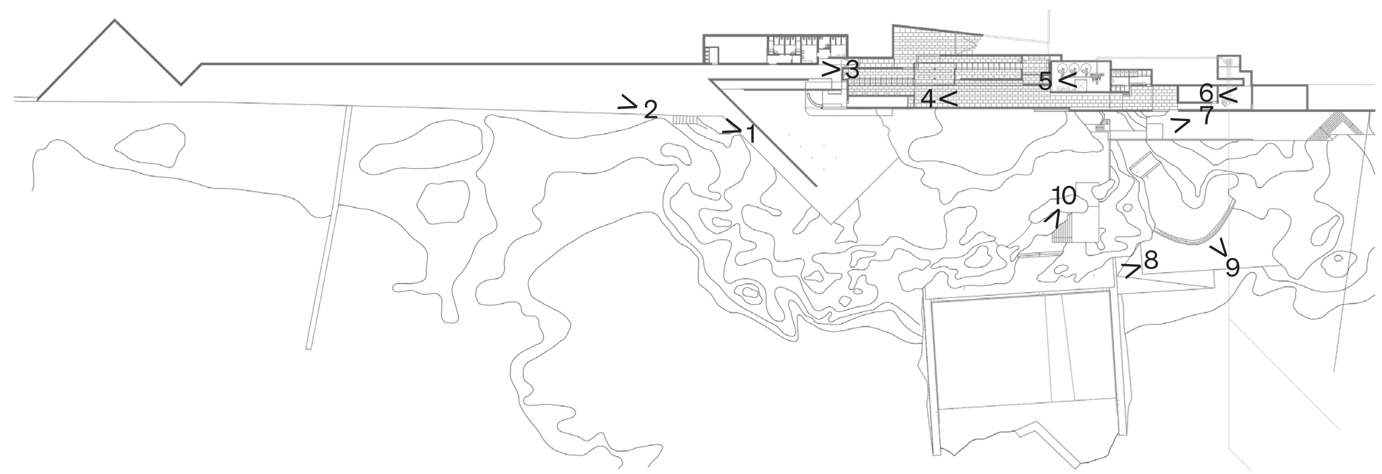

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4.64 Location of the image captions.


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4.65 Excavation of the north platform extension.
4.66 Setting of the north platform's pavement.
4.67 Rebar of the new concrete walls of the north volume.
4.68 Changing rooms' hallway during the wood cleaning process.
4.69 Water treatment room after the removal of the original equipment.

4.70 South storage room after the demolition of the roof slab.
4.71 Formwork of the walkway rebuild.
4.72 Concrete pouring over the new technical galleries.
4.73 Concrete pouring in the curved wall of the children swimming pool.
4.74 Demolition of the inner side of the adults swimming pool concrete walls.


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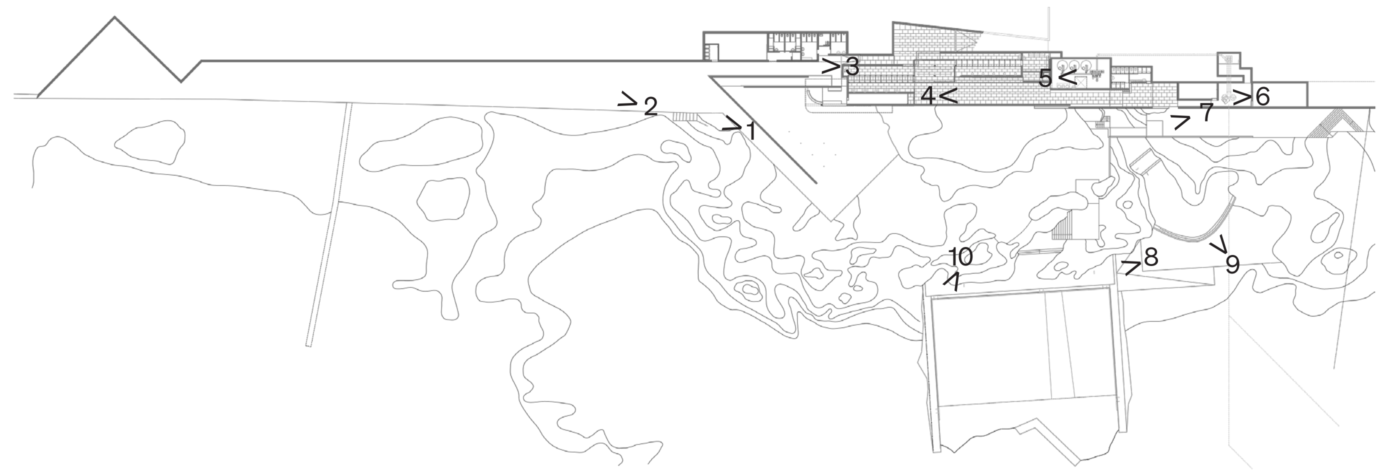

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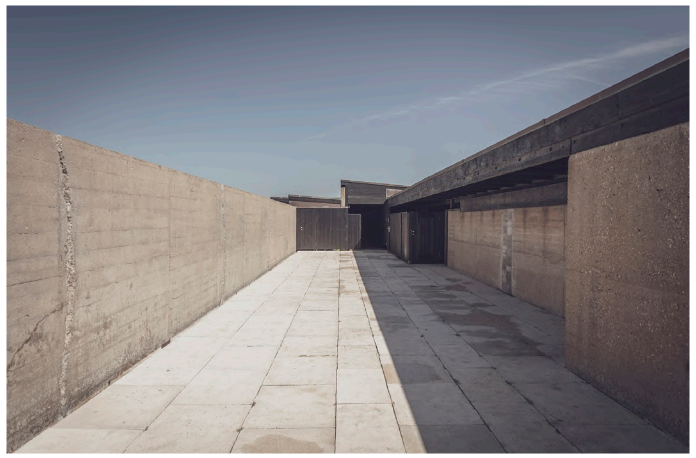
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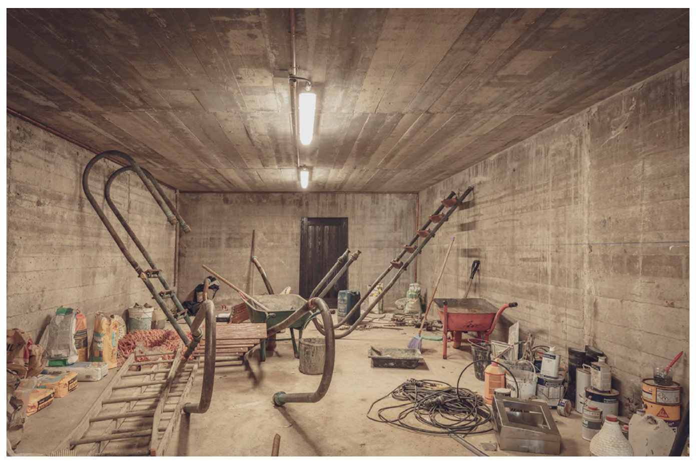
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4.76 Rebuilt north volume and retaining wall.
4.77 North platform extension.
4.78 Rebuilt north volume.
4.79 Changing rooms' hallway after the intervention.
4.80 Water treatment room after the intervention.
4.81 South storage room after the intervention.
4.82 Rebuilt walkway.
4.83 View towards north after the intervention.
4.84 Children swimming pool after the intervention.
4.85 Adults swimming pool after the intervention.
4.86 Location of the image captions.
4.87 Details before and after the intervention (following spread).


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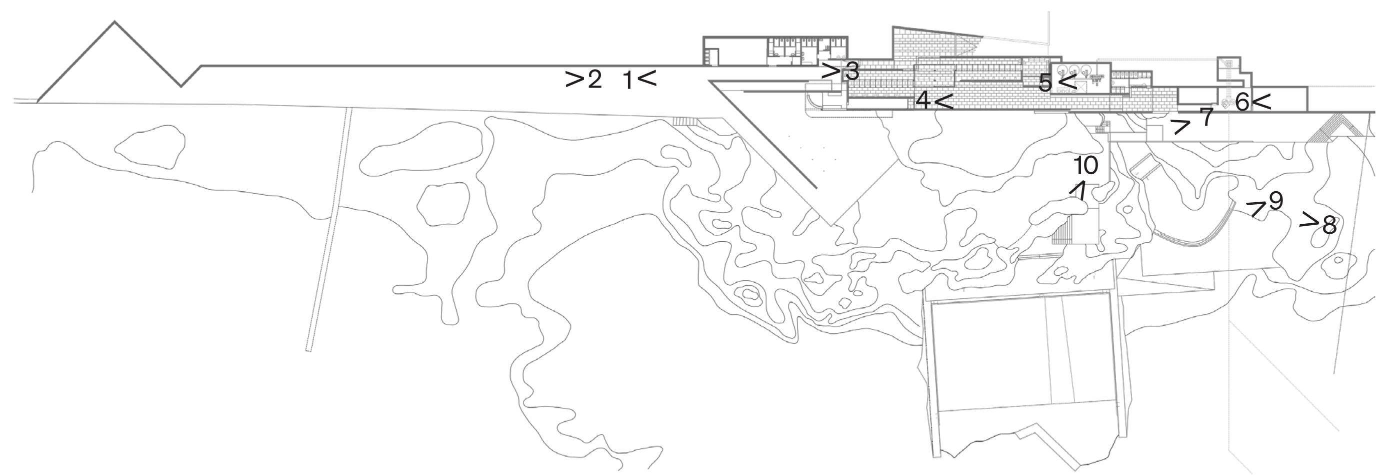

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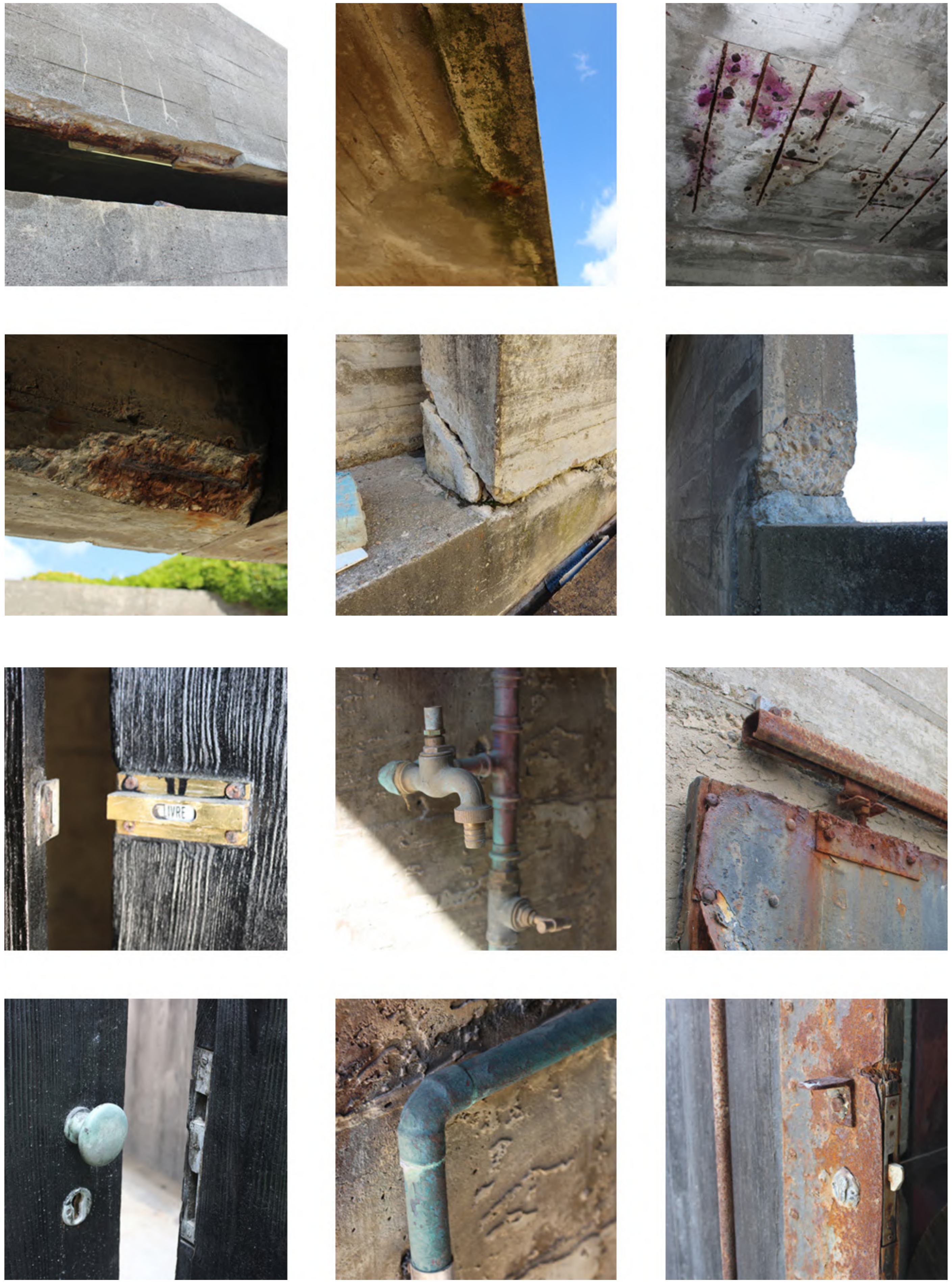

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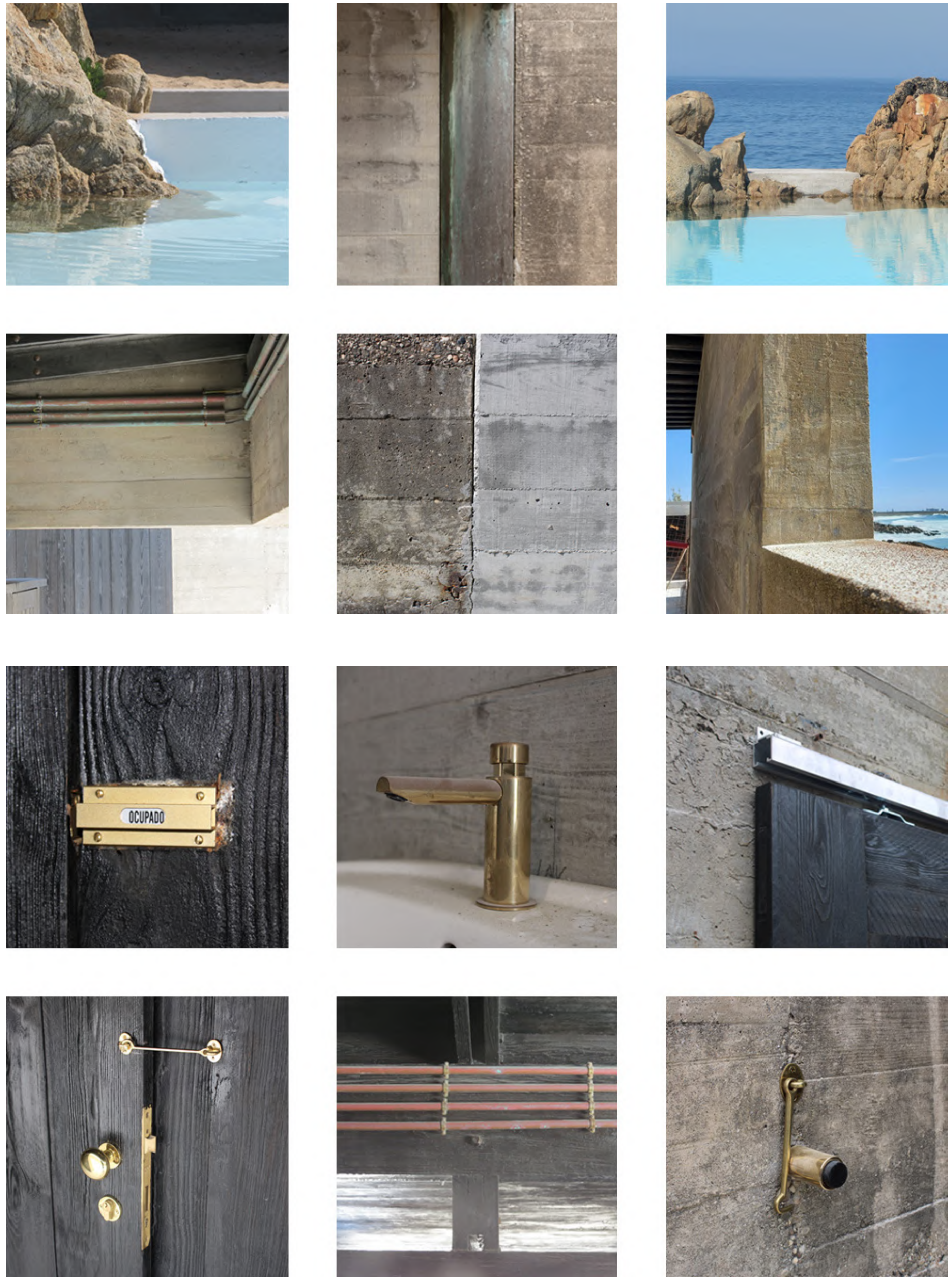

4.3.2 Concrete repair

General approach

Although the quality of the original concrete was very good, the damage survey has identified several problems and their causes. Hence, some of the concrete structures, such as the walls on the north side and the walkway that leads to the swimming pools, were already in an advanced state of decay, presenting severe rebar corrosion. In addition to spalling related to steel corrosion, the main signs of decay were 'pattern cracking, erosion of the concrete surfaces, and patches caused by incorrect interventions.

There were four types of approaches to concrete repair: i) demolition and replacement of concrete structures with same texture and formwork integration (this was the case of the suspended walkway and the roof slab of the south storage room, where the condition of the concrete was beyond repair); ii) localized repair of concrete spalling with chromatic, texture and formwork integration (in the cantilever beam over the changing room's entrance); iii) localized repair of material loss or detachment (in specific locations with impact on the geometry or the continuity of wall planes); iv) maintenance of cracks that did not present signs of steel corrosion and therefore did not pose a risk to the building's structure, some of which were left open as signs of the material history of the building.

The first three types of works on the concrete were performed with pine formwork in keeping with the original texture. In the latter case (iv), given the patches of the incorrect remedial interventions conducted over time, as well as the inevitable visibility of new repairs over existing cracks, Siza chose to preserve several cracks open in the exposed concrete as 'scars of time' that testify to the material history of the building (the cracks were related to the absence of expansion joints in the original design and are not related with rebar corrosion). In his own words, Siza performs a "*minimum intervention, neither wanting nor being able to hide what the passage of time determines*" (Siza, 2018). This is also, according to him, the "*most brutalist*" attitude and therefore coherent with the option of truth advocated by the use of raw materials in the original design (Siza, 2019, p. 19).

In this way, Siza recognizes the "age value" (Riegl, 1903) in modern buildings, intended as the passage of time and an explicit sense of the life cycle. However, despite recognizing time as an added value in architecture, Siza calls for the importance of regular maintenance: "*The passage of time in buildings is part of their quality; it increases the density of the buildings*", except when there is "*a lowering, for economic reasons, of either the quality of the materials or the execution, or a lack of maintenance*" (Siza, 2017, p. 151). Siza thus maintains that "*the work of rehabilitation should be converted into maintenance. Otherwise you repair, and afterward it decays again. Carrying out regular maintenance is a matter of economics*" (Siza, 2017, p. 141).

The conservation intervention in the Ocean Swimming Pool entailed the challenging subject of an architect preserving his own work. Understanding the work 'of the other' (the young Siza), Siza's recent intervention in the Ocean Swimming Pool (2018-2021) preserved the architectural integrity of the ensemble and accepted the marks of time as a densifying aspect of architecture (Ferreira, 2022).

4.88 Rebuilt north volume (previous spread).
4.89 Rebuilt walkway and south storage room roof slab.
4.90 Vertical crack on the wall by the entrance ramp before the intervention (filled with an inadequate mortar).
4.91 Vertical crack on the wall by the entrance ramp after the intervention (cleaned and left exposed).

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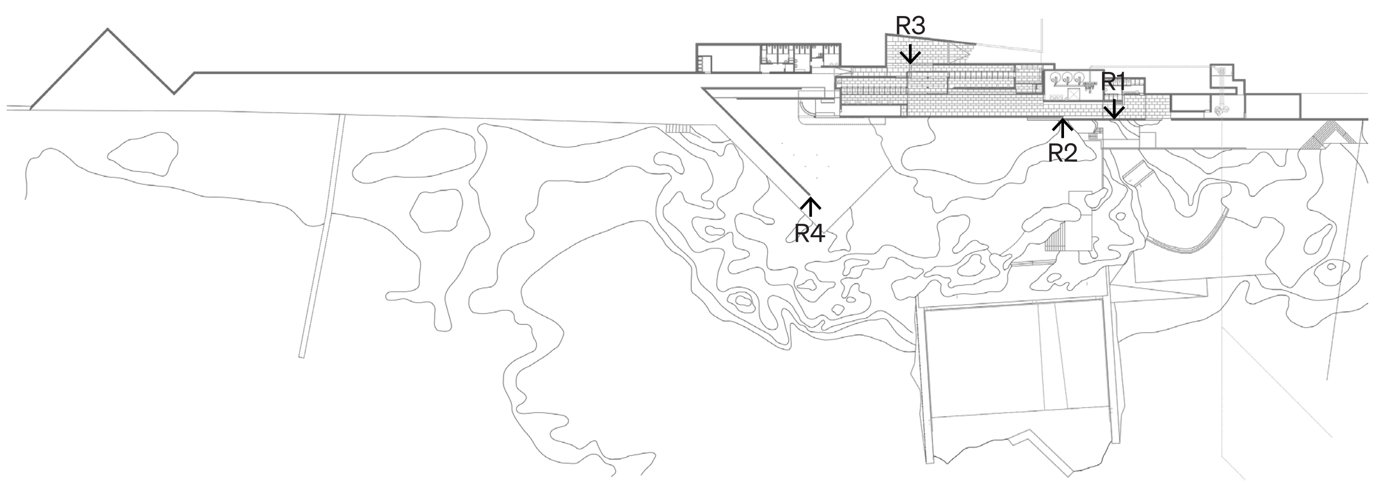
Pilot demonstration 1

The west façade presented a concrete detachment of about 0,5 m² in the angle between a higher and a lower wall (R1), caused either by the lack of movement joints or by foundation movement (fig. 4.95). The same façade also presented, at the lower corner of the wall over the concrete bench, a material discontinuity that led to the separation of a wall fragment, possibly due to the dilatation of a corroded vertical rebar (fig. 4.105).

The repair interventions were conducted by the specialized conservator-restorer Pedro Antunes (Cinábrio Restauro) and began with the elaboration of restoration mortar samples with different combinations of washed concrete sand, 2/4 mm pebbles, 0/1.2 mm yellow stone dust and 0/0,7 mm black ground limestone. A quick-setting binder was used to allow the application of olive shadow and black iron oxide pigments to fine-tune the coloration. Ten samples of the repair mortar were produced for analysis and selection by Álvaro Siza, with the objective of an optimized blending and integration of the new mortar with the preexisting concrete in terms of color and texture (fig. 4.93 and 4.94). The interventions were minimal, employing a restricted number of products and techniques, selected according to their stability, reversibility, and temporal inalterability, as well as their compatibility with the original materials.

The first repair (R1) required the reconstruction of the detached portion. For this purpose, 316 stainless steel threaded rods were inserted in the preexisting concrete and coated with epoxy resin before the application of the restoration mortar. A siliconized sheet was then applied on top of it to keep the joint open and allow structural movements. Wooden planks were used as formwork to achieve the intended texture in keeping with the original. The repair mortar was gently introduced inside the formwork and after ten to fifteen minutes of curing, a water-soaked sponge was used to mimic the wear of the existing surfaces, followed by a supplementary localized chromatic reintegration to mimic the concrete wall's pigmentation (fig. 4.103).

The second repair (R2) started with the removal of the loose fragments and their numbering for later repositioning. The 2 cm corroded vertical rebar was subjected to mechanical and chemical cleaning, followed by the application of a rust converter and an epoxy resin coating to prevent future corrosion. The fragments' inner surfaces were punctured to allow their realignment with the wall and then glued with an epoxy resin. Lastly, the remaining gap created by the fragmentation was filled with the same mortar and methodology used in the previous intervention (Cinábrio, 2021).



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4.92 Location of the concrete repair interventions.

Pilot demonstration 2

The remaining two spots selected by Álvaro Siza for concrete repair presented concrete spalling. The first one is located at the cantilever beam over the changing rooms' entrance (R3). The beam exhibited concrete delamination caused by rebar corrosion, the latter originated mostly by chloride ingress (from the seafront environment), combined with concrete carbonation. The second is located at the top of the terrace 45º angled wall (R4). Here, the anomaly was caused by the unauthorized removal of material to embed electrical wires for exterior lighting. Both locations were intervened using the Patch Restoration Method (Valença *et al.*, 2015) specifically the Gray Concrete Restoration Method (GCR-Method) (Miranda *et al.*, 2021) to characterize the concrete surface, including the color and texture of the surface, to design the restoration mortar, to define the application and finishing procedures and to assess the intervention.

The chromatic characterization of the surfaces was performed through image processing techniques using the HSV (Hue, Saturation, Brightness) and CIELAB color spaces. The Brightness (V) color parameter was used to correlate the percentage of pigment to be added to a reference mortar in the case of gray concrete. The chromatic characterization indicated 4% of black pigment to be added to the restoration mortars in the R3 affected area. In the first case, since proportions between 2.5% and 4% result in lower variation of the V parameter, it was decided to incorporate 3% of black pigment in the mortar mixture, to ensure a slightly lighter color than the surface to be repaired, in case the chromatic compatibility was not perfect. This facilitated the application of located color corrections and glazes that replicate the stains of the surrounding surface through the application of yellow pigment. In the 45º angled wall (R4), a reduced area of binder was measured because of the aggregates' (sand and pebbles) high exposure to erosion. Thus, it was concluded that the aggregates have a major contribution to the color and texture of the surface, and no black pigment was incorporated in the mortar. On the other hand, the results obtained in the CIELAB color space were used to estimate the proportion of pigments to be used, which indicated a slight trend toward red and yellow. The incorporation of 1.5% of yellow pigment and 0.5% of red pigment, in relation to the cement weight, was tested and validated.

The restoration mortar was developed to ensure all mechanical, physical, and durability requirements taking into account the location of the building, mainly its high exposure to chlorides. In that sense, the mortar's mixture was designed with a water to cement ratio of 0.5, and cement was partially replaced by micro limestone filler and natural ground pozzolan, assuring a high-quality and compact matrix with reduced permeability, leading to a durable and sustainable solution.

A finishing texture reproduced with untrimmed formwork boards and brush was first tested in sample panels. These were then brought to the site for color evaluation, compared to the original concrete to check if final refinements were necessary, based on image processing and the opinion of Álvaro Siza. Both surfaces to be repaired and the samples presented an identical value for V (in HSV color space), with 0.56% differences. The color difference in these surfaces was also measured in the CIELAB color spaces, considering that a JND (Just Noticeable Difference) value of 2.3 represents the lower limit of color variations that are noticeable to the human eye. The measured color variation between the surfaces was 1.24, making it imperceptible. These results in both color spaces allowed the validation of the restoration mortars and set the final formulation (Miranda *et al.*, 2022).

The application of the restoration mortar started with preliminary work for substrate preparation, namely the removal of deteriorated concrete. In the first case (R3), it was extended to the rebars' concrete overlay, removing any material that could be affected by corrosion. This was followed by intense brushing and the application of a corrosion protection product. Additionally, longitudinal and transversal rebars (galvanized steel rods) were added and glued with epoxy resin. In the other case (R4), the depth of the opening was increased to allow the restoration mortar to have a minimum thickness.

The application of the restoration mortar in the entrance area (R3) was done with untrimmed pine formwork boards to recreate the stereotomy and texture of the preexisting concrete surface's texture. After 5 hours of curing, the formwork was removed. It was followed by a chromatic reintegration through the application of glazes (pointillism) on the transition areas while the restoration mortar was still fresh to allow the partial absorption of the pigments into the superficial matrix. Additionally, any texture and level difference in the transition areas were smoothed through the use of a small spatula and brushes, and completed with a final sanding process after the curing process with a grouting sandpaper. In the case of the 45º angled wall (R4), the mortar was directly applied in the gap. The addition of the pebbles in the superficial mortar was done by hand, allowing the regularized restoration mortar to be approximately 3 millimeters thicker than the wall's surface. A superficial hardening retarder was posteriorly applied to delay the curing process of the first 2 to 3 millimeters depth of the restoration mortar. After 5 hours of curing, the excess unhardened mortar layer was removed with a wet sponge, recreating the eroded texture of the wall and exposing all the aggregates. Both repairs underwent a final color evaluation after six months, and color differences between the repaired and the original concrete surfaces were lower than JND (not perceptible to the human eye).


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4.93 Restoration mortar discussion with Álvaro Siza.
4.94 Restoration mortar validation.
4.95 Joint between a higher and a lower section of the west wall before the intervention (R1).
4.96 Brushing of the intervention area (R1).
4.97 Drilling for the insertion of rebar (R1).
4.98 Application of glue in the rebar holes (R1).
4.99 Initial restoration mortar filling (R1).
4.100 Application of formwork to the lower section (R1).
4.101 The lower section after the removal of the formwork (R1).
4.102 Application of restoration mortar on the upper section (R1).
4.103 Color and texture corrections (R1).
4.104 Final result after the intervention (R1).


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4.105 Joint between the west wall and the concrete bench before the intervention (R2).
4.106 Bioccide application (R2).
4.107 Removal of loose fragments (R2).
4.108 Cleaning of loose fragments (R2).
4.109 Application of epoxi resin on the exposed steel rod (R2).
4.110 Application of glue on the loose fragments (R2).

4.111 Placement of the loose fragments (R2).
4.112 Placement of the loose fragments (R2).
4.113 Application of the restoration mortar (R2).
4.114 Color and texture corrections (R2).
4.115 Horizontal joint that was maintaned (R2).
4.116 Final result after the intervention (R2).


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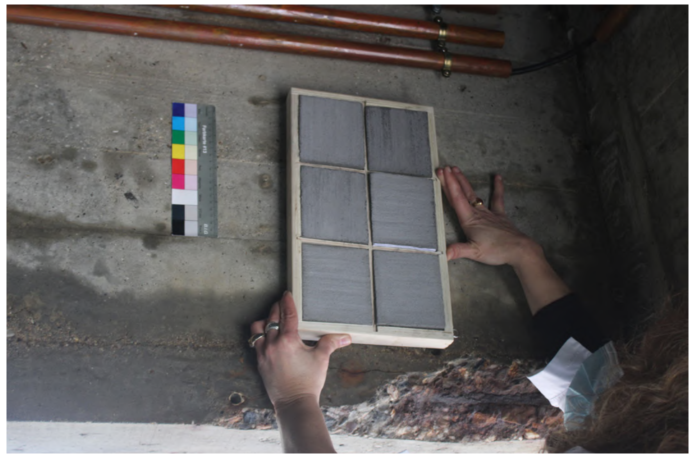
4.117 Changing rooms hallway after the intervention (following spread).



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4.118 Restoration mortar validation (R3).
4.119 Restoration mortar discussion with Álvaro Siza (R3).
4.120 Cantilever beam over the changing rooms entrance before the intervention (R3).
4.121 Material removal and rebar reinforcement (R3).
4.122 Application of restoration mortar with formwork (R3).
4.123 Color and texture corrections (R3).
4.124 Sanding of the transition areas (R3).
4.125 Final result after the intervention (R3).
4.126 Top of the 45º terrace wall before the intervention (R4).

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4.127 Application of restoration mortar with pebbles (R4).
4.128 Application of the superficial retarder (R4).
4.129 Final result after the intervention (R3).
4.130 Changing rooms entrance after the intervention (following spread).

4.4 Hazards, vulnerabilities and risks

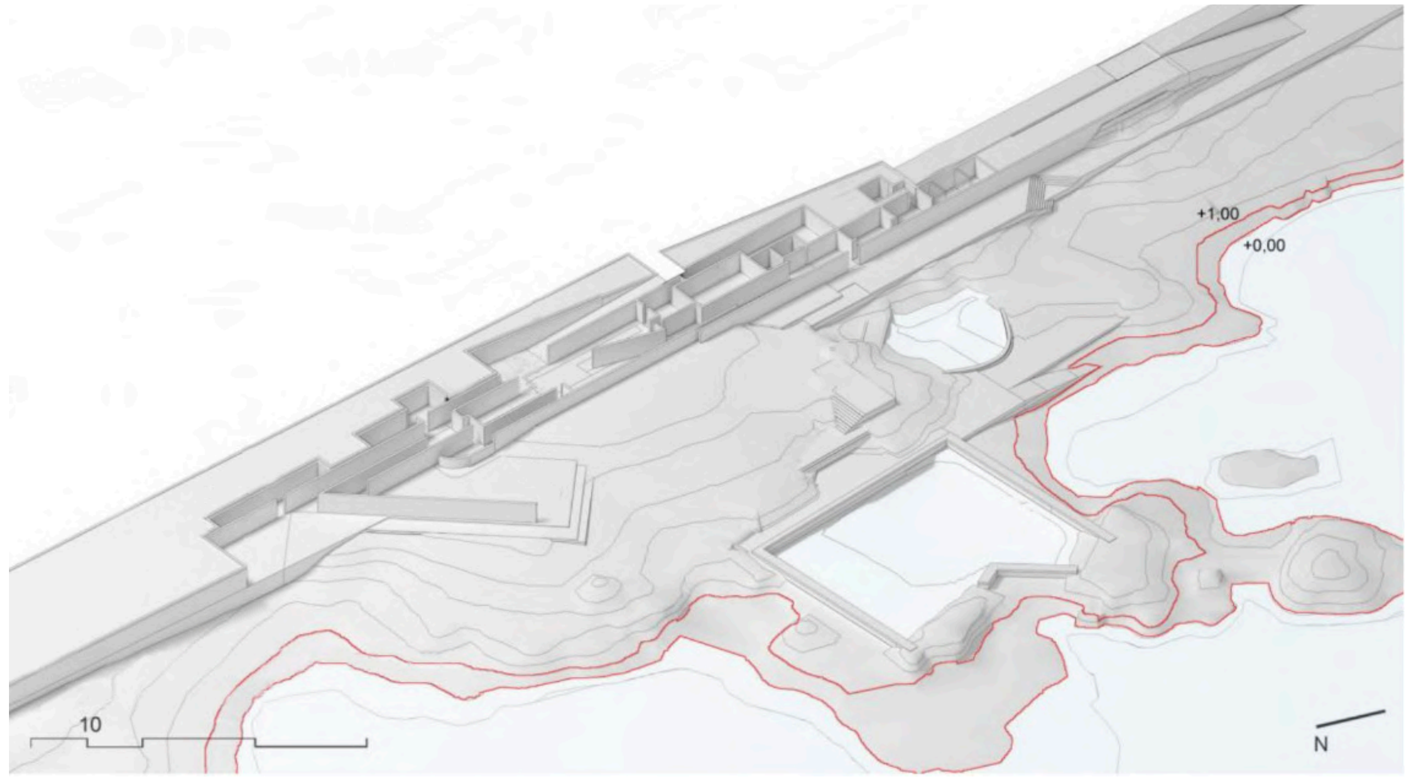
4.4.1 Methodology

Reinforced concrete constructions located in coastal environments, namely in intertidal and splash areas, are known to be vulnerable to a wide range of degradation phenomena (Mehta, 1980; Santhanam and Otieno, 2016; Qu, *et al.*, 2021). Exposure to the ingress of chloride ions from seawater alone can cause steel corrosion in reinforced concrete, which can then lead to spalling of its surface (James, *et al.*, 2019). Moreover, these constructions can be further exposed to damage resulting from coastal erosion or hydrometeorological events (Pranzini, Wetzel and Williams, 2015; Gomes, *et al.*, 2018). In addition, the increasing rate of phenomena related with climate change is introducing new challenges that can affect the vulnerability of these constructions. For example, aside from creating new threats such as sea-level rise, climate change is also intensifying the occurrence of coastal erosion and extreme hydrometeorological phenomena (Masselink and Russell, 2013; Stott, 2016; Konisky, Hughes and Kaylor, 2016). Furthermore, for the particular case of reinforced concrete constructions, the rise of atmospheric CO_2 concentration and temperature are known to lead to an increase in concrete carbonation (Yoon, Çopuroğlu, and Park, 2007; Stewart, Wang and Nguyen, 2011; Talukdar, Banthia and Grace, 2012) which in turn leads to a non-negligible increase in carbonation-induced corrosion of steel reinforcement (Stewart, Wang and Nguyen, 2012; William and Attar, 2015; Köliö *et al.*, 2015). Overall, these several phenomena can lead to a number of issues that may affect the functionality, aesthetics and durability of reinforced concrete constructions.

Anthropogenic hazards are another source of threat to constructions in general. These hazards are related to human-induced actions or inactions that endanger constructions and can lead to devastating consequences if left unaddressed. Anthropogenic hazards can be grossly divided into intentional human activity that is malicious and has negative im--pacts, intentional human activity that is non-malicious, but that may have negative impacts, and non-intentional human activity that may have negative impacts. While the identification of some of these hazards is sometimes difficult, one of the key challenges for their inclusion in risk management processes is often related with the definition of their likelihood since their occurrence cannot be predicted using probabilistic models based on the recurrence of these events.

When the construction exposed to the hazard is also considered culturally significant, additional features are also at risk due to the likely loss of integrity caused by the negative hazard impacts. In this context, Modern architecture is particularly vulnerable to certain types of hazards given that, at the time of construction, the material and technological features that were involved were often experimental. For example, it has been shown that concrete ages faster than other materials (Di Biase, 2009), which makes the preservation of historic constructions in concrete a time-constraint activity requiring proactive solutions. Furthermore, given the referred climate change effects that are likely to accelerate concrete degradation, addressing its preservation becomes urgent. Given the importance of this topic, several documents have been highlighting the cultural significance of reinforced concrete heritage constructions, namely the Madrid-Delhi Document (ICOMOS ISC20C, 2017) and the Cádiz Document (ICOMOS ISC20C, 2021), discussing the need for their preservation. However, there are no comprehensive methodologies for assessing how the impacts of different types of hazards may affect the cultural significance of such heritage constructions, namely in cases where some of the hazards may be intensified by climate change.

The proposed approach can be seen as a simplified first-level assessment framework for identifying relevant hazards, vulnerabilities and risks in reinforced concrete heritage constructions. The methodology was supported by the analysis of different information sources, with a special focus on the consultation of regional and local level legal and administrative documents (policies, regulations, reports, maps, etc.). This information was complemented with data collected from interviews conducted to officers of the Municipal Council heading the Culture, Urban Planning, Environment, Civil Protection, and Heritage Commission departments. The identification of hazard impacts took into account the site's values that contribute to its cultural significance, given their essential nature for the decision-making process over what should be preserved and what can be changed.



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The methodology that was followed for risk, vulnerability and hazard identification considers that risk can be defined as the potential negative impacts in the asset under assessment due to the occurrence of a threatening event, which need to account for the diversity of values and functions associated to the asset (Reisinger, *et al.*, 2020). The threatening events are termed hazards and represent a potentially damaging physical event, natural or anthropogenic, that can have negative impacts on the asset under assessment. These negative impacts represent the risk measure but are often globally termed as losses (GFDRR, 2014). Globally, these impacts can be seen as the result of the dynamic interaction between the hazard and existing vulnerabilities (e.g. physical, social, economic or environmental vulnerabilities) which represent the susceptibility of the asset under assessment to the damaging effects of the hazard, combined with a lack of ability to cope with those impacts, i.e. a lack of resilience (Romão, Paupério and Pereira, 2016). Within this definition, it is noted that the word "potential" refers to the presence of uncertainty when analyzing these issues. The uncertainty can have different sources and occurs across the different elements of the risk assessment, namely when establishing the likelihood of occurrence of the hazard that can cause the negative impacts or when estimating the actual negative impacts.

The risk, vulnerability and hazard identification approach that was considered herein falls into the category of qualitative methods and combines the likelihood and severity of the selected hazard scenarios with the vulnerability levels that were identified to establish risk levels. Regarding the selected hazard scenarios, natural and anthropogenic hazards are considered, including both sudden- and slow-onset hazards, and also accounting for the likely effects of climate change. Although in a qualitative form, the vulnerability levels that are identified consider physical impacts on the asset (i.e. physical damage) and impacts to the cultural significance and values of the asset. Finally, given the preliminary nature of the proposed analysis, these risk levels must be understood as a tool to establish risk mitigation priorities and identify issues requiring more detailed and resource-demanding analyses.

Regarding the selected hazards, it is noted that the potential impacts of the Galp Energia oil refinery that was located nearby are not considered in the current analysis. The refinery was decommissioned in mid-2021 and is no longer a threat. According to available information, the site is going to be transformed into a green and innovative district with housing, a university campus, a large park, and various facilities over the next 4 years.

4.131 Graphic representation (in red) of a +1.00 m sea level rise (adapted from Gilabert Campos, Castellano Pullido and García Píriz, 2019).

4.4.2 Hazards

Natural hazards

Given the location of the Ocean Swimming Pool, the more relevant natural hazards were found to be storm surges and chloride action. In addition, given their relation with climate change, events such as sea level rise and the increase of atmospheric carbon dioxide were also considered in the current assessment.

In terms of chloride action, the most important source of chlorides for the Ocean Swimming Pool is the contact with marine air and splash-water (Schueremans, 2007). Chloride concentration will vary according to the nature of the shoreline and the resulting surf, wetting and drying cycles, as well as wind direction and speed, all of which can vary seasonally and on a daily basis. Additionally, chloride deposition also depends on ambient temperature as well as rainfall regimes that may wash off some of the chlorides. All these variables influence the chloride deposition rate, resulting in a higher or lower deposition of these ions according to the cumulative effect of these conditions (Liu, 2018).

A storm surge is an abnormal rise of seawater over the predicted astronomical tide level that storms generate. These storms originate in low pressure systems, or depressions, which temporarily increase the sea level by decreasing atmospheric pressure. Due to their morphology, low and sandy coasts are particularly sensitive to this extreme hydrodynamic phenomenon. In some European regions along the Atlantic coast, storm surges can reach over 2 m above normal tide levels. Nevertheless, the highest recorded values on the Portuguese coast were closer to 1 m (Santos and Miranda, 2006). However, one of the effects of climate change might be an increase in storminess along the Portuguese continental coast, which was hit by a significant number of storms between 2010 and 2018: Xynthia (February 2010), Hercules (January 2014) and Emma (March 2018). These eight years concentrate 53% of the total number of coastal flooding occurrences since 1980 (Tavares, 2021). The presented coastal flood scenarios (figs 4.132-4.133) were based on the Mod.FC_2 projection (0.44 m for 2050 and 1.15 m for 2100 in relation to the vertical datum of Cascais 1938), considering maximum high-tide and additional storm surge with a return period of 100 years, according to the Directive 2007/60/EC (Antunes, Rocha and Catita, 2019, p. 239). These scenarios show a 20% to 40% flood probability (with a water depth between 2.80 m and 2.90 m) in 2050 and of 60% to 80% (with a water depth between 3.00 m to 3.35 m) in 2100 for the site.

In the context of climate change and its effects, it is currently known that, from 1880 to 2012, the average global temperature increased by 0.85ºC (IPCC, 2014, p. 40). Given current concentrations and ongoing emissions of greenhouse gases, it is likely that global mean temperature will continue to rise above the pre-industrial level until the end of this century. The world's oceans will warm and ice melting will continue, leading to an increase in the average height of the ocean surface, designated by Global Mean Sea Level (GMSL). Up to 2050, GSML projections exhibit little scenario dependence and estimate a likely sea level rise of 0.19 m and 0.23 m between the baseline period (1995-2014) and 2050. Beyond 2050, the scenarios increasingly diverge. Between the baseline period (1995-2014) and 2100, processes in whose projection there is medium confidence estimate a likely GSML rise between 0.44 m and 0.77 m (IPCC, 2021, p. 1302). The specific sea level rise projections for the west coast of Portugal, based on the intermediate hazard scenario Mod.FC 2b, point to permanent tide submersion levels of 0.44 m in 2050 and of 1.15 m in 2100, relative to the Cascais Vertical Datum 1938 (Antunes, 2019). The specific tide submersion scenarios for 2050 and 2100 in the area of the swimming pools (figs. 4.134-4.235) indicate that, for the latter, both swimming pools are likely to be submerged for 9 hours a year.

Given its relation with climate change, the impact of the rise in atmospheric CO_2 is also considered herein. As referred before, the rise of atmospheric CO_2 concentration can lead to an increase in concrete carbonation, which in turn leads to a non-negligible increase in carbonation-induced corrosion of steel reinforcement. Carbon dioxide levels are higher today than at any point in human history, mostly as a result of anthropogenic emissions (e.g., burning of fossil fuels for energy). In 2021, according to the Global Monitoring Lab of the National Oceanic and Atmospheric Administration (NOAA), global average atmospheric carbon dioxide was 414.72 ppm (Lindsey, 2022).

It is expected that, with higher atmospheric CO_2 concentration, the proportion of emissions taken up by both ocean and land will decline. Thus, even if there is considerable uncertainty in projections of future CO_2 concentration, the IPCC projections lead to a CO_2 concentration for 2010 that ranges from 651 to 682 ppm (IPCC, 2001, p. 222).

Anthropogenic hazards

Given the location and past history of the Ocean Swimming Pool, vandalism, incorrect or improper use, and neglect or lack of maintenance were the three types of anthropogenic hazards considered in the current analysis.

Vandalism, characterized by acts that cause deliberate damage or even destruction, has been a persistent issue throughout history. Regardless of the underlying motivations, the consequences of vandalism inflict willful damage upon the material landscape of cultural heritage constructions. These malicious acts can take various forms, such as graffiti, defacement, theft of valuable artifacts, or intentional physical damage to structures. Vandalism not only causes irreversible harm to a heritage site but also disrupts its historical context and erodes the collective memory embedded within these sites.

Heritage constructions that retain their original purpose and remain accessible to the general public often face issues related to incorrect or improper use. The continuous flow of visitors and the lack of proper monitoring can lead to increased wear and tear, potentially compromising the structural stability and authenticity of the site. Inadequate visitor management can further exacerbate the damage caused by incorrect use.

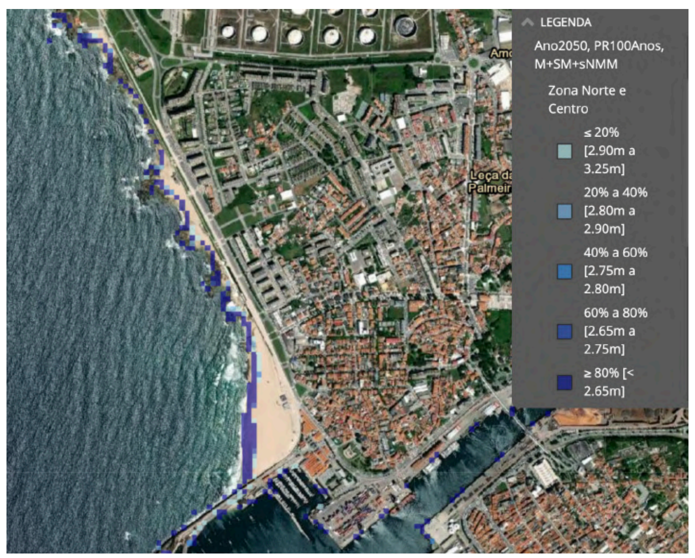
Long-term neglect or insufficient maintenance poses a pervasive threat to heritage constructions worldwide. The passage of time, exposure to natural elements, and lack of regular upkeep can lead to significant deterioration of historic structures. Although maintenance is essential for ensuring the preservation of cultural heritage constructions, stakeholders often neglect systematic and routine maintenance works. This neglect can arise due to a lack of understanding about the unique needs of these structures, as well as the unavailability or inconsistent allocation of resources.

4.132 Leça da Palmeira coastline extreme flooding scenarios for 2050.

4.133 Leça da Palmeira coastline extreme flooding scenarios for 2100. (adapted from Antunes, *et al.* 2017) A scale of blue hues, from dark to light, represents the five levels of confidence of the Flood Hazard Index: 1-Very low; 2-Low; 3-Medium; 4-High; 5-Extreme; separated by 20% flood probability intervals.

4.134 Leça da Palmeira coastline tide submersion scenarios for 2050 after GMSL rise.

4.135 Leça da Palmeira coastline tide submersion scenarios for 2100 after GMSL rise. (adapted from Antunes, *et al.* 2017) A scale of blue hues, from dark to light, represents the percentage of submersion hours and its absolute values during a year: 10% or 876 hours; 5% or 438 hours; 2.5% or 219 hours; 1% or 88 hours; 0.1% or 9 hours.



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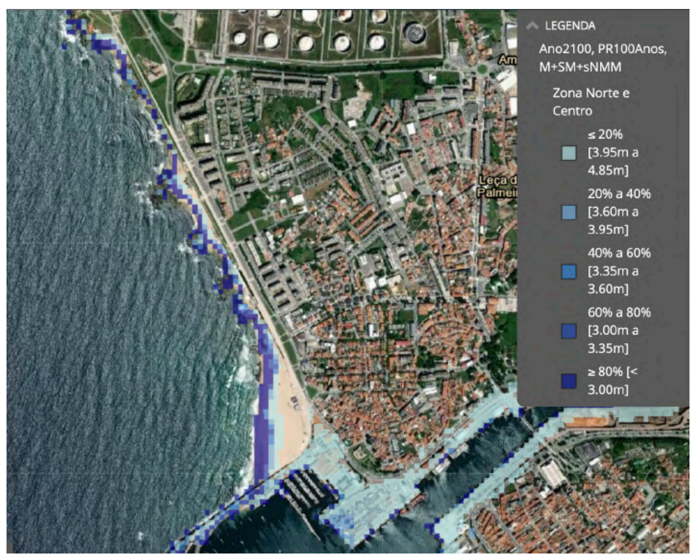

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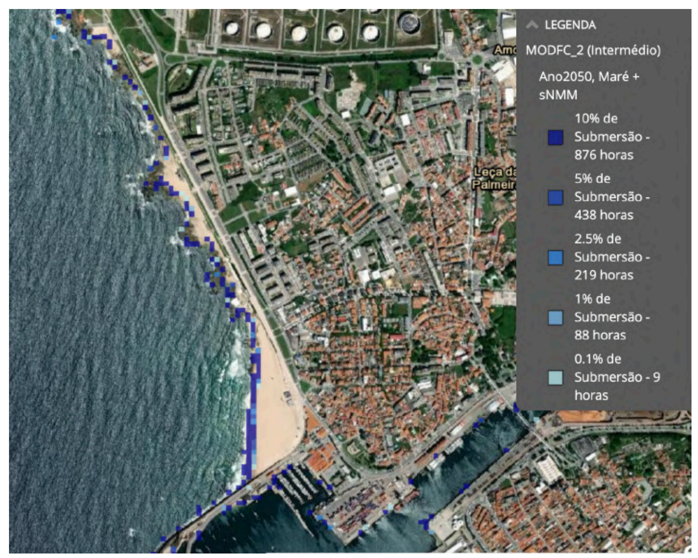

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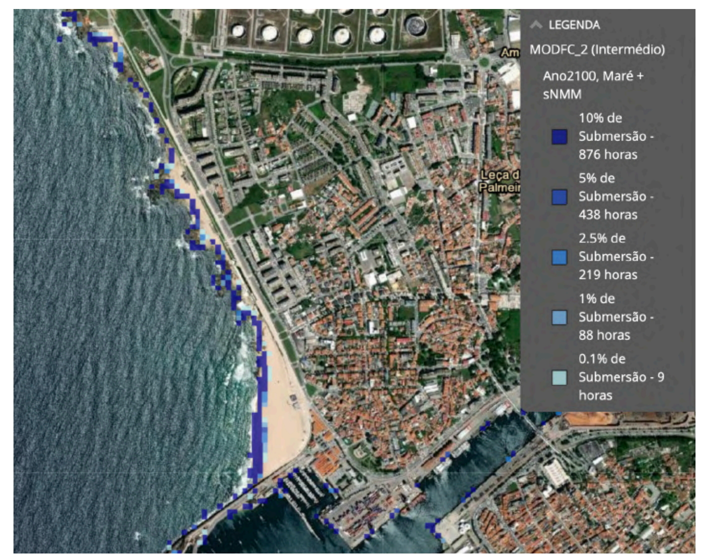

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Classification of the hazard scenarios

Figure 4.136 presents a summary of the previously described hazard scenarios along with a likelihood classification using three levels: LOW, MEDIUM and HIGH. For the slow-onset natural hazards related with climate change, this classification reflects the confidence in the climate model that predicts the event. In contrast, for the case related to chloride action, whose classification is HIGH, it reflects the fact that the asset is continuously exposed to that hazard. For anthropogenic hazards, the classification reflects the likelihood of the hazard occurring at least once a year.

Category	Hazard	Scenario	Description	Source
Slow-onset natural hazard	Sea level rise	Sea level rise of 0.44 m until 2050 **Likelihood: HIGH**	Likely sea level rise at west coast Portugal according to scientists	Antunes (2019)
Slow-onset natural hazard	Increase of atmospheric carbon dioxide	Atmospheric CO_2 increase between 236-267 ppm until 2100 Likelihood: HIGH	Likely atmospheric CO_2 increase according to the Intergovernmental Panel on Climate Change (IPCC)	IPCC (2001)
Slow-onset natural hazard	Chloride action	Permanent marine environment exposure **Likelihood: HIGH**	The asset is permanently exposed to the effect of airborne chlorides carried by the sea winds	
Sudden-onset natural hazard	Storm surge	Occurrence of a storm surge **Likelihood: HIGH**	The asset's location makes it particularly vulnerable to storm surges and coastal flooding	Antunes, Rocha and Catita (2019)
Sudden-onset anthropogenic hazard	Vandalism	Theft of copper elements and graffiti **Likelihood: LOW**	The absence of clear fences and the low height of the building's roof make the site particularly vulnerable to trespassing and vandalism	
Slow-onset anthropogenic hazard	Misuse	Throwing waste into toilet vases **Likelihood: MEDIUM**	Throwing waste into toilet vases might lead to clogging and to repair costs	
Slow-onset anthropogenic hazard	Lack of maintenance	Absence of regular surveys **Likelihood: MEDIUM**	The absence of regular surveys prevents the early identification of anomalies and leads to costly and more difficult repairs in the future	

4.136

4.136 Summary of the selected hazard scenarios.

4.4.3 Vulnerabilities

Vulnerability to natural hazards

Sea level rise is particularly threatening to coastal structures such as the Ocean Swimming Pool. The entrance level of the property from the street is at +7.50 m above the sea level, while the changing rooms and the swimming tanks were built at +5.00 m and +2.90 m above the current sea level, respectively. As such, there is an increased likelihood for the swimming tanks to be impacted by wave overtopping in future storms, but also in normal conditions if sea level rise reaches significant values (wave height above 2.00 m are rather common under normal weather conditions). This particular vulnerability of the Ocean Swimming Pool is made visible through the simulation presented in figure 4.131 which shows the impact of a 1.00 m sea level rise in terms of the area reached by water in these conditions and its closeness to the larger swimming tank.

The durability of concrete in coastal areas is mainly determined by its deterioration over time which is affected by the exposure conditions of the surrounding environment. In such an environment, the penetration of chlorides in concrete structures increases the likelihood of rebar corrosion, resulting in cracking and delamination of the concrete cover and a subsequent reduction of the reinforcement cross section, which seriously affects the load bearing capacity of structural elements (Costa and Appleton, 2001, p. 242). In addition to this issue, climate change is likely to cause an acceleration of deterioration processes that will also affect the safety and serviceability of concrete infrastructures. In this context, the main driver for increased concrete deterioration is the atmospheric CO_2 concentration. The increase in CO_2 levels is expected to increase the likelihood of concrete carbonation (Yoon, Çopuroğlu, and Park, 2007; Stewart, Wang and Nguyen, 2011; Talukdar, Banthia and Grace, 2012) which in turn leads to a non-negligible increase in carbonation-induced rebar corrosion (Stewart, Wang and Nguyen, 2012; William and Attar, 2015; Köliö *et al.*, 2015) as referred before. This impact of climate change on existing infrastructures is expected to be considerable, as corrosion damage is disruptive and costly to repair (Stewart, Wang and Nguyen, 2011, pp. 13-26).

The vulnerability of coastal constructions also needs to be considered regarding the occurrence of storm surges given their immediate and prolonged impacts, namely damage to the swimming pool tanks and the retaining walls. During a surge, the combined moving force of waves and wind may lead to damage to the constructions, as well as to the infrastructures, including access roads and electrical or hydraulic networks. Wave overtopping, overwashing and flooding of coastal areas are likely to occur during these surges, exposing the concrete surfaces to direct contact with seawater, increasing the level of chloride deposition that will significantly decrease the lifespan of the building. After the surge, ground subsidence and increasing coastal erosion can occur which, in turn, may create more damage to constructions and hydraulic networks. Furthermore, suspended sediments and materials in the seawater may mechanically degrade the concrete surfaces and clog the water supply and filtering systems, compromising their normal working conditions.

These extreme events are more clearly illustrated by figures 4.138-4.142 which pin-points the exact extension each one had and its immediate impacts on the Ocean Swimming Pool between 2017 and 2019. It is noted that the 2011 Matosinhos Municipal Plan for Civil Protection Emergency (CMM, 2011) rates storm surges with overwashing of the coastline with a medium-low level risk, meaning a low frequency (e.g. one time every 5 years). However, given the apparent increase in the rate of occurrence of these events, there is a need to review this rating based on empirical data combined with the outcomes of numerical simulations.

Vulnerability to anthropogenic hazards

Due to the site's natural setting along a continuous stretch of beaches, it has no clear limits or fencing, making it vulnerable to trespassing, vandalism and theft. Therefore, the building is particularly exposed to damaging anthropogenic activities such as wall inscriptions like graffiti, material destruction or theft of valuable materials like copper. As most of the walls of the asset are made of exposed concrete, they cannot be painted over, which increases the difficulty of removing graffiti. Also, its low-lying copper roof is tempting given the rise in the price of this material. Copper theft of the roof's sheeting or of water fixtures affects the normal operating conditions of the asset, resulting in the occurrence of anomalies that might have serious consequences if not promptly addressed. The permanent presence of a security guard can mitigate these vulnerabilities.

The Ocean Swimming Pool has been permanently operational since it opened in 1965. Since then, it has been visited by an average of sixty thousand people each year (based on available data from 2018 shared by the Municipal Council of Matosinhos). As a result, the asset is vulnerable to unintentional damage from intensive use or willful damage from improper use. As it is a fully functional public facility, some of the issues that can occur are difficult to prevent, such as clogged toilet vases due to improper waste disposal, or damaged showers and water faucets.

The lack of a structured and clearly defined maintenance policy facilitates the occurrence of uncontrolled degradation of the asset, compromising its preservation for future generations. The development and implementation of maintenance plans not only ensure the execution of regular visual inspections and scheduled material replacement but also define intervention guidelines that should prevent unauthorized or incorrect interventions that may hinder the significance of the site. Adequate maintenance plans therefore allow the prompt identification of anomalies and provide guidance for the most adequate response to these anomalies.

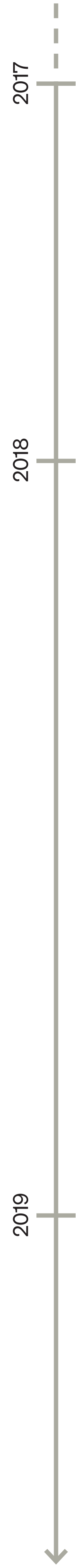
Classification of the vulnerability scenarios

Figure 4.137 presents a summary of the previously described vulnerability scenarios along with a severity classification using three levels: LOW, MEDIUM and HIGH. This classification considers both the severity of the physical damage that can occur as well as the severity of the impact on the cultural values that can be affected. A severity level classified as LOW means that the physical damage is either negligible or small enough to be easily repa-rable, while the impacts to cultural values are also expected to be negligible. A severity level classified as MEDIUM means that the physical damage is not negligible and re-pairing it will also involve non-negligible costs. This damage will also have relevant impacts to cultural values, but these are also expected to be recoverable after the damage repair. A severity level classified as HIGH means that the physical damage is expected to be significant and may not be fully repairable. As such, the impacts to cultural values in this case may not be recoverable.

Affected cultural values	Hazard	Vulnerability	Description
All	Sea level rise	Permanent submersion **Severity: HIGH**	Sea level rise, as a result of climate change, implies the permanent submersion of the asset, preventing its fruition in the future
Aesthetic	Increase of atmospheric carbon dioxide	Acceleration of concrete carbonation and rebar corrosion **Severity: MEDIUM**	The increase of atmospheric carbon dioxide, as a result of climate change, will accelerate concrete carbonation, leading to the corrosion of steel rebars which can cause cracking, spalling and the weakening of reinforced concrete elements.
Aesthetic	Chloride action	Acceleration of rebar corrosion **Severity: MEDIUM-HIGH**	The permanent exposure to the maritime environment, which is richer in chlorides, accelerates the corrosion of steel rebars which can cause cracking, spalling and the weakening of reinforced concrete elements.
Economic Aesthetic	Storm surge	Building damage Infrastructural damage **Severity: HIGH**	The moving force of storm surge may result in building damage. Direct exposure to seawater will seriously compromise the normal operating conditions of infrastructural networks due to direct contact with water, chlorides or due to water-suspended sediments that can clog the hydraulic and filtering systems.
Economic Aesthetic	Vandalism	Graffiti Copper theft **Severity: MEDIUM-LOW**	Graffiti have a negative impact on the asset's image and may be particularly difficult to remove since the asset was built mainly with unprotected materials (exposed concrete). Copper theft (the roof cladding or the water pipes) affect the normal operating conditions of the asset and might lead to serious consequences if not promptly addressed.
Economic	Misuse	Equipment damage **Severity: MEDIUM-LOW**	The misuse of the facilities might lead to equipment damage and determine the need for unexpected repairs and additional costs.
Economic Aesthetic	Lack of maintenance	Acceleration of the asset's degradation **Severity: MEDIUM-HIGH**	The lack of regular and appropriate maintenance interventions will accelerate the degradation of the asset.

4.137

4.137 Summary of the selected vulnerability scenarios.



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4.4.4 Risk level

Figure 4.143 presents the risk levels that were identified for the selected hazard and vulnerability scenarios. The risk levels were classified into four categories:

i) Acceptable risk without the need to implement any action - this is a negligible risk level.

ii) Acceptable risk with the implementation of monitoring actions - this is a negligible risk level but actions for monitoring the evolution of the conditions of the asset are recommended to understand if the risk level is increasing, due to a change in the hazard or the vulnerability.

iii) Tolerable risk - this represents a non-negligible risk level for which mitigation actions are only expected to be implemented if the results of a cost-benefit analysis are favorable.

iv) Unacceptable risk - this represents a non-negligible risk level for which mitigation actions must be implemented urgently.

Hazard	Scenario	Vulnerability	Risk level
Sea level rise	Likelihood: HIGH	Severity: HIGH	Unacceptable risk, mitigation actions are inevitable and urgent
Increase of atmospheric carbon dioxide	Likelihood: HIGH	Severity: MEDIUM	Tolerable risk
Chloride action	Likelihood: HIGH	Severity: MEDIUM-HIGH	Unacceptable risk
Storm surge	Likelihood: HIGH	Severity: HIGH	Unacceptable risk
Vandalism	Likelihood: LOW	Severity: MEDIUM-LOW	Acceptable risk without the need to implement any action
Misuse	Likelihood: MEDIUM	Severity: MEDIUM-LOW	Acceptable risk with the implementation of monitoring actions
Lack of maintenance	Likelihood: LOW	Severity: MEDIUM-HIGH	Acceptable risk with the implementation of monitoring actions

4.143

4.138 Damage to the west platform ramp as a consequence of coastal erosion.
4.139 Concrete detachment as a consequence of wave impact .
4.140 Effects of coastal erosion.
4.141 Effects of coastal erosion.
4.142 Flooding and coastal erosion occurrence plan.
4.143 Risk levels for the identified hazard and vulnerability scenarios.
4.144 Wave overtopping during a storm surge .

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5. MANAGEMENT AND CONSERVATION POLICIES

5.1 Introduction
5.2 Overarching policies
5.3 Site policies
5.4 Conservation and management policies

158—229

5. MANAGEMENT AND CONSERVATION POLICIES

5.1 Introduction

Chapter 5 addresses a broad range of strategies, from planning to maintenance, establishing a set of policies to be implemented in the context of this CMP. These policies are framed to: i) respect and reinforce the primacy of Álvaro Siza's design principles in understanding significance and guiding all management and change; ii) retain and respect the Ocean Swimming Pool's setting; iii) ensure adaptations and new uses are compatible with the significant values of the place while preventing uses that could result in its progressive degradation; iv) retain the authenticity, integrity, character, and quality of the building and its various elements, providing guidance for care and conservation of significant elements and fabric; v) retain the integrity of the original structural systems, materials, and finishes, while allowing for necessary upgrading; vi) and draw attention to the need for coordination of planning, continuity of conservation and other expert advice, including implementation of cyclical maintenance.

The chapter is organized under three sections which correspond to the main sets of policies (numbered and highlighted in separate boxes): A) Overarching Policies, B) Site Policies, and C) Conservation and Management Policies. Therefore, section 5.2, Overarching Policies, focuses on the importance of any future intervention being informed by Álvaro Siza's design principles; the clarification of the stakeholders' role in the framework of this CMP for better integration; commitments and contributions for sustainable development as expressed by UN 2030 Agenda; and interpretation, to organize and disseminate knowledge about the Ocean Swimming Pool whilst promoting ways to maintain public engagement with the listed property. Section 5.3, Site Policies, frames the management and conservation of the Ocean Swimming Pool within its territorial, landscape, and spatial planning context, as to define policies and guidelines for the management and safeguarding of the site while considering risk assessment and climate change adaptation. Finally, section 5.4, Conservation and Management Policies, provides guidance for the management of change, conservation, detailed actions of periodic maintenance, and informing operational management and use.

The policy definition is sustained by a variety of sources, such as institutional documents and legislation (national and international), interviews with the Municipal Council departments related to the Ocean Swimming Pool and the site managers, observation, and fieldwork. The ultimate goal of the policies is to retain, conserve and, where possible enhance, the significance of the place. Thus, the following table establishes a direct relationship between the statement of significance and the policy response to sustain it.

STATEMENT OF SIGNIFICANCE	POLICY RESPONSE TO SUSTAIN SIGNIFICANCE
Outstanding work within the context of the revision of the Modern Movement	A.2 Álvaro Siza's design principles
Considered a masterpiece by leading international architecture critics	A.2 Álvaro Siza's design principles
Extensively photographed, filmed, and written about	A.7 Interpretation Plan / A.10 Archives and Collections
Expressing a tectonic shift from regionalist inspired designs towards a more abstract language	A.2 Álvaro Siza's design principles
Material integrity has been maintained	B.5 Risk Management Plan/ C.2 Maintenance Plan
One of the first constructions in exposed concrete in Portugal, employing innovative construction systems	C.2 Maintenance Plan
Reflects a harmonious integration within the topography and surrounding landscape	B.8 Landscape Management Plan
Social and cultural landmark for the community	A.7 Interpretation Plan / A.8 Communication strategy / A.9 Community Engagement
One of the most sought-after attractions in Matosinhos	C.5 Capacity and entrance control
An exceptional case of an architect preserving his own work while enhancing its significance	C.1 Significance and tolerance for change
Is included in the Tentative List for World Heritage Status as a component property of 'Álvaro Siza's Architecture Works in Portugal' and is listed as National Monument	B.2 Cultural Heritage Safeguarding

5.1

5.1 Correspondence between the key heritage values of the statement of significance and policy response to sustain significance.

5.2 Overarching policies

5.2.1 General policies

The definition of general policies is essential to prevent the implementation of ad-hoc or circumstantial decisions that do not take into account the conservation of the place's values and significance. Therefore, not only any future changes or interventions should be preceded by a detailed investigation, as they should be analyzed by an advisory body gathering stakeholders and experts and ensuring respect for Álvaro Siza's design principles identified in section 2.5.2 of this CMP. They are meant to be the primary source of guidance and inspiration for any proposed changes to the place as well as its ongoing management, conservation, and use.

5.2

5.2 Design Principles Álvaro Siza: Ocean Swimmming Pool (1960-2021).
5.3 Stakeholder's interest/influence grid.

A.1	*Advisory body*	Promote the creation of an advisory body, which manages to articulate the different stakeholders to generate mechanisms for reaching consensus and enhancing participation with the interested parties in the implementation and monitoring of the CMP. Álvaro Siza, as a stakeholder, should be part of this advisory body and must be consulted regarding any future interventions on the Ocean Swimming Pool.
A.2	*Álvaro Siza's design principles*	**A.2.1** *Program* - Ensure the site maintains its current use as established by Álvaro Siza in the original design. **A.2.2** *Interventions* - Ensure any intervention in the Ocean Swimming Pool, determined by future needs, follows Álvaro Siza's design principles, defined in section 2.5.2. **A.2.3** *Urban policies* - Consider Álvaro Siza's design principles in the definition of landscape and urban policies regarding the site's surroundings.
A.3	*Investigation and knowledge*	Ensure any intervention in the Ocean Swimming Pool is preceded by a detailed investigation, condition survey, expert analysis, and the consultation of Álvaro Siza. The techniques, methodologies, and materials applied must follow the best international and technical standards.

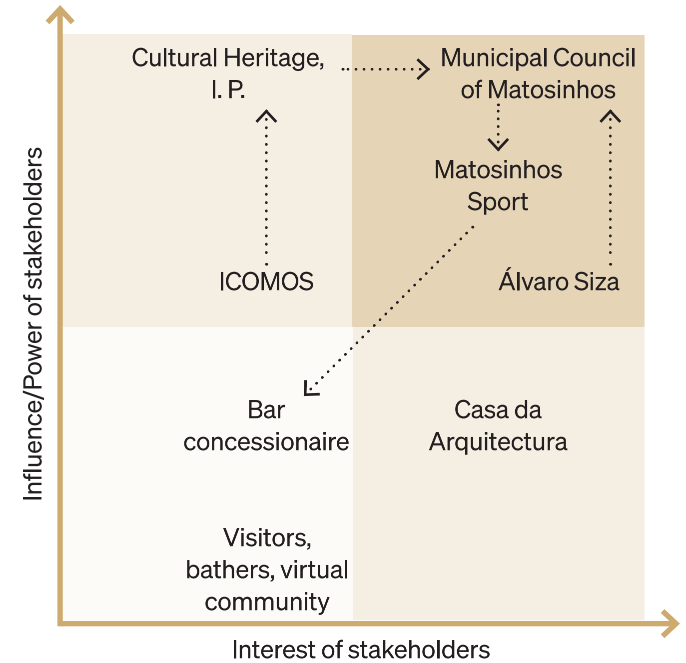
5.2.2 Stakeholders policies

The stakeholders of the Ocean Swimming Pool, identified in section 2.8, range from heritage safeguarding organizations to local management, Álvaro Siza, and the different users.

The objective of this section is to provide a correlation network and an overall agreement of actions and roles for the conservation of the property. The graphic on the right details the interaction between the different stakeholders of the Ocean Swimming Pool, relating them with the power and interest each one has. The black arrows represent the direct links between stakeholders.

The most important stakeholders for the safeguarding of the Ocean Swimming Pool are the ones with the most power and interest. However, it is important to find ways to engage with the stakeholders with less power/interest to enhance involvement and thus achieve more success in preserving and managing the site.

The main lines of direct influence presented in the previous chart, identifying the interaction between the different stakeholders of the Ocean Swimming Pool and relating them with the power and interest each one has, are explained below:



5.3

STAKEHOLDER CATEGORY	STAKEHOLDER	INTEREST IN THE PROJECT	IMPACT (POWER/ INTEREST)	POTENTIAL STRATEGIES FOR GAINING SUPPORT OR REDUCING OBSTACLES
Heritage safeguarding	Cultural Heritage, I. P.	Ensure the management, safeguarding, enhancing and conservation of assets integrating the national cultural heritage, such as the Ocean Swimming Pool; Responsible for the implementation of legislation and listing of cultural heritage; Authorize any intervention on listed properties.	Medium power/ High interest	Encourage to be more present in the decision making and protection regarding the Ocean Swimming Pool; Advocate for more frequent communication with local entities.
	ICOMOS	Enforce the compliance with the World Heritage Convention, in case the Ocean Swimming Pool is included in the World Heritage List; Ensure the conservation status of the site and that interventions follow the most adequate technological, methodological and theoretical conservation approach.	Medium power/ High interest	Encourage to be more present in the decision making and protection of the Ocean Swimming Pool.

Local management	Municipal Council of Matosinhos	Preserve and protect the city's cultural heritage including the Ocean Swimming Pool, by defining the urban and lanscape policies of its surroundings and also assuring its maintenance routines; Benefit from the economic impact of tourism as a result of the national and international recognition of the Ocean Swimming Pool.	High power/ High interest	Advocate for more communication between departments and ensure that no change to the Ocean Swimming Pool can be done without consulting the Cultural Heritage, I. P.; Integrate the Cultural Heritage, I. P. decisions regarding listed properties in the Municipal Master Plan; Develop and implement policies to protect and preserve the Ocean Swimming Pool; Improve the communication strategy of the Ocean Swimming Pool, facilitating access to information such as opening schedules, visits, user regulations, etc.
	Matosinhos Sport	Make profit out of the Ocean Swimming Pool's use; Maintain, repair and replace building elements with minimum disruption and cost; Maintain the daily functioning of the Ocean Swimming Pool and ensure an effective interaction between the staff and suppliers.	High power/ High interest	Advocate and encourage more communication between Matosinhos Sport and the Municipal Council of Matosinhos in order to prevent conflicts and improve results regarding maintenance and conservation interventions.
	Casa da Arquitectura	Disseminate knowledge and educate specialised and general public on Portuguese architecture and notably on the Ocean Swimming Pool; Make profit out of the guided visits conducted on the Ocean Swimming Pool.	High power/ High interest	Increase its role in the dissemination strategy of the Ocean Swimming Pool; Create a cyclical visit program.
	Bar concessionaire	Make profit out of the bar in the Ocean Swimming Pool; Provide the best possible service to the users.	Low power/ Low interest	Extend the opening period beyond the normal functioning schedule of the Ocean Swimming Pool so that visitors can enjoy the place for purposes other than bathing.

Design management	Álvaro Siza	Ensure that the design principles of the Ocean Swimming Pool are respected.	High power/ High interest	Involve the architect in the planning process/decision making from the outset and provide regular updates according to use or security needs.
Users	Bathers	Have a good sports and leisure experience	Low power/ Low interest	Engage in workshops and other educational activities so that less informed users recognize the significance of the site, underlining the importance of following the user regulation inside the premises; Encourage to become part of the onsite virtual community or take action in disseminating the Ocean Swimming Pool significance.
	Visitors	Increase knowledge about the site and obtain a firsthand experience.	Low power/ Low interest	Encourage to become part of the virtual community or take action in disseminating the Ocean Swimming Pool's significance.
	Virtual community	Disseminate knowledge on the Ocean Swimming Pool.	Low power/ Low interest	Keep informed and provide appropriate platforms to consult/share information about the Ocean Swimming Pool.

5.4

On a second level, there are the indirect influence stakeholders that hold some decision power over the site. This is the case of other national regulatory entities linked with environmental management such as the Portuguese Environment Agency (APA) which also holds an important role in the regulation and adaptation to climate change impacts such as sea level rise.

In the scope of this CMP, it is important to consider the Getty Foundation *Keeping It Modern* grant initiative directed at the architectural conservation of 20th-century heritage. Furthermore, non-profit organizations like DOCOMOMO, devoted to the documentation and conservation of buildings, sites, and neighborhoods of the Modern Movement, may play an important role in the safeguarding and dissemination of knowledge about the Ocean Swimming Pool. It is also important to acknowledge the Faculty of Architecture of the University of Porto and other education and research institutions for the dissemination, promotion, and safeguarding of Álvaro Siza's works.

5.4 Potential strategies for gaining stakeholder's support or reducing obstacles.

A.4	*Engagement of stakeholders*	Engage with ICOMOS, DOCOMOMO, and other heritage related organizations, universities, and schools in disseminating and sharing knowledge about the Ocean Swimming Pool.
A.5	*Administrative control*	Ensure the building's management roles and responsibilities are clearly defined, assigned, and understood by all stakeholders. This CMP recommendations should be formally adopted by the Municipal Council of Matosinhos.

5.2.3 Sustainable Development Goals policies

The Sustainable Development Goals (SDGs) are a set of goals created by the United Nations to assess some of the most demanding issues that humanity is facing in the 21st century. There are currently 17 Goals, defined in 2015, based on the UN 2030 Agenda for Sustainable Development (UN, 2015). These are important strategic goals for the countries to take action upon granting world peace and achieving prosperity while tackling important issues like sustainability, equality, education, economic growth, and several others.

The Ocean Swimming Pool CMP seeks to comply with these goals, contributing to a set of measures that will maintain the good practices the property has been applying so far. It is also the utmost intent to adopt new SDGs that will further complement its role in the world's inclusiveness, education, shared knowledge, and sustainability as a recognized cultural heritage.

The CMP is committed to fulfilling the following SDGs:

4 QUALITY EDUCATION

TARGETS

4.7

COMMITMENTS

Promote quality education and learning opportunities.

CONTRIBUTION

Contribute to the education and training of site magers, staff and users regarding sustainability trough awareness and leadership.

6 CLEAR WATER AND SANITATION

TARGETS

6.3

COMMITMENTS

Improve water quality.

CONTRIBUTION

Promote the reduction of pollution, elimination of dumping and minimization of hazardous chemicals and materials release through a more sustainable management of water.

Develop a plan to achieve these goals, save water and assure appropriate monitoring.

8 DECENT WORK AND ECONOMIC GROWTH

TARGETS

8.3, 8.7, 8.9

COMMITMENTS

Promote sustainable tourism and fair and inclusive job opportunities.

CONTRIBUTION

Promote equality in the access to employment.

Promote local investment by using local sustainable products and services.

Foster practices of sustainable tourism by creating norms to protect the environment and the cultural heritage.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

TARGETS

12.2, 12.5, 12.6, 12.4

COMMITMENTS

Efficiently use natural resources and reduce waste.

CONTRIBUTION

Increase resources efficiency by establishing productive measures and keeping record of the performance.

Develop maintenance and practice guides so that the different stakeholders can adopt sustainable measures and follow the same protocol.

13 CLIMATE ACTION

TARGETS

13.1, 13.3

COMMITMENTS

Help reduce its environmental impact on climate change and its capacity to mitigate and adapt to it, safeguarding its heritage.

CONTRIBUTION

Achieve carbon neutrality and reduce energy consumption according to the Portuguese Government *Roadmap for Carbon Neutrality 2050*.

Increase the site's resilience to climate change by following the Coastal Zone Program, the Municipal Strategy for Climate Change Adaptation and Matosinhos Municipal Emergency and Civil Protection Plan.

Develop and antecipate lines of action for emergency response and disaster recovery.

14 LIFE BELOW WATER

TARGETS

14.1, 14.2, 14.3

COMMITMENTS

Manage natural water resources in a responsible manner.

CONTRIBUTION

Promote and safeguard local biodiversity by setting rules and restrictions for the users of the Ocean Swimming Pool and educate about its relevance to the environment.

Prevent any kind of ocean pollution resulting from the pool facilities by monitoring its waste and enforcing due procedures.

17 PARTNERSHIPS FOR THE GOALS

TARGETS

17.6, 17.16, 17.17

COMMITMENTS

Create future and enhance present partnerships.

CONTRIBUTION

Create partnerships with other heritage sites at a national or international level in order to share experiences and knowledge.

Promote a good relationship and transparency between the different public and private entities and stakeholders that manage the site.

Promote meetings, protocols and other forms of contact between the Ocean Swimming Pool and other entities that can better help it accomplish the Sustainable Development Goals.

5.5

5.5 UN Sustainable Development Goals commitments and contributions.

A.6	*Sustainable Development Goals*	Comply with the good practices of the Sustainable Development Goals (SDG – UN 2030 Agenda) contributing to the inclusion, education, knowledge sharing, and sustainability of the world.

5.2.4 Interpretation policies

In order to convey the cultural significance and the heritage values of the Ocean Swimming Pool to the public, policies that foster interaction with visitors and several types of users are a fundamental part of this CMP so that they can establish responsible use and natural care about the place.

As expressed by the *ICOMOS Charter for the Interpretation and Presentation of Cultural Heritage Sites*, 'interpretation' refers to "*the full range of potential activities intended to heighten public awareness and enhance understanding of cultural heritage sites*" (ICOMOS-ICIP, 2008, p. 4). On the Ocean Swimming Pool, it can represent a series of active strategies that provide users with information about the site and keep them actively involved in acquiring more knowledge about its heritage values. It is also expected that interpretation allows people to create new narratives and engage with the place through experience and facilitate cultural significance recognition whilst maintaining public awareness about the conservation strategies proposed in this CMP.

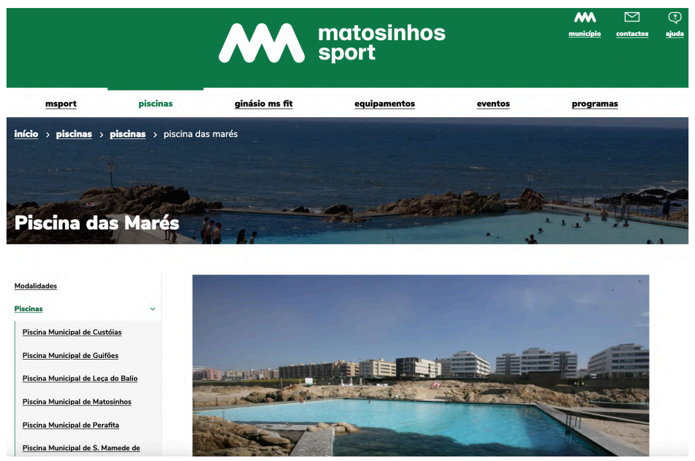
The interpretation of the Ocean Swimming Pool should be made through effective communication by the Municipal Council of Matosinhos, Matosinhos Sport, and Casa da Arquitectura (see section 5.2.2). It would also be important to provide context about the significance of the Ocean Swimming Pool in the framework of buildings designed by Álvaro Siza, including those in the World Heritage Tentative List. This knowledge must be communicated through easy, direct, and concise activities with the public.

Hence, an Interpretation Plan should be based on comprehensive research to identify significant themes and interpretative opportunities that should be adapted according to the different audiences for the interpretative activities, providing a framework for managing visitors. The Plan should be regularly reviewed to incorporate lessons taken from the results of previous activities.

The Interpretation Plan shall include i) Communication, ii) Visits and events, iii) Community engagement, and iv) Archives and collections policies, to be further detailed in this section.

5.6 Vertical information totem placed in front of the access ramp, 2021.
5.7 Matosinhos Sport webpage.
5.8 Online platforms with institutional information on the Ocean Swimming Pool.


5.6



5.7

A.7	*Interpretation Plan*	Develop and implement a comprehensive Interpretation Plan based on a clear understanding of the significance of the place and that establishes how the cultural significance will be communicated through specific programs, visits and activities, engaging the community and its users.

Communication

The complex dynamics behind the site's management, for which the Municipal Council is ultimately responsible, Matosinhos Sport is charged with its operation during the bathing season and Casa da Arquitectura organizes the guided tours, results in the lack of a coordinated communication strategy. Information is, therefore, dispersed by each stakeholder's online pages preventing those interested in visiting from obtaining a comprehensive perspective on opening times, entrance fees, and booking of visits. The site is closed to the public for most of the year, a period in which visits have to be booked at least five days in advance and depend on the inscription of at least five participants to take place, a procedure that excludes the possibility of individual visits. Furthermore, the absence of year-round staff on the premises prevents many visitors who head to the site, unaware of the requirement to book visits in advance, from experiencing its remarkable sequence of spaces or getting to know the history of its design and construction.

The single online platform proposed above should also include this CMP and relevant information and documentation on the Ocean Swimming Pool belonging to other institutions such as the Canadian Centre for Architecture, the Municipal Archive of Matosinhos, and the FAUP Documentation Centre. The objective would be to create a shared knowledge network and make available the different procedures and methodologies adopted for the Ocean Swimming Pool and the conservation and maintenance of other architectural works of Álvaro Siza.

Today, general information on the Ocean Swimming Pool is presented in a vertical totem in front of the access ramp (fig. 5.6). This hinders the interpretation of the site, as it prevents an unobstructed perspective over the spaces and the fluidity of the oriented spatial experience. Hence, interpretation signage with significant size and impact should be avoided. Any sign or textual information should be easy to understand and comply with Álvaro Siza's design principles, without disturbing the views of the site or obstructing circulation spaces. Also, it would be necessary to reflect on the criticalities of displaying information physically because of its impact on the property's perception, while reflecting on how this could be integrated in digital means through specific web apps.

ORGANIZATION	WEBSITE	LANGUAGE	CONTENTS
Municipal Council of Matosinhos	https://www.cm-matosinhos.pt/conhecer/lazer/piscina-das-mares	PT/EN	Description, opening schedule, fees, location and user regulation.
Matosinhos Sport	https://www.matosinhosport.com/gca/?id=440	PT	Opening schedule, fees, location and user regulation.
Leça da Palmeira Parish Board	https://www.leca-palmeira.com/piscinas-de-leca-da-palmeira-horarios-e-precos/	PT	Opening schedule, fees and location.
Casa da Arquitectura	https://casadaarquitectura.pt/pt/visitas-guiadas/itinerarios/piscina-das-mares/	PT/EN	Guided visits schedule, prices and booking contacts .
FAUP (*Keeping It Modern* grant - Getty Foundation)	https://oceanswimmingpool.cargo.site to be migrated to https://sizaoceanswimmingpool.arq.up.pt	EN	Information regarding the history of the Ocean Swimming Pool and all the activities that took place under the *Keeping It Modern* grant.
ISCTE-IUL/ FAUP	https://istar.iscte-iul.pt/sizaatlas/	EN	Inventory of Álvaro Siza's built works and documentation of the works in the World Heritage Tentative List.

5.8

A.8	*Communication strategy*	**A.8.1** *Online platform* - Create a single online platform easily accessible by the general public that gathers all relevant information regarding the Ocean Swimming Pool, such as opening schedules, entrance fees, user regulations, or information on the site's history and significance. **A.8.2** *Shared knowledge network* - Establish a shared knowledge network with those responsible for the management of other Álvaro Siza's works, creating an integrated dissemination and safeguarding strategy.

Visits and events

An Interpretation Plan should be developed involving all the interested parties, namely the stakeholders responsible for the Ocean Swimming Pool operation. The significant values of the asset should be made accessible and communicated to all who use and visit the place, as well as those who access it by other means. The most important active interpretation of the site is through its ongoing use as a public swimming pool. As long as this activity continues, then arguably the most significant aspects of the place are being interpreted. Guided visits are other interpretation initiatives that should be promoted as they are very effective in engaging the physical, emotional, and intellectual capacities of the visitor, revealing qualities and stories about a place which would not otherwise be evident. Thus, the training of guides and the definition of the visits' contents are of uttermost importance. They should engage the visitor with Álvaro Siza's design principles and the site's cultural significance. The creation of a web app with an audio guide or tour proposal could be considered as an alternative for individual visits.

The possibility of occasionally hosting events such as concerts or exhibitions should be explored as a means for broadening general public contact with the Ocean Swimming Pool. However, the site's high exposure to the marine environment creates some weather-related unpredictability so this calendar of recreational activities must be flexible and with low impact. Also, surveys to users and visitors have demonstrated an interest in having the bar open beyond the bathing season and the possibility of buying tickets directly on the premises.

Community engagement

'Community engagement' is understood as a process of creating opportunities for knowledge sharing and collaboration of stakeholders with low power to propose guidelines for the preservation of the Ocean Swimming Pool. As previously presented (see section 5.2.2), they are the visitors, the users, and the bathers. Policies in this category should address ways to combine official and scientific interpretation and communication strategies to the emergence of affective memories and new narratives of cultural significance.

Casa da Arquitectura performs visits for visually impaired people, as well as several workshops with children. Children are important as the future guardians of the Ocean Swimming Pool. Since they are amongst the bathers and visitors, especially in the holiday season, a proposal for learning programs should be carried out, making children aware of heritage values through games and playful activities. This will bring them closer to the work of Álvaro Siza and engagement can be achieved through stimulation, curiosity, and motivation by provoking the creation of affectionate memories with the support of architecture and art.

5.9

5.10

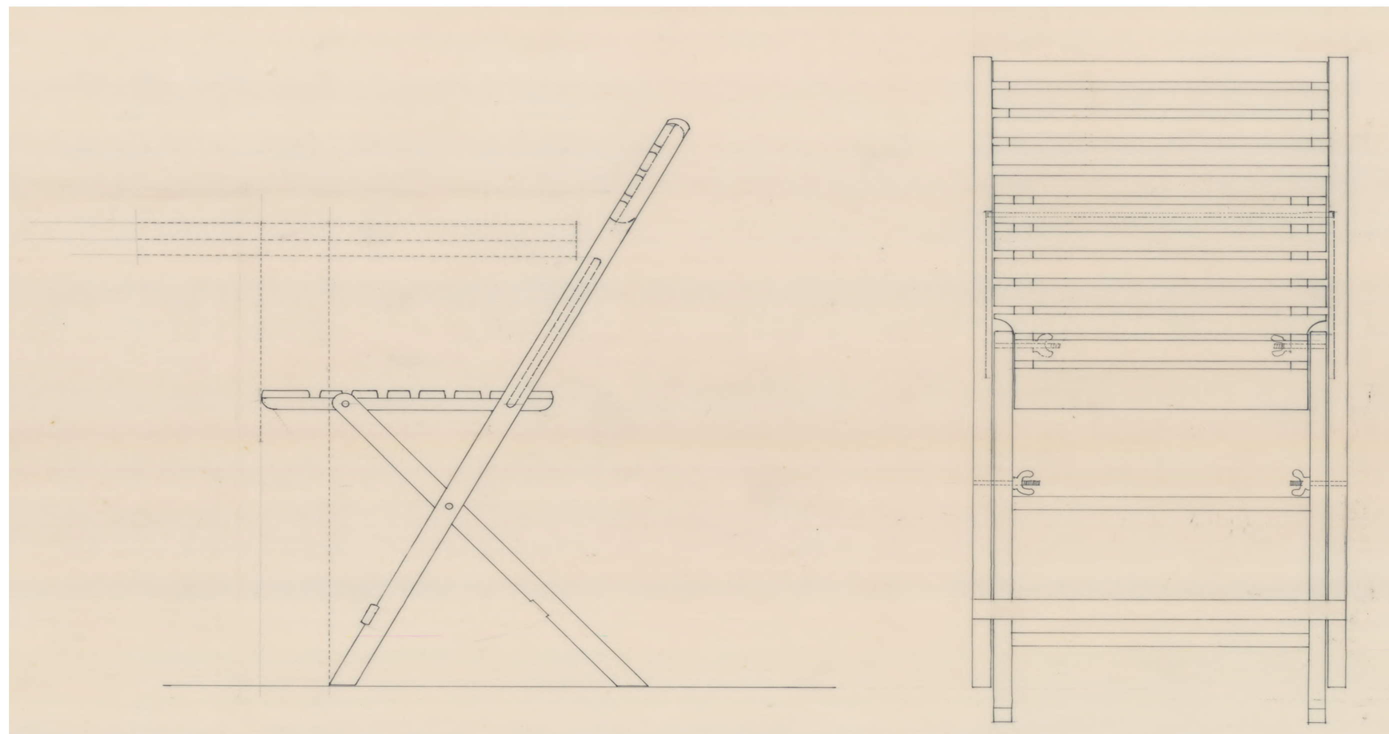
A.9	*Community engagement*	**A.9.1** *Learning programs* - Develop learning programs for schools and families, composed of didactic activities for children, related to the Ocean Swimming Pool. **A.9.2** *Broadening access* - Promote specific visits and knowledge dissemination activities aimed at visitors with additional access needs, such as deaf and visually impaired audiences, promoting inclusiveness and broadening access to the site.

Archives and collections

In 2014, Álvaro Siza donated his archives to three internationally renowned institutions: the Canadian Centre for Architecture (CCA) in Montreal, Canada, the Gulbenkian Foundation in Lisbon, and the Serralves Foundation in Porto, Portugal. Even though the bulk of the documentation regarding the Ocean Swimming Pool is held in Montreal by the Canadian Centre for Architecture, further documentation is held by the Municipal Archive of Matosinhos, the Faculty of Architecture of the University of Porto and in the personal archives of both Álvaro Siza and some photographers that registered the site before and during the time of its construction. Therefore, all the documental evidence related to the Ocean Swimming Pool which is dispersed throughout different institutions should be cataloged and digitized, creating a comprehensive database available for consultation of interested parties from all over the world.

This inventory should be extended to significant furniture pieces and fittings specifically designed by Álvaro Siza for the property to retain and protect their significance into the future, even if they are still in use. Also, the existing operations manual should be reviewed against international best practice to identify gaps and improvements in housekeeping, namely weekly monitoring as part of regular maintenance actions.

5.9 Guided visit during Porto Open House, 2021.
5.10 Guided visit during Porto Open House, 2021.
5.11 Terrace chair detail, 1973.



5.11

A.10	*Archives and collections*	**A.10.1** *Archives* - Gather, catalog, and digitize all documentation related to the Ocean Swimming Pool that is dispersed throughout different institutions, creating a comprehensive digital database available for consultation of interested parties from all over the world. **A.10.2** *Collections* - Create an inventory of all the furniture and objects specifically designed by Álvaro Siza for the property with information on their location and condition to assure their future preservation and exhaustive documentation.

5.3 Site policies
5.3.1 Planning policies

The site policies' definition of this CMP was supported by international and national guidelines and legislation that define the site's management with regard to its spatial planning, as well as risk assessment and climate change adaptation (fig. 5.12).

The Portuguese Spatial Planning System is organized into three hierarchical levels: national, regional, and local. National and regional programs are the responsibility of the Government (in collaboration with regional and local authorities), being mainly strategic and framework providers for other plans. At the local level, the municipal planning tools are organized hierarchically: Municipal Master Plans, Urban Plans, and Detailed Plans. Under the responsibility of Municipal Councils, those instruments are primarily regulatory and land-use based.

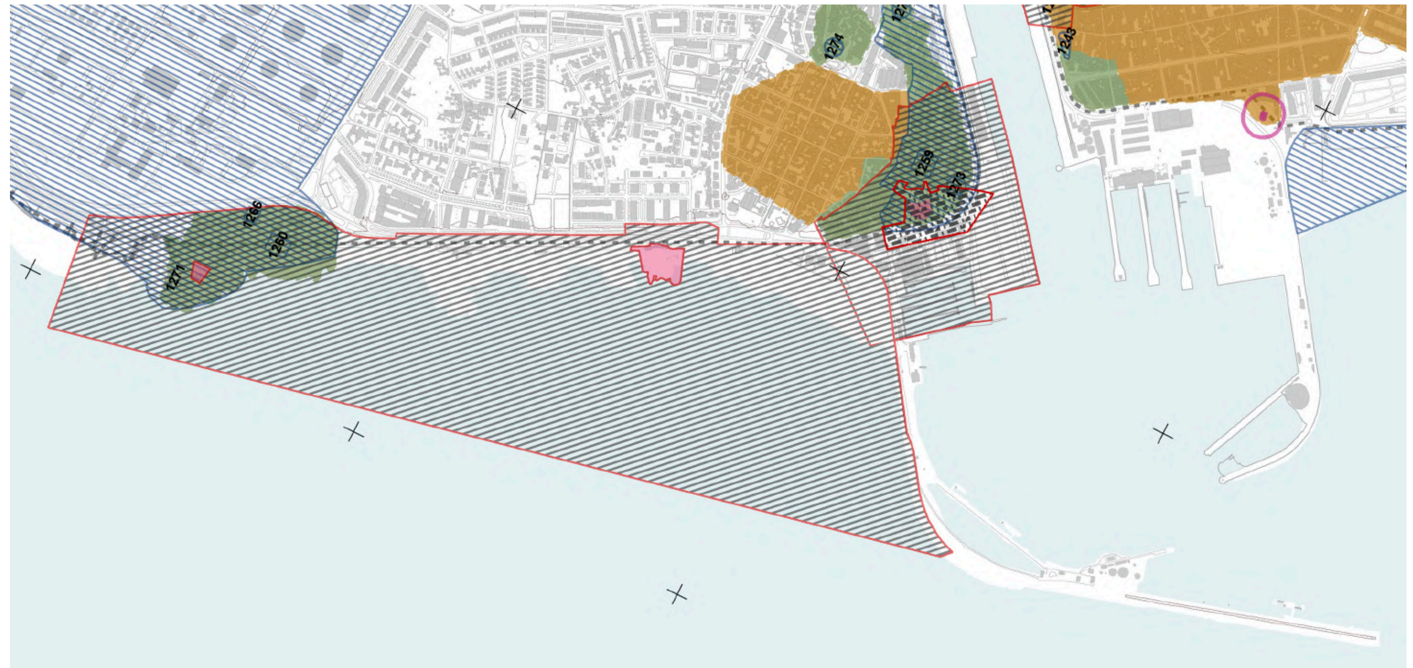
The Municipal Master Plan, mandatory for the 308 Portuguese municipalities, defines the strategy and rules to manage rights and duties over land and resources. This plan also incorporates other 'tools', fundamental to support the management of susceptible resources, such as heritage (Heritage Map), and environmental ones (Legal Regime of the National Ecological Reserve). Those guidelines and rules are the boundaries for other municipal planning tools, such as the operative and physical related design, such as the Urban Plans and Detailed Plans.

SCOPE	SPHERE OF ACTION	PLANNING INSTRUMENTS	DATE
International level	Climate change	Draft updated Policy Document on the impacts of climate change on World Heritage properties (WHC, 2021)	2021
		The Future of Our Pasts: Engaging Cultural Heritage in Climate Action (ICOMOS, 2019)	2019
		Paris Agreement (UNFCC, 2015)	2015
	Sustainable Development	Transforming our world: the 2030 Agenda for Sustainable Development (UN, 2015)	2015
	Risk assessment	Sendai Framework for Disaster Risk Reduction 2015-2030 (UNDRR, 2015)	2015
		Managing Disaster Risks for World Heritage (WHC, 2010)	2010
		Directive on the assessment and management of flood risks (Directive 2007/60/EC, 2007)	2007
	Climate change	Policy Document on the Impacts of Climate Change on World Heritage Properties (WHC, 2006a)	2006
		Climate Change and World Heritage. Report on predicting and managing the impacts of climate change on World Heritage (WHC, 2006b)	2006
National and regional level	Sea level rise/ Climate change	Caminha-Espinho Coastal Zone Program (Resolution of the Council of Ministers No. 111/2021, 2021)	2021
	Climate change	Roadmap for Carbon Neutrality 2050 (Resolution of the Council of Ministers No. 107/2019, 2019)	2019
	Environment	Legal Regime of the National Ecological Reserve (Decree-Law No. 166/2008, 2008)	2008
	Heritage	Law for Cultural Heritage (Law No. 107/2001, 2001)	2001
	Planning	Legal Framework of the Ports of Douro and Leixões Administration (Decree--Law No. 308/87, 1987)	1987
Municipal level	Planning	Municipal Master Plan (Notice No. 13198/2019, 2019)	2019
	Climate change	Municipal Strategy for Climate Change Adaptation (CMM, 2019)	2019
	Disaster response	Matosinhos Municipal Emergency and Civil Protection Plan (CMM, 2011)	2011

5.12

Heritage Safeguarding

The Heritage Safeguarding Map aims to protect heritage by inventorying and mapping its architectural and archaeological sites (including their Buffer Zones), defining specific rules for those protected areas in the context of the Municipal Master Plan. This mapping process targets every work of architectural, artistic, ethnographic, technical, or social interest that was selected to be protected. The Ocean Swimming Pool is listed as National Monument, being thus identified as a Listed Property, protected by a Special Buffer Zone which includes the Boa Nova Tea House and Restaurant, designed by Álvaro Siza and also listed as National Monument.



Listed Property   Special Buffer Zone

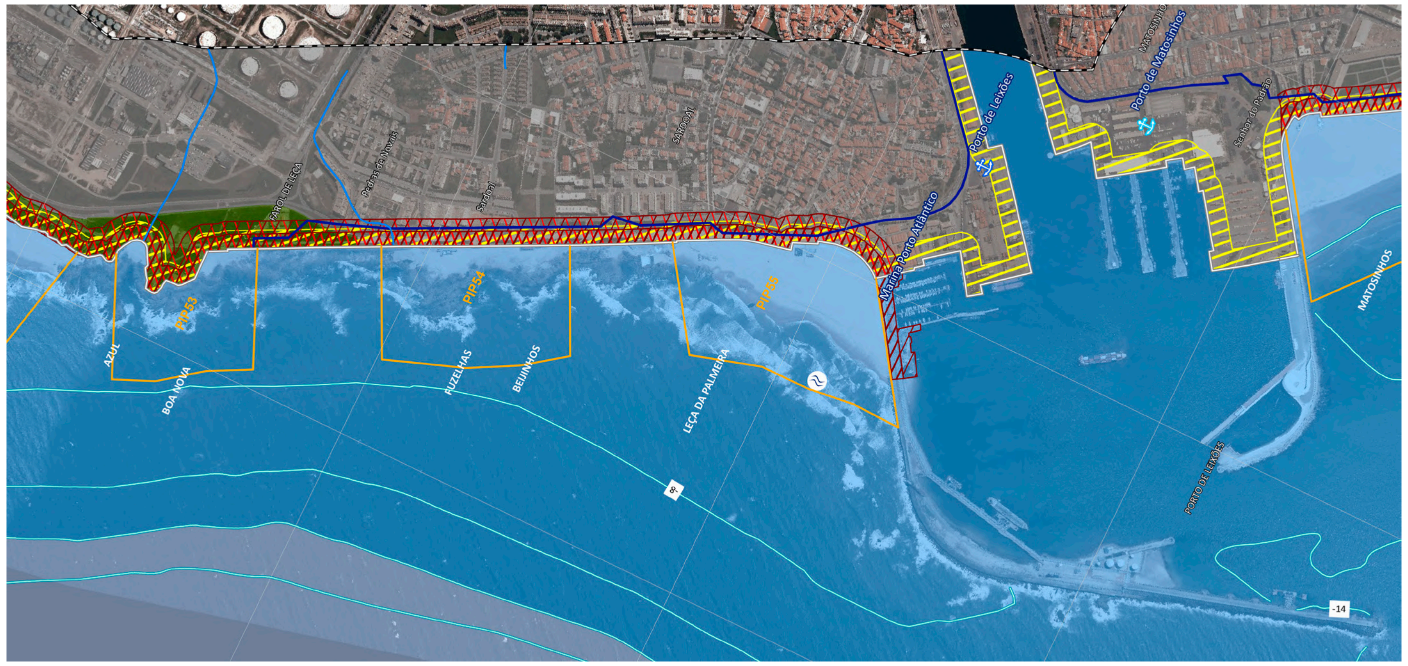
5.13

5.12 International, national, regional and municipal level planning instruments.
5.13 Municipal Master Plan heritage safeguarding plan.

B.1	*Spatial Planning*	The Ocean Swimming Pool's management and conservation must comply with the legal instruments that regulate spatial planning, such as the Municipal Master Plan and others at the national, regional, and local levels.
B.2	*Cultural Heritage Safeguarding*	Comply with the Law for Cultural Heritage (Law No. 107/ 2001), which forbids any interventions, inside or outside listed properties or any change of use likely to affect it, without prior consent from the cultural heritage administration. A detailed safeguarding plan for the area must be established, defining: occupation and priority uses; the conservation works to be implemented; the intervention criteria in the built and natural elements; the inventory of all the integral parts of the set; the strategic lines of intervention, in the economic, social, urban and landscape renewal contexts.
B.3	*Buffer Zone preservation*	Respect the restrictions posed by the Buffer Zone, defined by Ordinance No. 608/2012, to ensure the preservation of views and the integration of the property into the landscape. The Buffer Zone ensures the landscape and visual integration of a given property including the surrounding areas that are relevant to the context. Licenses for construction works or any work that alters the topography, alignments, heights, and the distribution of volumes and roofs or the exterior finishes of buildings cannot be granted without prior assent from the cultural heritage administration.

Coastal protection

The Ocean Swimming Pool is conditioned by the restructured *Caminha-Espinho Coastal Zone Program* (POC-CE), as it is positioned between the Maritime Protection Zone (more specifically the Coastal Protection Strip that aims to safeguard natural resources) and the Land Protection Zone (more specifically the Seashore that aims to safeguard and manage the water domain). Subsequently, the Ocean Swimming Pool is also set in the Coastal Erosion Safeguard Strip (Level 1) and the Coastal Flood and Overflow Safeguard Strip (Level 1) which aim to safeguard the coastal risks, for the time scenario of 2050 (which corresponds to level 1).



Coastal Protection Strip　Seashore　Port Jurisdiction Limit　POC-CE Intervention Area Limit
Coastal Erosion Safeguarding Strip (Level 1)　Coastal Flood and Overflow Safeguarding Strip (Level 1)

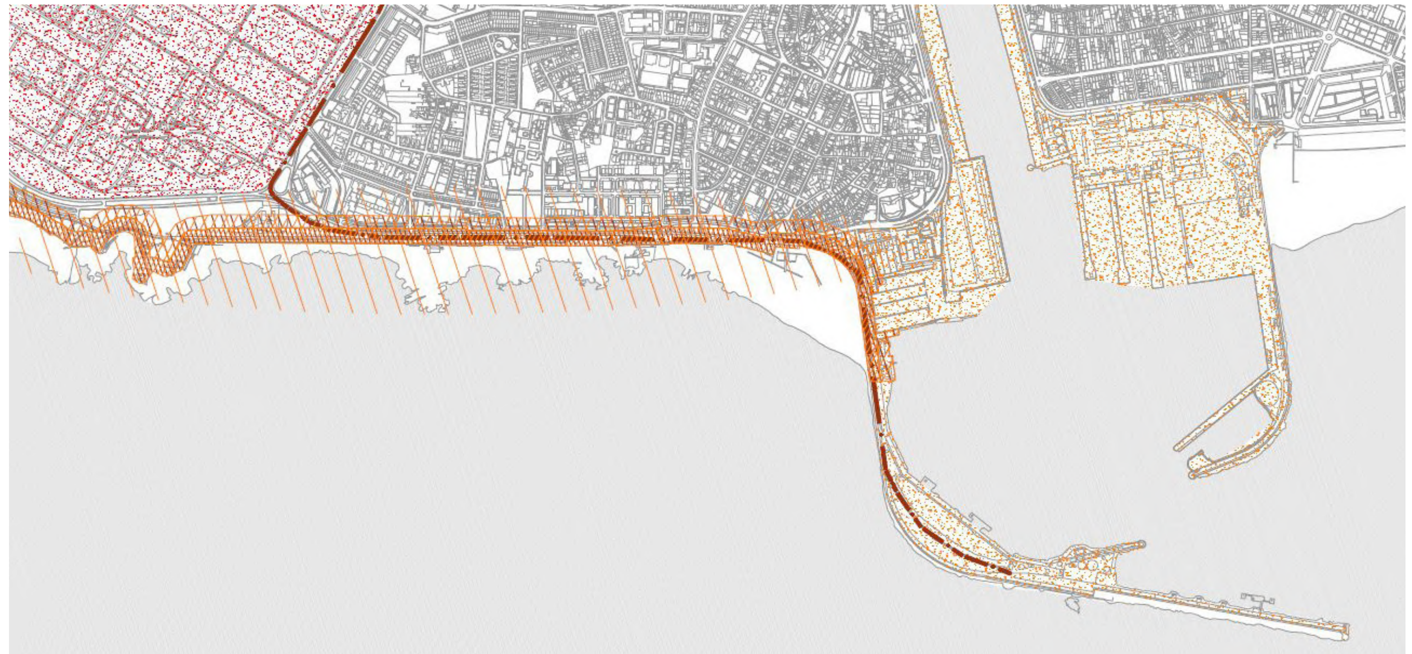
5.14

B.4	*Coastal protection regulation*	Comply with the Caminha-Espinho Coastal Zone Program, which determines that new constructions, soil sealing actions, changes to the coastline, and activities that result in the direct destruction of relevant marine ecosystems or rock outcrops are forbidden along the Coastal Protection Strip in which the property is set.

5.3.2 Risk assessment and climate change adaptation

The set of policies outlined for risk assessment and climate change adaptation are supported by a broad number of international, national, and municipal plans and legislation outlined in section 5.3.1. According to information from the Municipal Master Plan and the Civil Protection Department, risks are classified into two main levels, according to the severity degree, and likelihood of occurrence: extreme risk and high risk. They are further classified according to their origin, be it technological (resulting from human activity) or natural.

The identified extreme risks from natural origin are Coastal Erosion (Level 1) and Oceanic Overflow and Coastal Flooding (Level 1). Identified as high risks are accidents in the oil refinery, in loading and unloading of hazardous substances from ships in the port of Leixões or the transport of dangerous substances through pipelines, among those of technological origin, and the occurrence of extreme weather phenomena along the coast, such as storm surges, as the most significant risk of natural origin.



Coastal Erosion (Level 1)　Coastal Flood and Overflow (Level 1)　Storm surges
Port of Leixões　Oil Refinery　Pipelines

5.15

5.14 Coastal Zone Program plan.
5.15 Risk map (adapted from the Municipal Master Plan and information provided by the Civil Protection Department).

Climate change is a global challenge for the present and future generations that has become one of the biggest threats to humankind and built heritage. It is crucial to acknowledge and understand the impacts that natural and anthropic hazards have on the Ocean Swimming Pool, in particular those whose effects are intensified by climate change, to ensure that they are prevented, mitigated, or, when that is not possible, that adaptation measures are implemented. In chapter 4 (section 4.4) these hazards were already identified, alongside scenarios and vulnerabilities ranked according to their likelihood and severity to assess their risk level. It is essential to adapt to the present and future impacts they will have on the property and to assure preparedness when such events occur through a flexible plan that considers multiple scenarios and an emergency/post-disaster plan that would rapidly and efficiently restore the situation back to normal.

5.16 Ocean Swimming Pool during a storm surge (folowing page).

B.5	*Risk Management Plan*	**B.5.1** *Risk management* - Develop and implement a Risk Management Plan which includes regular risk assessments, the development of mitigation measures, and emergency preparedness measures. **B.5.2** *Disaster recovery* - Develop and anticipate lines of action for emergency response and disaster recovery.
B.6	*Green procurement*	**B.6.1** *Environmental analysis* - Conduct an environmental analysis of the Ocean Swimming Pool's regular functioning to identify energy-saving opportunities. **B.6.2** *Green procurement* - Adopt green procurement (energy, waste, and water) and carbon offsetting strategies, emphasizing green products, services, and business models.
B.7	*Climate change adaptation*	**B.7.1** *Adaptation measures* - Compile a set of measures, or actions (as a study case), for implementation in other cases with similar constraints, to help other listed sites to adapt to climate change. Similarly, the knowledge obtained from this case study should also suggest additional measures or guidelines for local and regional policies. **B.7.2** *Permanent flooding* - Study future lines of action for building conservation in case of permanent damage or flooding that makes the normal use of the built structures and infrastructures impossible (be it relocation, the construction of more permanent protection measures like walls or spurs, etc.). **B.7.3** *Staff training* - Train staff/stakeholders and inform users on more efficient management strategies, and promote the use of sustainable practices while working, using, or managing the place. It would be beneficial to the implementation of these strategies if there were participatory activities, presentations, or workshops to raise public awareness of appropriate mitigation measures. **B.7.4** *Archival information* - Organise an archive containing exhaustive information on the Ocean Swimming Pool (3D and 2D mapping, visual information, etc.) to assure its proper reconstruction and future preservation in case of damage or material loss.

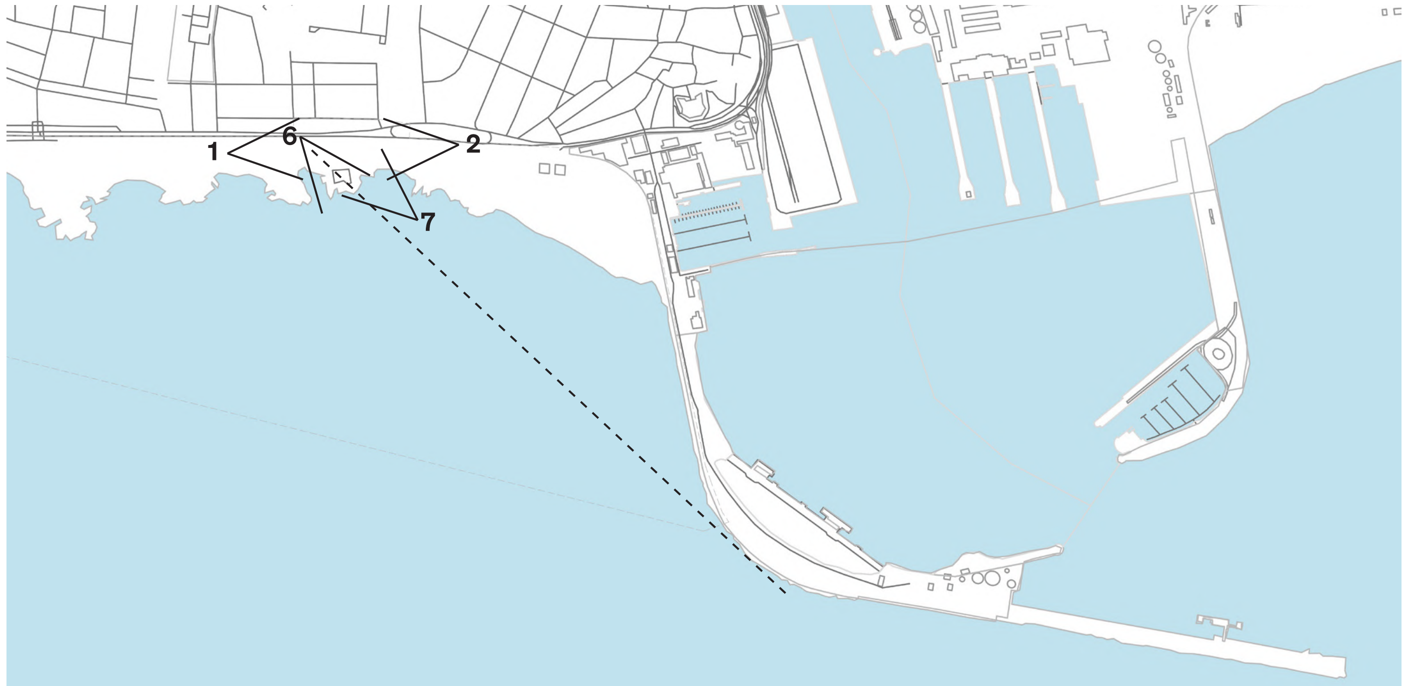
5.3.3 Landscape policies

The Ocean Swimming Pool landscape integration is a crucial element to its cultural significance, as it was one of the main concerns of the original design and must, therefore, be preserved. Being listed as National Monument, its Buffer Zone contributes to the protection of the visual integrity between the property and its surrounding context.

However, this landscape integration is exposed to several vulnerabilities. Real estate pressure led to a significant increase in constructions along the seafront, which created a negative impact, since they are visible from the site, compromising the radical horizontality of the setting that was fundamental for Siza's original design principles.

The beaches play a crucial part in the composition of the views, so they can have a negative visual impact if not well maintained. This includes the removal of accumulated waste as a result of human activities or transported by the tides.

Finally, the absence of a Landscape Management Plan makes it more difficult to enforce a coherent approach toward the protection of the site's visual relationships, namely the visual alignment that the terrace wall establishes with the port's mole.



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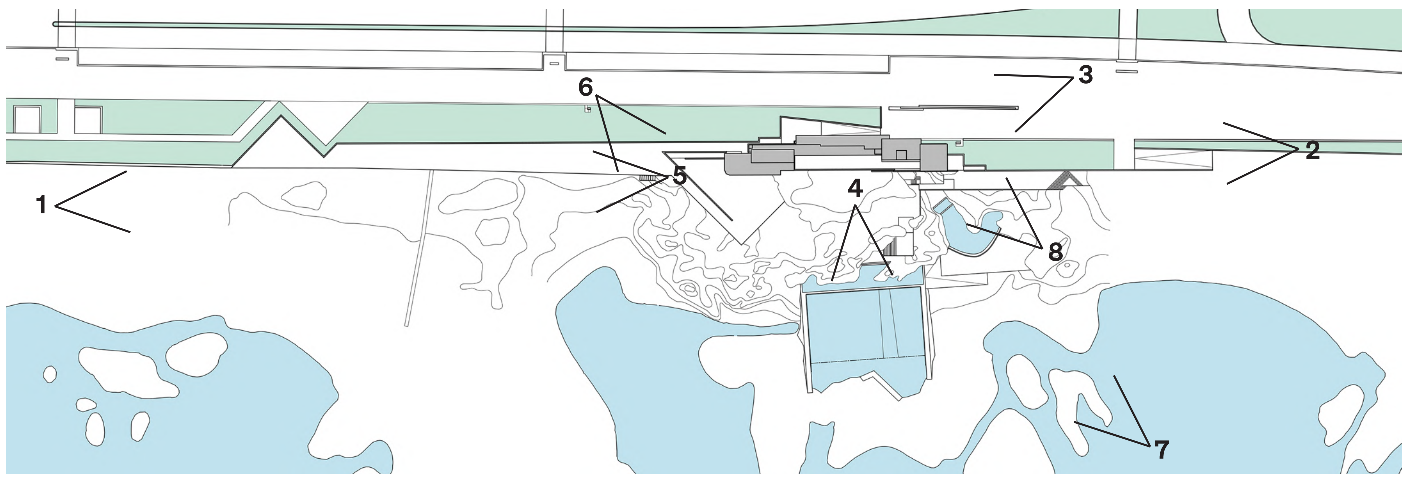

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5.17 Location of the image captions.
5.18 Location of the image captions.

5.19 Visual continuity towards the south and the Port of Leixões (View 1), 2021.
5.20 Visual continuity towards the north and the Boa Tea House (View 2), 2021.

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5.21 Uninterrupted views towards the sea from the avenue (View 3), 2021.
5.22 Integration of the adults swimming pool (View 4), 2021.
5.23 Warning sign by the adults swimming pool disturbing visual relationships, 2021.

5.24 Visual continuity towards the north and the Boa Tea House (View 5), 2021.
5.25 Visual alignment (dashed line) that the 45º terrace wall establishes with the port's mole (View 6), 2021.

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5.26 Relation between the site and the street, where it is evident the real estate pressure created by the taller buildings (View 7), 2021.
5.27 View from the south beach, where the marginal avenue's taller buildings break the idea of a horizontal wall that separates de viewer from the stree (View 8), 2021.
5.28 Terrace furniture, 2021.
5.29 Intrusive placement of furniture along the north platform, 2021.

B.8	*Landscape Management Plan*	**B.8.1** *Landscape integration* - Develop and implement a Landscape Management Plan that ensures the preservation of the site's surrounding context characteristics, essential for the building's significance. Any intervention in the site or inside its Buffer Zone must be submitted to the Cultural Heritage, I. P. to ensure the close relationship between the property and the surrounding landscape is retained. **B.8.2** *Urban planning* - Enforce urban planning restrictions on building height by the seaside avenue, preventing further visual impacts over the site's immediate context. **B.8.3** *Visual relations* - Ensure the prohibition of any intervention or structure that obstructs the visual relations between the Ocean Swimming Pool and its surroundings. **B.8.4** *Landscaping* - Implement a landscaping plan for the gardens on the building's roof, with regular maintenance cutting and pruning of the vegetation to avoid obstructing the view from the avenue. **B.8.5** *Beach cleaning* - Implement a cleaning routine of the beach and rock outcrops to avoid the accumulation of waste on the site. **B.8.6** *Placement of furniture* - Limit the presence of furniture such as chairs and tables to the bar terrace. Parasols for the use of bathers must be requested to the bar concessionaire and abide by uniform design features. The bar concessionaire should restrain from placing equipment (such as ice cream freezers) on the exterior. **B.8.7** *Placement of signage* - Control the placement of signage (such as security warnings) and other elements in the building, swimming pools, or rocks to prevent the disturbance of the visual relation with the landscape and the sea.

5.4 Conservation and maintenance policies

5.4.1 Tolerance for change

This section aims at identifying the tolerance for change levels of the most significant spaces and components of the Ocean Swimming Pool. It should serve as a tool for managing change while retaining and eventually enhancing the site's cultural significance. Future changes or conservation interventions must not interfere with the components and functions of higher significance, hence the importance of clearly establishing each space's tolerance for change to inform management decisions and the conservation methodologies adopted in future interventions.

SPACE	**TOLERANCE FOR CHANGE**				**CONSIDERATIONS**
Changing rooms significance ranking: A Built between 1962 and 1965, the changing rooms, with their dark and involving atmosphere, are an essential part of the oriented spatial experience, mediating the transition between the street level and the interior of the bathing complex.	1 = Low tolerance 2 = Moderate tolerance 3 = High tolerance				Any intervention in this space must be of conservation as its configuration and material are most important. The Baltic pine roof structure with dark stain and its copper cladding, the exposed concrete walls with horizontal formwork finish, the Baltic pine partition walls, doors and joinery with dark stain, original brass fittings and the white concrete slabs must be retained unaltered.
SELECTED COMPONENTS	FORM	FABRIC	FUNCTION	LOCATION	
Copper cladding	1	1	1	1	Configuration and material are most important. Retain unaltered.
Baltic pine roof structure with dark stain	1	1	1	1	Configuration and material are most important. Retain unaltered.
Exposed concrete walls with horizontal formwork finish	1	1	1	1	Configuration and material are most important. Retain unaltered.
Baltic pine partition walls with dark stain	1	1	1	1	Configuration and material are most important. Retain unaltered.
White concrete slabs	1	1	1	1	Configuration and material are most important. Retain unaltered.
Baltic pine doors, frames and joinery with dark stain	1	1	1	1	Configuration and material are most important. Retain unaltered.
Copper and brass fittings	2	1	1	2	Configuration and material are most important. There is, nevertheless, some tolerance for change in form or location to respond to future needs.
Ceramic wash basins and foot washes	2	2	1	2	The original foot washes should be kept. Even if there is some tolerance for change in form or location to respond to future needs, the replacement of any component should take into account the overall coherence and opt for similar models.
Exposed water network in copper tubes	2	1	1	2	Configuration and material are most important. There is, nevertheless, some tolerance for change in form or location to respond to future needs.
Exposed electrical network in copper tubes	2	1	1	2	Despite being a result of the recent conservation works (2018-2021), the exposed copper tubes were carefully integrated in the architectural design and follow Álvaro Siza's design principles for the set. Even if there is some tolerance for change in form or location to respond to future needs, the visibility of new elements should be minimized.

5.30

The methodology of this section is aligned with the tolerance for change framework at heritage places (Burke, 2017) and supported by the analysis and evaluation of different sources, with a special focus on interviews with site managers and visual inspection, as well as archival and documental research. This process allowed a better understanding of the characteristics of the original construction and the interventions the property suffered over time. Having the most significant spaces of the building identified, the four steps for managing tolerance for change listed below were applied to each of them:

i) Establish the level of significance of each space. This process is supported by the assessment of significance carried out in chapter 3, in which four levels were identified: exceptional, high, moderate, and some significance;

ii) Identify the components of each space that contribute to the cultural significance of the place;

iii) Evaluate the tolerance for change of each component, according to its form, fabric, function, and location, on a scale of three levels: low, moderate, and high;

iv) Define operating guidelines to manage future conservation interventions to minimize negative impacts and keep the site's values intact, considering opportunities for change that support or enhance its cultural significance.

The identification of the tolerance for change of each space was implemented through tables in which every component was discriminated and evaluated individually (fig. 5.30). For a more clear presentation, the results of this work were converted into synthesis tables (presented in Appendix E) in which according to the overall evaluation of its components, a single level of tolerance for change is attributed to each space, followed by a brief description of the characteristics of the space, the conservation works it underwent and considerations regarding future interventions and opportunities for change (fig. 5.31). Lastly, a summary of the results is presented in figure 5.32.

Space	Changing rooms (2)
Level of significance	Exceptional significance
Tolerance for change	Low tolerance
Description	Built between 1962 and 1965, the changing rooms, with their dark and involving atmosphere, are an essential part of the oriented spatial experience, mediating the transition between the street level and the interior of the bathing complex. During the last conservation works all the wooden elements were cleaned and varnished. Additionally, the electrical wiring was placed inside exposed copper tubes, carefully integrated in the architectural design and in accordance to Álvaro Siza's design principles.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. The i) Baltic pine roof structure with dark stain and its copper cladding, ii) the exposed concrete walls with horizontal formwork finish, iii) the Baltic pine partition walls, iv) doors and joinery with dark stain, v) original brass fittings and vi) the white concrete slabs must be retained unaltered. There is some tolerance for change in form or location of the vii) ceramic wash basins and foot washes to respond to future needs. The replacement of any component should take into account the overall coherence and opt for similar models. There is some tolerance for change in form or location of viii) the exposed water and ix) electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.

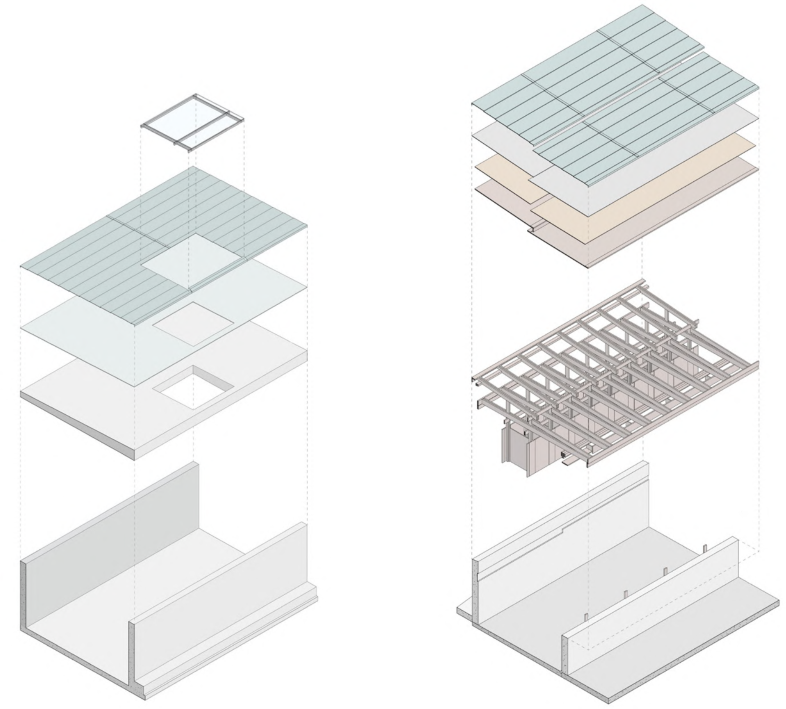
5.31

SPACES	LEVEL OF SIGNIFICANCE[1]	TOLERANCE FOR CHANGE[2]			
		FORM	FABRIC	FUNCTION	LOCATION
Entrance ramp and changing rooms hallway (1) (3)	A	1	1	1	1
Changing rooms (2)	A	1	1	1	1
Collective changing room (21)	C	1	2	2	1
Cloakroom (15)	B	1	1	2	1
Water treatment room and chlorine cabinet (18) (20)	C	1	1	1	1
South bathrooms (13)	B	1	2	1	1
Security room (22)	C	2	2	3	1
Water collection room (19)	D	3	3	1	1
South storage rooms (24) (25)	C	2	2	3	1
South platform (10)	B	1	1	1	1
Beach and access paths (8) (4)	A	1	1	1	1
Swimming pools and foot washes (6) (7) (5)	A	1	1	1	1
West platform (11)	B	1	1	1	1
Bar and terrace (16) (9)	B	1	1	1	1
Kitchen (17)	C	1	2	2	1
North platform (12)	B	1	1	1	1
North bathrooms (14)	C	2	2	2	1
Employee's changing rooms and bathrooms (23)	D	3	2	3	1
North storage room and waste management room (26) (27)	D	3	2	3	1

[1]Level of Significance: A) Exceptional B) High C) Moderate D) Some [2]Level of Tolerance for Change: 1) Low 2) Moderate 3) High

5.32

5.30 Tolerance for change definition for the components of each space (example).
5.31 Tolerance for change definition for each space, including brief description and oportunities for change (example, see Appendix E).
5.32 Summary of the tolerance for change definition.
5.33 Building elements and components (water treatment room and changing rooms).



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C.1	*Significance and tolerance for change*	All elements of the Ocean Swimming Pool are to be maintained, used and managed in accordance with their relative level of significance, defined in Chapter 3 and the identified tolerance for change for their component parts. The following general policy statements have been formulated to guide changes at the place and are supplemented by more detailed conservation guidelines and guidance for change on each component in Appendix E. The levels of significance refer to section 3.7 and are to be considered as part of this policy. A) Exceptional significance: Alteration of elements considered of exceptional significance is not permitted unless otherwise mentioned in the Tolerance for Change tables. Maintenance, conservation and repair interventions are permitted to ensure their ongoing function and to retain significance. It is essential that the original design intent of the element is retained and respected. B) High significance: Alteration of elements considered of high significance is permissible only when this is necessary in order to retain or strengthen an element considered of exceptional significance or unless otherwise mentioned in the Tolerance for Change tables. It is essential that the original design intent of the element is retained and respected. C) Moderate significance: Alteration of elements considered of moderate significance is permissible in order to retain or strengthen those of higher significance, unless otherwise mentioned in the Tolerance for Change tables. It is essential that their role in supporting elements and functions of higher significance is retained. D) Some significance: Elements considered of some significance may be altered, unless otherwise mentioned in the Tolerance for Change tables. It is essential that their role in supporting elements and functions of higher significance is retained.

5.4.2 Detailed conservation and maintenance policies

This section aims at providing non-exhaustive guidance for the conservation and maintenance of the Ocean Swimming Pool. In order to approach all the constructive elements of the building in detail, this section is subdivided into sub-sections dedicated to the different elements and their components: Roofs (copper cladding/ wooden structure/ concrete slabs); Walls (cyclopean concrete retaining walls/ lightly reinforced concrete walls/ wooden partition walls); Pavements (white concrete slabs/ cement plaster pavements); Frames and hardware (wooden frames/ metal frames); Furniture and Fittings; Tanks; and Installations (plumbing/ electrical wiring).

The identification of 'Maintenance Source Elements' (Abrantes, 1994; Calejo, 2006) and their respective components is an essential parameter to enable an adequate recognition and framework of the functional and constructive characteristics of the building and the definition of the Maintenance Plan. Each 'Maintenance Source Element' corresponds to a building system, with its own conditions and mechanisms, which allows to optimize the assigned service performance levels and thus outlining maintenance policies and strategies.

Maintenance actions allow to obtain information based on management assumptions and resource optimization necessary for the implementation and execution of the various procedures of maintenance strategies. The set of actions to which a preventive maintenance strategy corresponds (inspection, cleaning, proaction) is characterized by acting before pre-pathology phenomena, and, therefore, seeking to obtain more satisfactory results.

The Maintenance Plan (IPQ, 2007) is a part of great importance in the CMP, as it describes the set of specifications that aim to foresee and plan the various maintenance actions, defining the various tasks to be performed for: i) inspection, ii) cleaning, iii) proaction and iv) repair. The latter includes replacement and correction actions aiming at restoring the initial conditions foreseen in the design.

i) Inspection actions render it possible to obtain behavior indicators of the various elements of the building, which enhance the recognition of pre-pathology phenomena.

ii) Cleaning actions allow for an improvement in performance equal to that initially foreseen and can range from housekeeping procedures that ensure the element/component remains clean, to a technical cleaning seeking to implement a set of actions to improve the element's performance carried out by a specialized technician.

iii) Proaction makes it possible to obtain functioning indicators of the various elements and guarantee their correct performance. This process can be particularly important, before pre-pathology phenomena, because it can help to anticipate the appearance of anomalies, which would end up implying an early replacement of the element or component.

iv) Repair actions are meant to restore the initial performance of the elements/components (after prior inspection). The implementation of these actions depends on some aspects, such as the correction of anomalies and the diagnosis, thus seeking to avoid a functional breakdown or an anticipated end of life. In a limit situation, when the end of its useful life occurs, the total replacement of the element/component will be necessary, corresponding to its end of cycle.

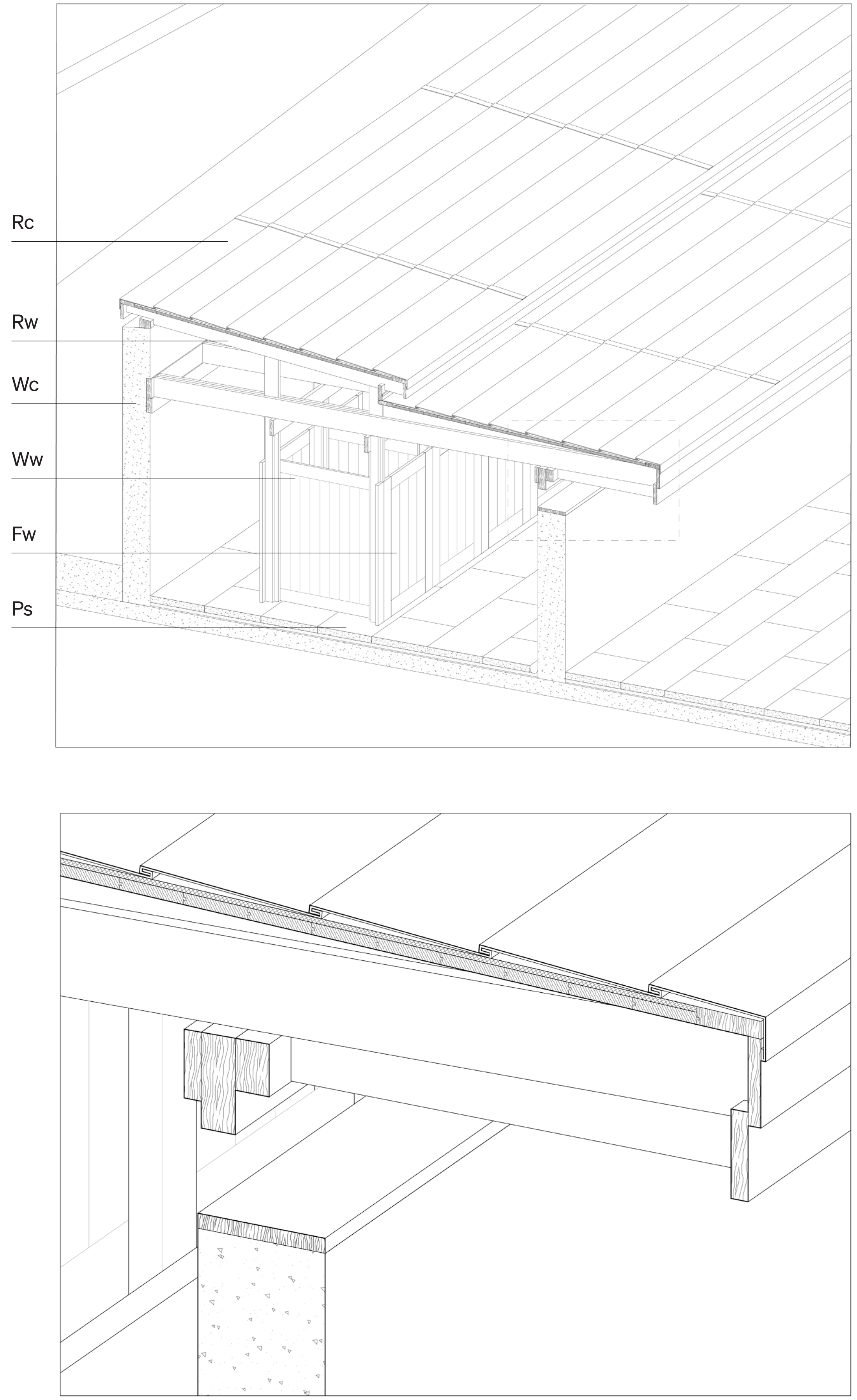
This section focuses on compiling detailed information on building elements and components as support for future conservation and maintenance actions (both preventive and reactive) responding to threats and vulnerabilities, daily wear and tear, or interventions related to functional upgrades or adaptations responding to new requirements. Its structure is based on sheets for each 'Maintenance Source Element' and its components, including: i) characterization of the original design solution (1960-1973), ii) description of the most recent conservation intervention (2018-2021), and iii) guidance for future interventions.

Based on the effects the previously identified hazards can have on the element's condition, it is possible to generate management and maintenance actions to guarantee its good condition and physical integrity. Therefore, it is possible to ensure preventive conservation that minimizes physical changes through specialized advice in conservation decisions and actions. Thus, specific lines of action were developed for each constructive element in order to maintain its integrity and at the same time preserve the site's significance.

5.34 Coding of building components.
5.35 Identification of building components (changing rooms section).

ELEMENT	COMPONENT	CODE
Roofs	Copper cladding	Rc
	Wooden structures	Rw
	Concrete slabs	Rs
Walls	Cyclopean concrete retaining walls	Wr
	Lightly reinforced concrete walls	Wc
	Wooden partition walls	Ww
Pavements	White concrete slabs	Ps
	Cement plaster pavements	Pp
Frames and hardware	Wooden frames	Fw
	Metal frames	Fm
Furniture and fittings		Ff
Tanks		T
Installations	Plumbing	Ip
	Electrical wiring	Ie

5.34



5.35

Roofs

Copper cladding (Rc)

"*The construction system adopted is that of unplastered poorly reinforced concrete walls, supporting a Baltic pine roof, covered with copper cladding over asphalt fabric.*" (Siza, 1965)

Original design (1960-1973)

The roofs of the changing rooms, south bathrooms, water treatment room, and bar are clad with 'Alcufol' type membrane, composed of asphaltic felt and copper alloy finish, applied over 10 mm thick cork agglomerate. This solution included 1 mm thick copper sheet tops and rain gutters. In 1995, the original cladding solution was entirely replaced with a 1 mm thick electrolytic copper roofing, 'Astoriana' type, fixed by stainless steel clips (AISI 304) placed every 60 cm and applied over 40 mm thick black cork agglomerate and a waterproofing plastomer bitumen membrane.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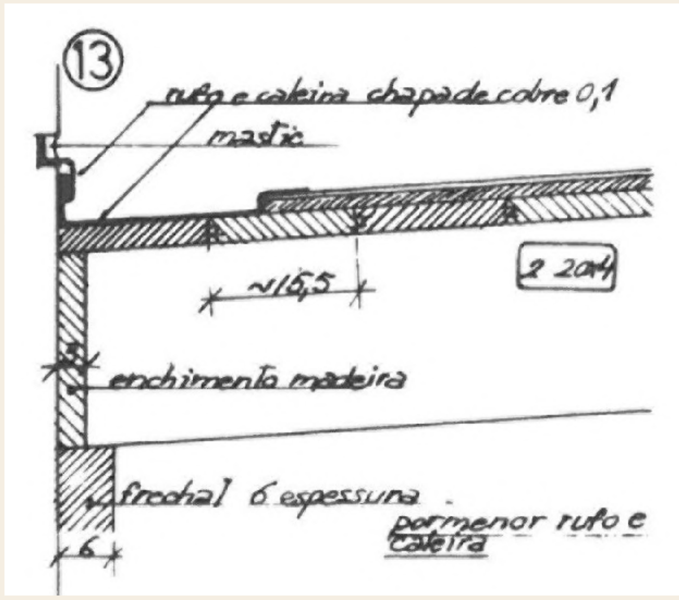

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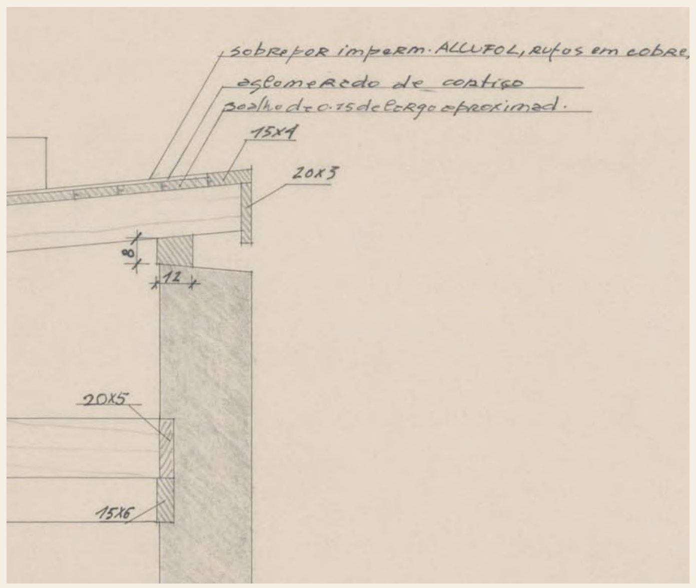
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Conservation (2018-2021)

The roof's copper cladding was cleaned with a soft brush so as not to damage the patina and overhauled, including the replacement of elements, welding, the strengthening of joints and tops, and the replacement of seam clips.


5.40

5.36 Changing rooms' roof, 1968.
5.37 Changing rooms' roof detail, 1966.
5.38 Changing rooms' roof, 1968.
5.39 Changing rooms' roof detail, 1965.
5.40 Changing rooms' roof, 2021.

ACTION LINES	
i. Inspection	Annual condition check-up and record to ensure that there is no damage, such as signs of corrosion (especially from pitting and/or interstitial), cracks in the joints between the sheets, deformations (kinks and warping) or other anomalies, observing if the copper plates are mounted correctly; semi-annual condition check-up and record of the water drainage components, to ensure that no blockages occur from the accumulation of waste or sand.
ii. Cleaning	Annual manual cleaning of the copper plates using a soft brush so as not to damage the patina, including the water drainage components. These should always be checked after a prolonged period of rain and strong winds, also observing the possible occurrence of infiltration inside.
iii. Proaction	Every five years, control and record the existence of early degradation in the joints/overlays (seams) and in the seam clips and screws of the copper plates. The use of a video endoscope may be required.
iv. Repair	If necessary, repair or replace damaged or missing components with new ones in the same material and geometry as the existing ones. Correct any anomaly in the overlays and assembly of the copper cladding, replacing damaged plates. These works must include a previous diagnosis.

Roofs

Wooden structures (Rw)

“There is wood, in very protected places, which resists very well by the seaside. There is this idea that wood is something vulnerable and that it rots; it has been there for over fifty years but that wood is at least two hundred years old, it is reclaimed Baltic pine from demolitions at that time.” (Siza, 2015)

Original design (1960-1973)

The sloping roofs of the changing rooms, south bathrooms, and bar are made up of 3 cm thick tongue and groove boards, over reclaimed Baltic pine beams. The wooden surfaces were first impregnated with a coat of boiled linseed oil, applied hot, and this protection was replaced with two coats of varnish, ‘BONDEX-DYRUP’ type, after previous scraping, between 1971 and 1973.

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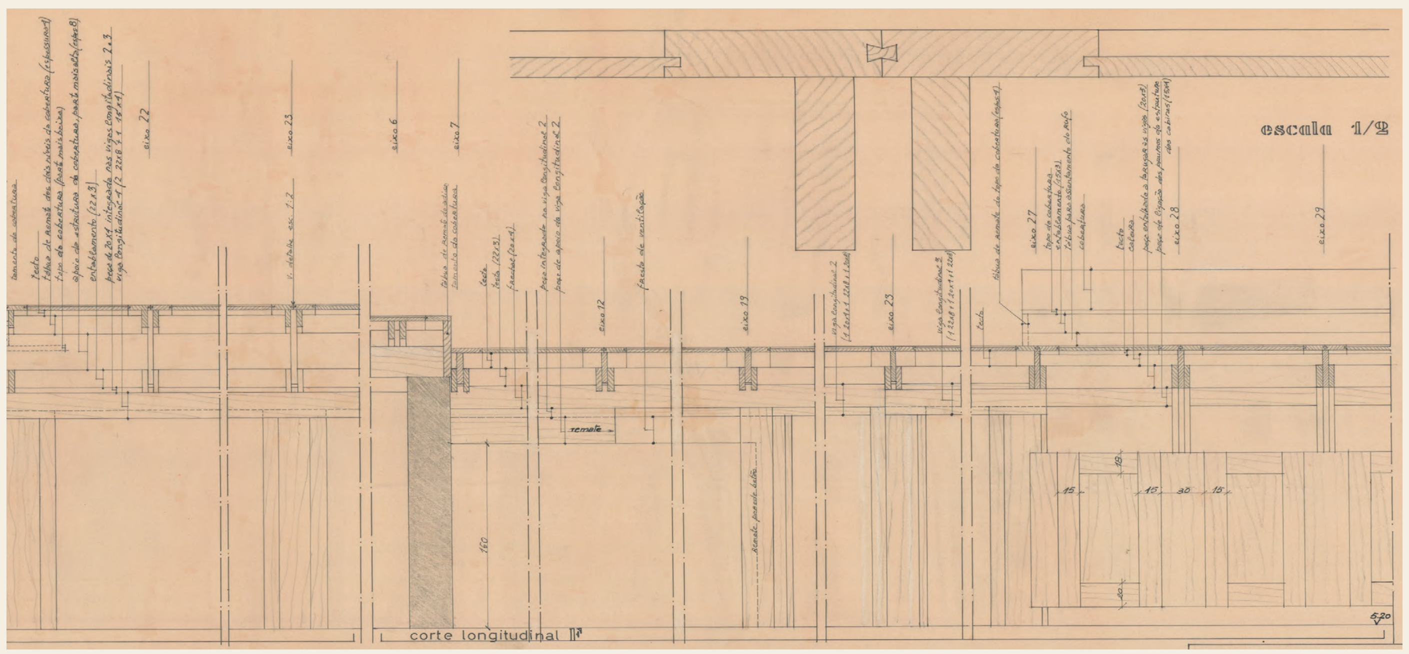

5.43

Conservation (2018-2021)

The beams and other wooden components of the roofs were overhauled and cleaned in order to remove all contaminants from the surfaces. To do so, a universal stripper (ref. 8015) and a steel wire brush were applied following the wood grain direction until it was in its natural state. This was followed by cleaning with a water jet and the application, without dilution, of a coat of ‘Bondex Classic Mate’ stain (ref. 4385 black) with a brush following the wood grain direction.

The existing mosquito nets and metal crates between the bar’s beams were removed, as well as the stainless steel cladding on the kitchen ceiling. The screw holes were filled with bitumen made from polyester resins.

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5.41 South bathrooms roof’s wooden structures, n/d.
5.42 South bathrooms roof’s wooden structures, n/d.
5.43 Wooden structures details, 1965.
5.44 Wooden structures during conservation works, 2020.
5.45 Wooden structures during conservation works, 2020.

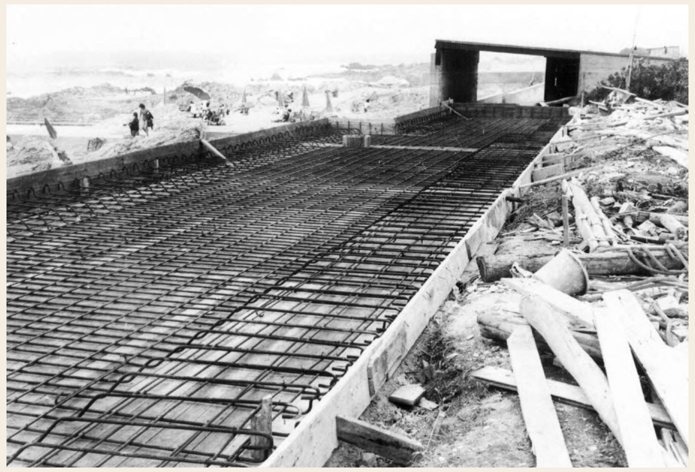
ACTION LINES	
i. Inspection	Annual integrity check-up and record of the wooden structures focused on their stability and degradation phenomena, observing the existence of cracks, deformations, defects of the structural elements, signs of rotting, or signs of attacks by xylophagous organisms. Every ten years, a structural integrity check-up must be carried out by a structural engineer to evaluate the appearance of new anomalies or the aggravation of existing ones.
ii. Cleaning	Every two years, wooden surfaces must be cleaned with water and manual brushing to remove any existing contaminants, such as fungi, algae, dust, and accumulated dirt.
iii. Proaction	Every two years, if necessary, wooden surfaces must be lightly sanded without entirely removing the existing layer of coating, followed by the application of one coat of an alkyd-based solution (Bondex Classic Mate ref. 4385) with a brush following the wood grain direction.
iv. Repair	If necessary, damaged wooden elements must be repaired or replaced with new pieces of similar characteristics. These works must include a previous diagnosis.

Roofs
Concrete slabs (Rc)

"The construction processes and materials used are similar to those adopted in the previous phases, given the strict conditions imposed by the location of the pool. That is, bare concrete is used in partition walls and slabs, Baltic pine is used in frames, and concrete slabs are used for interior floors." (Siza, 1973)

Original design (1960-1973)

The roofs of the water treatment and collection rooms, as well as the north and south storage rooms, are made up of reinforced concrete slabs at a percentage of 52kg/m³ in the north building and 130kg/m³ in the south building. The wooden plank formwork is visible on the underside of the slab, which is in exposed concrete (in the security room and the water collection room, the ceiling was painted white). Prefabricated plastic-asphalt membranes, 'Morter-Plas' type, were used, consisting of a polyethylene film covered on both sides with layers of special catalytic asphalt. The membranes were applied directly on the leveling layer with 10 cm welded overlaps. The edges were reinforced with overlapping membranes. For a protective finish, a 3 cm thick cement and sand screed in a 1:3 ratio was applied and finished with a trowel over a plastic film. The north and south storage rooms have landscaped roofs at the level of the avenue.



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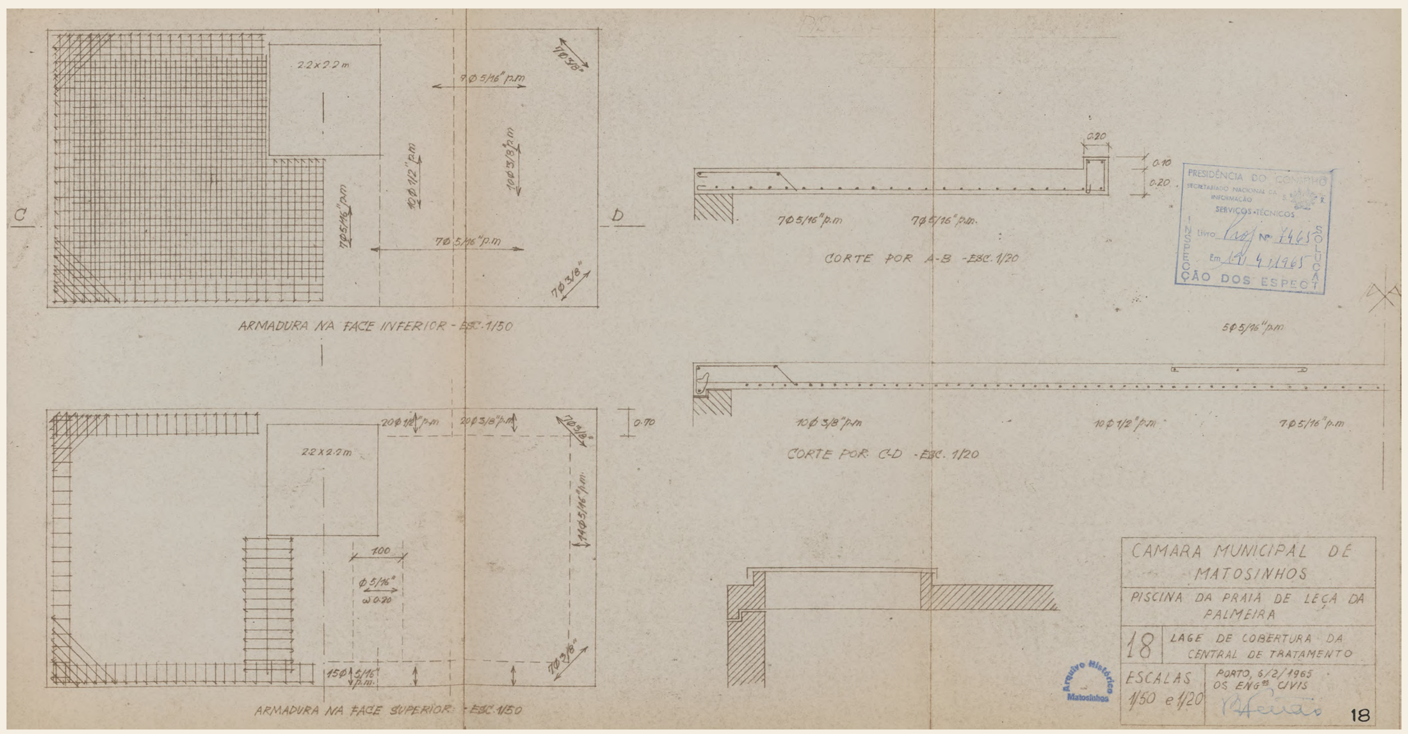

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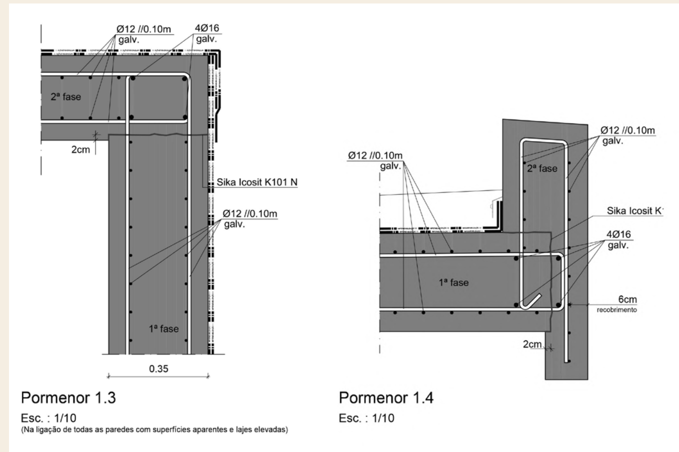
Conservation (2018-2021)

The roof slabs of the north and south storage rooms, which showed an advanced state of rebar corrosion, were demolished. They were rebuilt with A400NR galvanized steel rebars, and wooden plank formwork with the same stereotomy as the existing one on all exposed concrete surfaces. Two-component structural epoxy binder was applied to all bonding surfaces between new and existing concrete and water-stop joints were applied to all construction joints. The existing waterproofing membranes over the roof slab of the water treatment room were removed, including cleaning the surfaces with solvent gel suitable for removing bituminous material and high-pressure sprayed water. The adopted waterproofing system consists of a bitumen emulsion primer, a welded bitumen membrane modified with APP polymers and 3kg/mC of nominal mass, preceded by another bitumen membrane modified with APP polymers and 4kg/mC of nominal mass, overlapping and folding at least 20 cm over the vertical planes, the application of finishing profiles and their respective sealing. Additionally, shrubby species were planted to avoid the use of a fence similar to the one that existed before the intervention.



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5.46 South storage room's roof slab during construction, 1972.
5.47 Roof slab waterproofing, 1972.
5.48 Water treatment room's roof slab details, 1965.
5.49 Reinforced concrete roof slabs and waterproofing details, 2018.
5.50 South storage room after the roof slab demolition, 2019.

ACTION LINES	
i. Inspection	Annual condition check-up and record of the slabs and waterproofing to detect the existence of anomalies (among the most common: cracking, blistering, and accumulation of dirt). Every ten years, a slab structural integrity check-up must be carried out by a structural engineer to evaluate the appearance of new anomalies or the aggravation of existing ones.
ii. Cleaning	Annual cleaning of concrete surfaces by manually removing any residue deposits.
iii. Proaction	Every five years, the waterproofing should be inspected and cleaned with water and a soft brush, without damaging the membranes; pay special attention to the edges and overlaps that must be perfectly adhered, evaluating their elasticity.
iv. Repair	If necessary, any material replacement must respect the characteristics of the original concrete, namely the wood formwork finish. New concrete must be carefully studied and tested to prevent color and texture disparity with the preexisting surfaces. The complete replacement of the waterproofing system should occur between 15 to 20 years. These works must include a previous diagnosis.

Walls

Cyclopean concrete retaining walls (Wr)

“*The construction of retaining walls, to the north and south of the changing rooms, constitutes the necessary finishing to the buildings and, while simultaneously solving the access circuits and connection between areas, completes the embedding of the buildings in the retaining wall of the avenue and the meeting of two materials applied on large surfaces: granite masonry and bare concrete.*” (Siza, 1966)

Original design (1960-1973)

The retaining walls were built in cyclopean concrete, following the proportion of 70% of 300kg concrete to 30% of coarse crushed aggregates, and waterproofed on their internal face with 3 coats of non-ionic bituminous emulsion, ‘FLINKTOTE’ type. On the back of the walls, a drainage curtain was made in dry stone, arranged by hand, and a 20 cm diameter perforated concrete drain was installed on a 250 kg concrete slab. With the extension of the building to the north and south, between 1971 and 1973, new retaining walls were built in a combination of two sections: an interior in cyclopean concrete, with characteristics identical to those that had already been built; and an exterior in exposed concrete, reinforced at a percentage of 10kg/m³ and with wooden plank formwork. The inner face of these walls was waterproofed with water-repellent plaster composed of cement mortar and sand in a 1:2 ratio, to which 0.568 l of a ‘Feb-Proof’ plasticizing solution was added for every 50 kg of cement.

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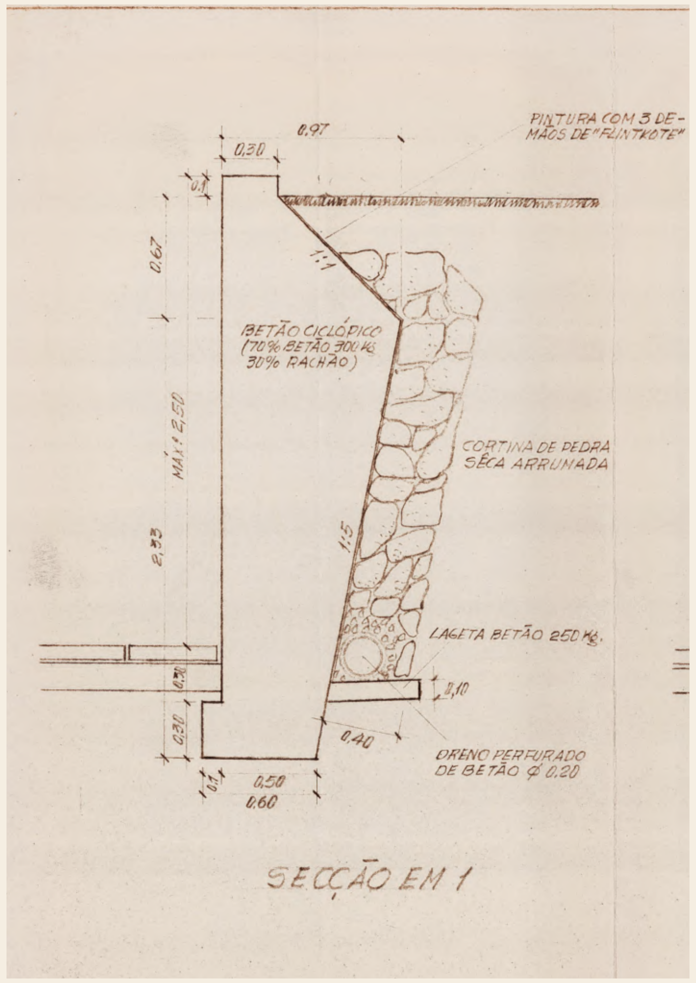

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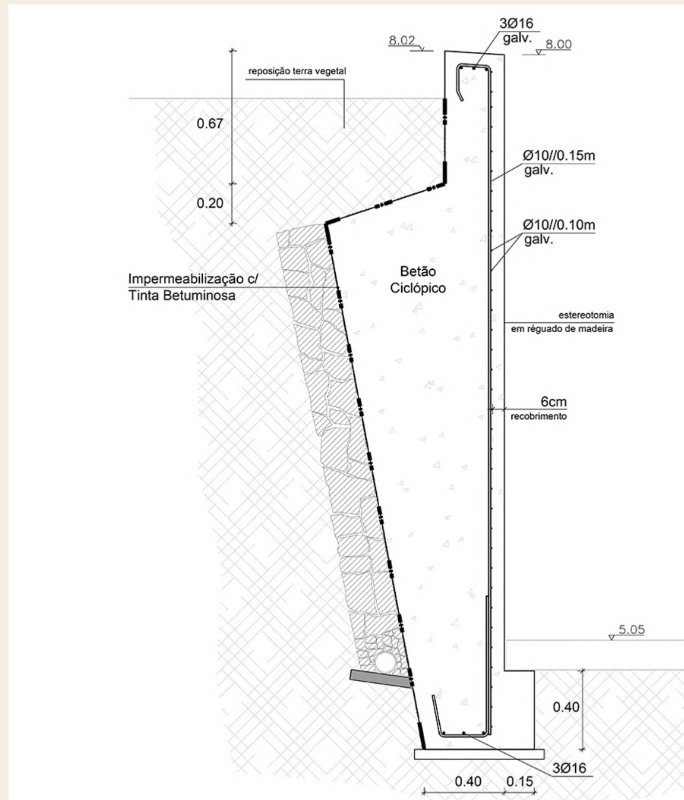
5.51 Construction of the retaining walls, 1971.
5.52 Construction of the retaining walls, 1971.
5.53 Cyclopean concrete retaining wall detail, 1965.
5.54 Cyclopean concrete retaining wall detail, 2018.
5.55 Construction of the retaining walls, 2019.

Conservation (2018-2021)

All retaining walls along the entire length of the new north platform were demolished up to the foundation level of the new exterior floors. The foundation surfaces were leveled with blinding concrete, with 250kg/m³ of cement. New retaining walls were built in slightly reinforced cyclopean concrete, consisting of 90/180 coarse crushed aggregates (30% of the total volume) and ribbed stainless steel mesh of class 1.4571 BS (EN 10088-1) measuring 50 × 50 × 3 mm, including wooden plank formwork with the same stereotomy as the existing one on all exposed concrete surfaces. All underground surfaces were waterproofed by applying two crossed coats of bituminous emulsion. On the back of the retaining walls, a dry stone drainage curtain was built, arranged by hand.



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ACTION LINES	
i. Inspection	Annual condition check-up record of the retaining walls to ensure that there is no damage, such as cracking (monitoring the most significant cracks - to be defined by the technician responsible for the inspection), evidence of efflorescence, concrete delamination, oxidized rebar and accumulations of dirt. Every ten years, a retaining walls structural integrity inspection must be carried out by a structural engineer to check for new anomalies or aggravation of existing ones.
ii. Cleaning	Every 5 years, if necessary, clean and treat the surfaces by removing any biological colonization without damaging the patina.
iii. Proaction	Every ten years, if necessary, treat oxidized rebars, through the complete removal of the oxidized layer to determine the loss of section. Provide for its correct replacement, with the application of a protective layer against corrosion.
iv. Repair	If necessary, any material replacement must respect the characteristics of the original concrete, namely the wood formwork finish. New concrete must be carefully studied and tested to prevent color and texture disparity with the preexisting surfaces. Vertical cracks caused by the absence of expansion joints in the original project, and whenever there is no rebar corrosion, must be kept open after careful cleaning, as long as the conditions of structural performance and integrity are guaranteed. These works must include a previous diagnosis.

Walls

Lightly reinforced concrete walls (Wc)

"Some concrete walls support the Baltic pine and copper roof and support the access paths to the pool." (Siza, 2009)

Original design (1960-1973)

The building's walls were built in lightly reinforced concrete with a percentage of 15kg/m³, and an average thickness of 30 cm. They are finished in exposed concrete, with horizontal lines resulting from the use of wooden plank formwork. During concreting, 'MEYCO' rubbers were applied to the joints between walls.

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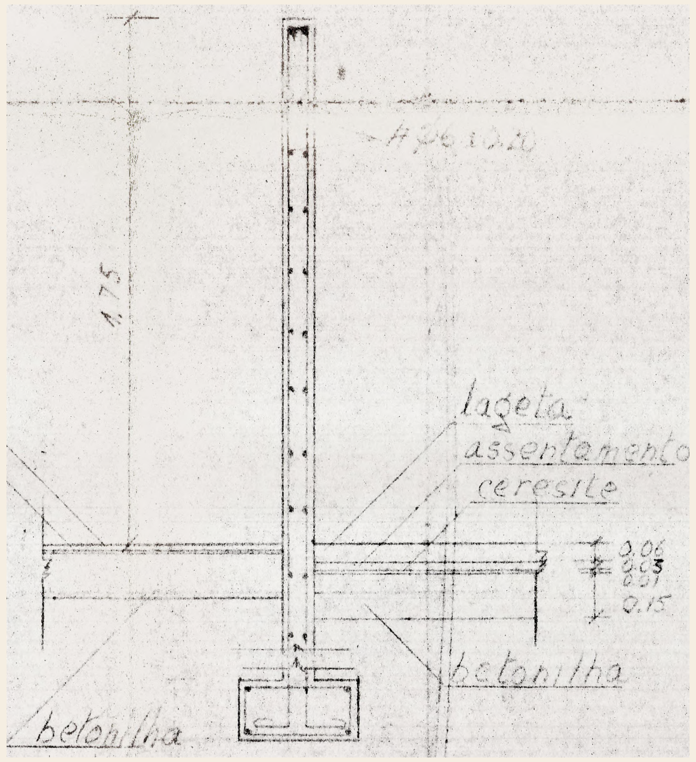
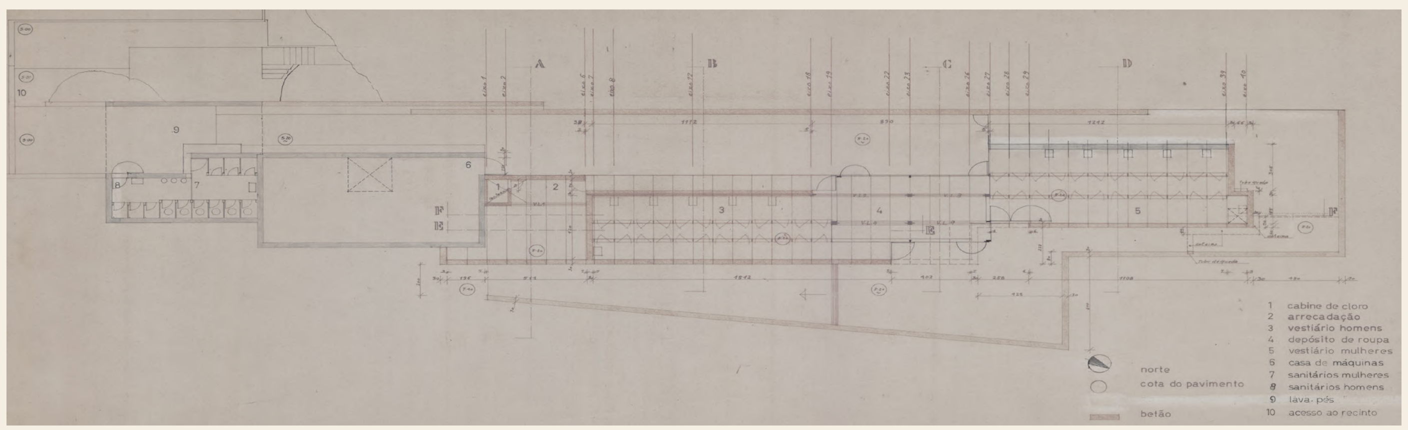


5.58

5.56 Bar terrace walls, n/d.
5.57 Bar terrace walls, n/d.
5.58 Lightly reinforced concrete walls detail, 1966.
5.59 Structural plan, 1965.
5.60 North bathrooms suspended partition walls, 2018.
5.61 North extension during construction, 2019.



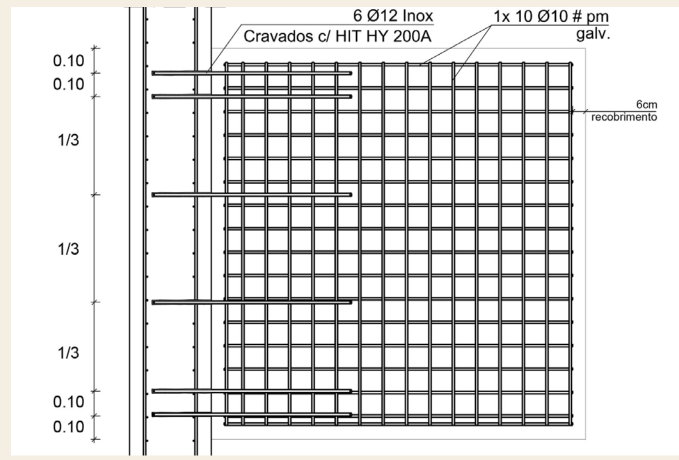
5.59

Conservation (2018-2021)

A mapping of all the cracks and anomalies that the concrete walls presented was carried out. Repair mortars that proved to be incompatible with the original concrete were removed, exposing cracks and detachments. Occasionally, localized repairs of the concrete were carried out using chromatic and texture integration in keeping with the formwork stereotomy. However, whenever the cracks did not represent any structural risk or signs of rebar corrosion, they were left open in a deliberate option on the part of the designer to assume the signs of the passage of time. In these cases, to inhibit rebar corrosion, a protective mineral coating was applied.

The former north building was demolished, giving way to a new construction with concrete walls with A400NR galvanized steel reinforcement and wooden plank formwork in keeping with the existing stereotomy to that existing on all exposed concrete surfaces. A 2-component structural epoxy binder was applied to all bonding surfaces between new and existing concrete and water-stop joints were applied to all construction joints. The façade of the new building is 30 cm thick and the beam that tops the longitudinal span has a section of 17 × 15 cm. Inside, 15 cm thick walls and 10 cm prefabricated partitions were built, also in exposed concrete, suspended from the perimeter walls through stainless steel anchors, nailed with chemical anchors for heavy loads.

The walls of the security and water collection rooms were painted with two coats of extra matte white aqueous paint, after previous brushing, treatment of cracks, and application of a colorless pliolite primer, suitable for dusty surfaces. The stainless steel sheets were removed from the kitchen, restoring it to its original condition.



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ACTION LINES	
i. Inspection	Annual condition check-up and record of the lightly reinforced concrete walls to ensure that there is no damage, such as cracking (monitoring the most significant cracks - to be defined by the technician responsible for the inspection), evidence of efflorescence, concrete delamination, oxidized rebar and accumulations of dirt. Every ten years, a retaining walls structural integrity inspection must be carried out by a structural engineer to check for new anomalies or aggravation of existing ones.
ii. Cleaning	Every 5 years, if necessary, cleaning and treatment of the surfaces, removing any biological colonization without damaging the patina.
iii. Proaction	Every ten years, if necessary, assess the need to apply a colorless non-glossy waterproofing membrane or an elastic, vapor-permeable one. This action can be performed at any stage of the Maintenance Plan's execution, and its execution must be duly evaluated.
iv. Repair	If necessary, any material replacement must respect the characteristics of the original concrete, namely the wood formwork finish. New concrete must be carefully studied and tested to prevent color and texture disparity with the preexisting surfaces. Vertical cracks caused by the absence of expansion joints in the original project, and whenever there is no rebar corrosion, must be kept open after careful cleaning, as long as the conditions of structural performance and integrity are guaranteed. These works must include a previous diagnosis.

Walls
Wooden partition walls (Wp)

“The intention was to suspend the partitions from the roof structure, avoiding any point of contact with the floor, in order to guarantee easy and efficient washing. Wood, due to its lightness, made it possible to achieve this objective, offering, on the other hand, superior comfort to that obtained with the most commonly used materials (wood, for this very reason, is often preferred in similar cases - for example, in Nordic countries).” (Siza, 1967)

Original design (1960-1973)

The partition walls of the changing rooms and south bathrooms are made of 2.5 cm thick reclaimed Baltic pine boards, suspended from the roof’s wooden structure. The wooden surfaces were first impregnated with a coat of boiled linseed oil, applied hot, and this protection was replaced, between 1971 and 1973, by two coats of varnish, ‘BONDEX--DYRUP’ type, after previous scraping. In the bathrooms and showers, the wood was protected with a film of vinyl resin. Also in this period, a partition wall was built in the collective changing room, made of a reclaimed Baltic pine panel, 2.5 cm thick, fixed to the floor with brass blocks. This partition wall supports a wooden bench resting on cantilevered brass bars.

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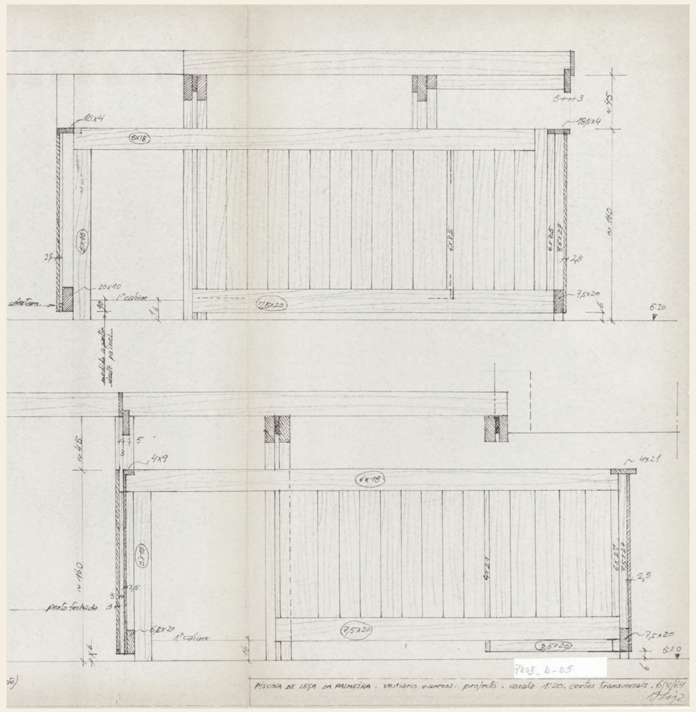

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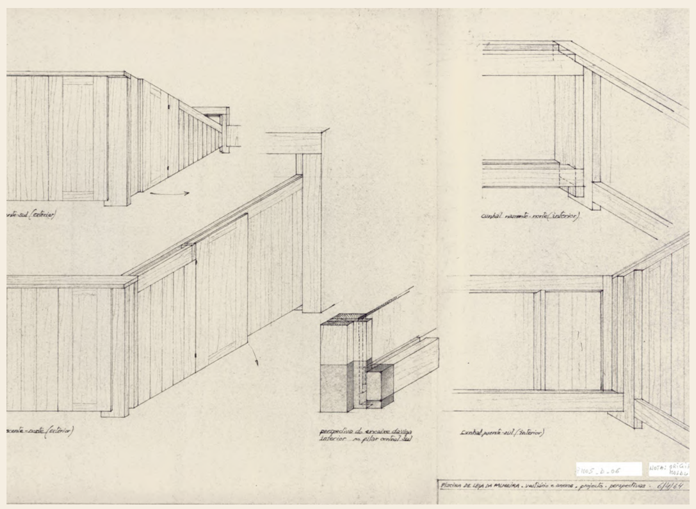

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5.52 Men’s changing room, n/d.
5.63 Wooden partition walls detailing, 1964.
5.64 Wooden partition walls perspectives, 1964.
5.65 Men’s changing room during conservation works, 2020.
5.66 Copper plated shower partition, 2021.
5.67 Men’s changing room plan, 2018.

Conservation (2018-2021)

The wooden partition walls have been overhauled and cleaned to remove all contaminants from the surfaces. To do so, a universal stripper (ref. 8015) and a steel wire brush were applied following the wood grain direction until it was in its natural state. This was followed by cleaning with a water jet and the application, without dilution, of a coat of ‘Bondex Classic Mate’ stain (ref. 4385 black) with a brush following the wood grain direction. The partition walls in the toilets and showers were replaced with new ones, made from 1 cm thick marine plywood, coated with 1 mm thick copper plate on all sides.

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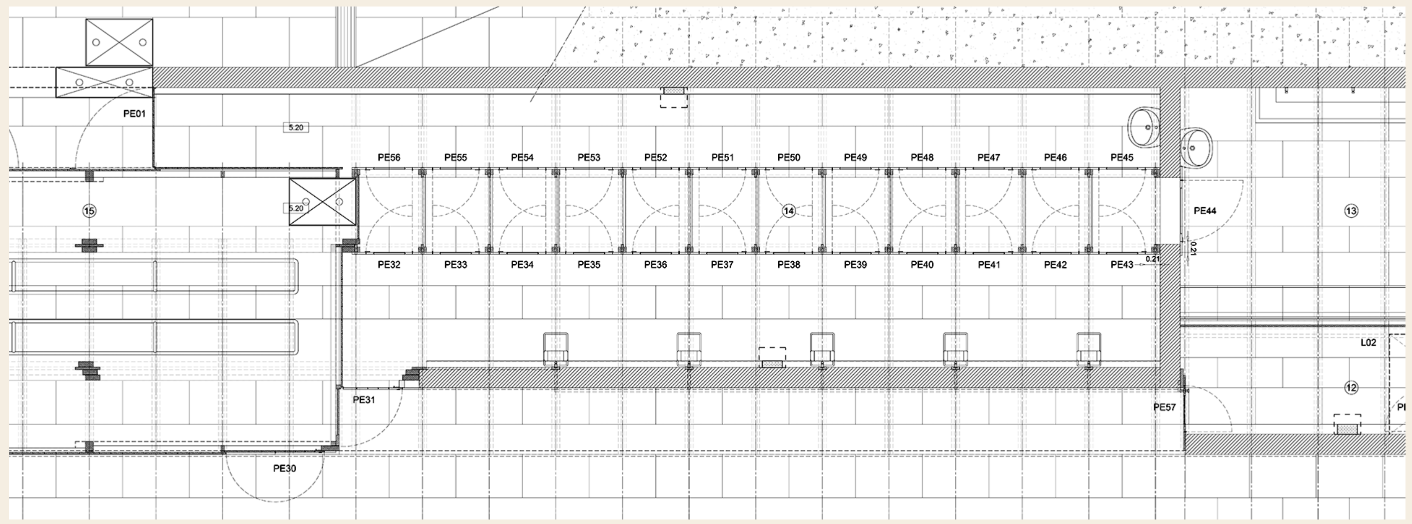

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ACTION LINES	
i. Inspection	Annual integrity check-up and record of wooden partition walls in terms of stability and degradation phenomena, observing the existence of cracks, deformations, signs of rot, or signs of attacks by xylophagous organisms.
ii. Cleaning	Every two years, wooden surfaces must be cleaned with water and manual brushing to remove any existing contaminants, such as fungi, algae, dust, and accumulated dirt.
iii. Proaction	Every two years, if necessary, wooden surfaces must be lightly sanded without entirely removing the existing layer of coating, followed by the application of one coat of an alkyd-based solution (Bondex Classic Mate ref. 4385) with a brush following the wood grain direction.
iv. Repair	If necessary, damaged wooden elements must be repaired or replaced with new pieces of similar characteristics. These works must include a previous diagnosis.

Pavements
White concrete slabs (Ps)

“The floor is made of precast cement slabs.” (Siza, 1965)

Original design (1960-1973)

The floor of the access ramp, changing rooms, south bathrooms, bar, and north building is made of 4 cm thick white concrete slabs, reinforced with steel mesh, laid on a water-repellent screed foundation. In the connection with the exposed concrete walls, there are gutters with a semi-circular section.

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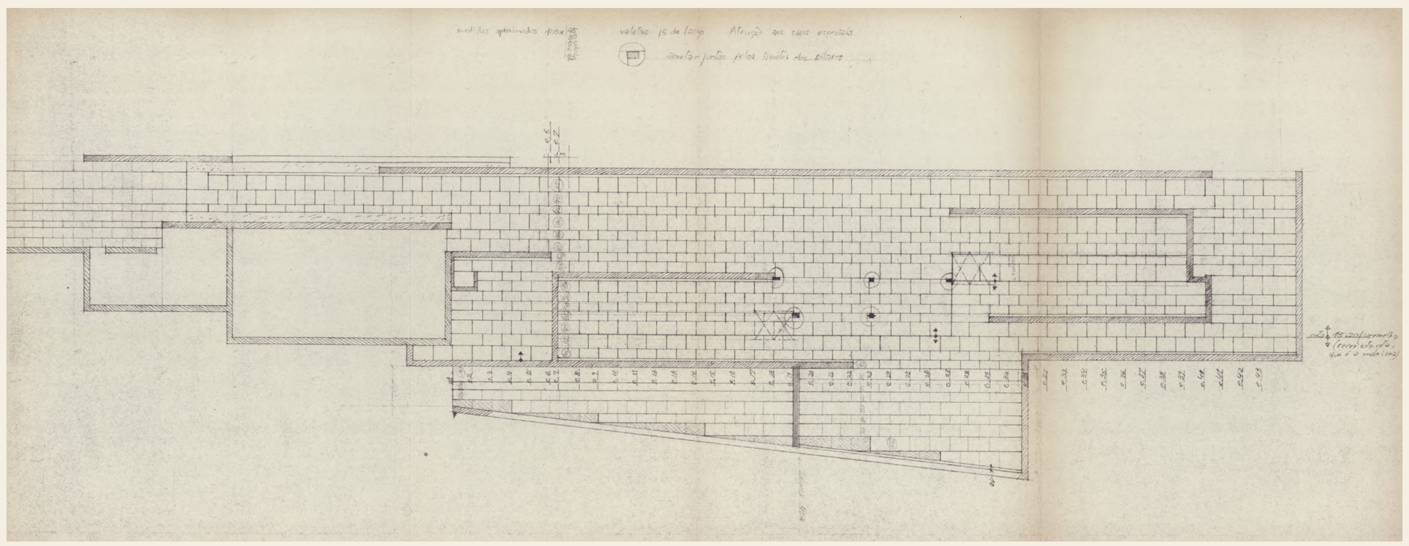

5.70

5.68 Entrance ramp white cement slabs, n/d.
5.69 Changing room’s hallway white cement slabs, n/d.
5.70 White cement slabs layout plan, 1965.
5.71 White cement slabs sandblasting, 2020.
5.72 Entrance ramp white cement slabs, 2021.
5.73 Changing room’s hallway white cement slabs, 2021.
5.74 White cement slabs under the south bathroom’s porch, 2021.

Conservation (2018-2021)

The bar and kitchen flooring, made up of white concrete slabs, was demolished, including the foundation, and replaced by 7 cm thick micro concrete, C30/37 class, reinforced with 2 1.4571 BS (EN 10088-1) stainless steel meshes measuring 50 x 50 × 3 mm, on 500 micron plastic. The remaining surfaces were sandblasted to provide non-slip properties and repaired when necessary. The deteriorated pieces were replaced with new ones, made of white concrete, lightly reinforced with 1.4571 BS (EN 10088-1) stainless steel mesh measuring 50 x 50 × 3 mm, with a sanded surface, equal dimensions to the existing ones, and 7 cm of thickness.

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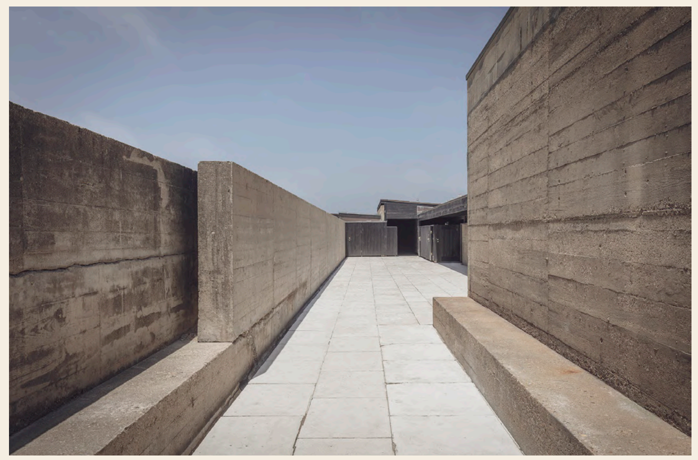

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ACTION LINES	
i. Inspection	Annual condition check-up and record to ensure that there is no damage or signs of moisture-induced degradation such as staining or cracking.
ii. Cleaning	Daily cleaning of the surfaces (housekeeping routine). Every ten years, cleaning with sandblasting air compressor without adding any chemical products.
iv. Repair	If necessary, existing pavements may receive localized or integral repairs, provided the new concrete is carefully studied and tested to prevent disparities in color and texture with the existing one. These works must include a previous diagnosis.

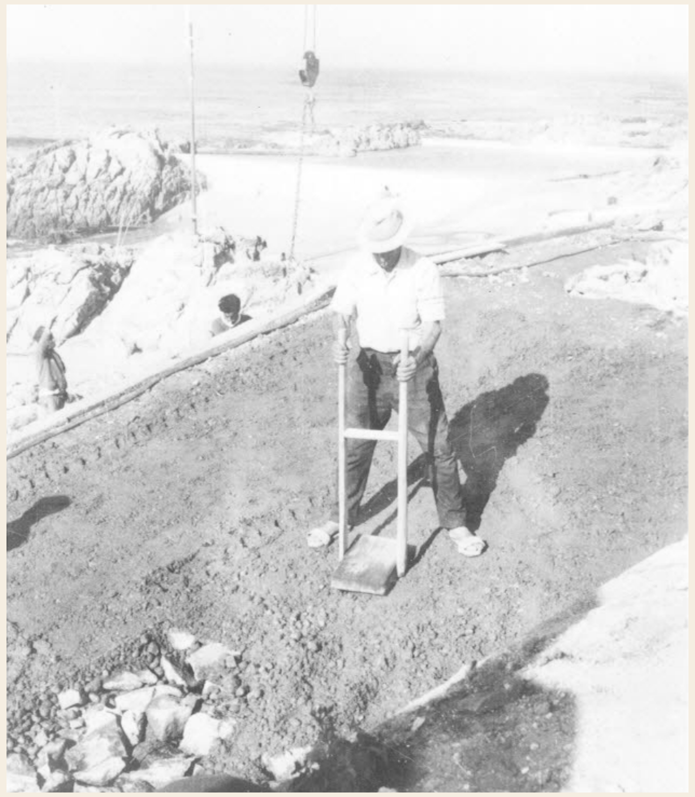
Pavements

Cement plaster pavements (Pp)

"The terrain's natural conditions were taken advantage of as much as possible, especially where rock outcrops limited areas sheltered from the prevailing winds. These areas have at times been enlarged by light rock removal. A system of platforms and concrete stairs comfortably connects the different levels of these areas." (Siza, 1965)

Original design (1960-1973)

The pavements of the north, south, and west platforms and the bar terrace were executed in troweled plaster, composed of cement mortar and sand in a 1:3 ratio, on a foundation of cyclopean concrete, composed of 75% of 250 kg concrete and 25% of coarse crushed aggregates. For the interior pavements, a troweled plaster of cement mortar and sand was applied in a 1:2 ratio, on a water-repellent screed foundation.



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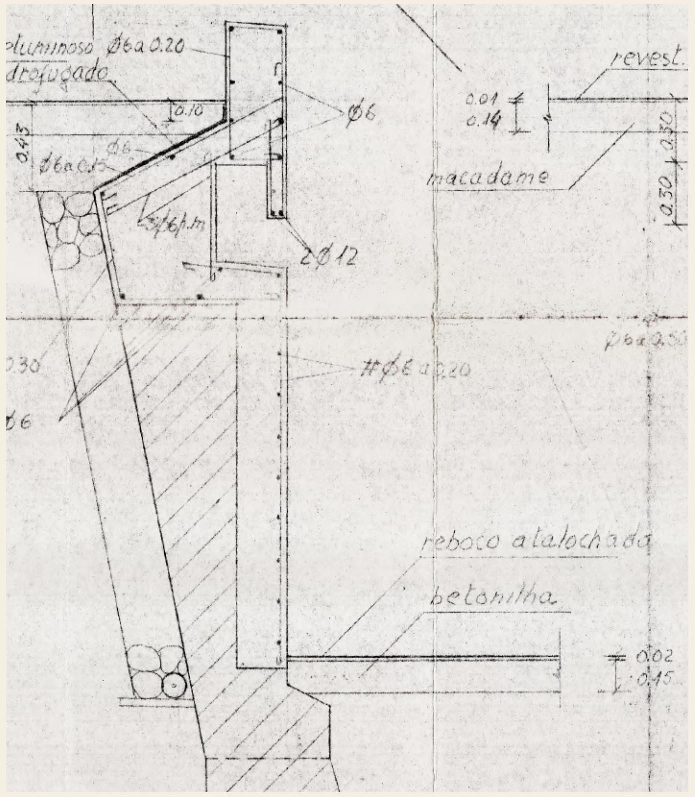

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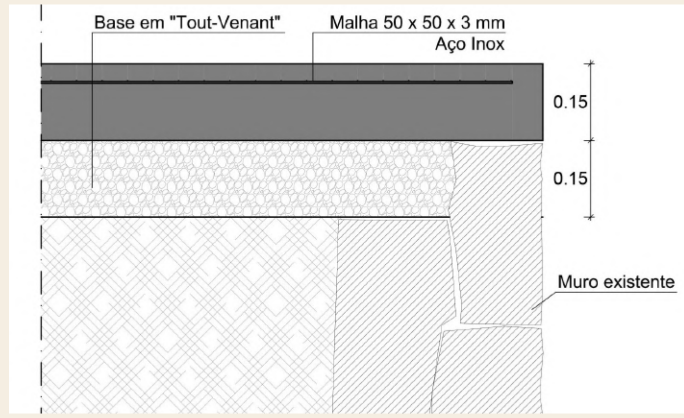
5.75 Ground leveling, 1971.
5.76 Cement plaster pavement detail, 1966.
5.77 North platform, 1972.
5.78 Micro concrete detail, 2018.
5.79 North platform during construction, 2020.
5.80 Suspended walkway detail, 2018.
5.81 Suspended walkway during construction, 2020.

Conservation (2018-2021)

The north platform pavement was fully demolished, while on the south platform and the bar terrace only the screed was removed. The new exterior pavements were executed in 15 cm thick micro concrete with a troweled surface, on a 15 cm thick tout-venant base. Recesses to conduct rainwater were created in slightly reinforced cyclopean concrete, consisting of 90/180 coarse crushed aggregates (30% of the total volume) and ribbed stainless steel mesh of class 1.4571 BS (EN 10088-1) of 50 × 50 × 3 mm, including wooden plank formwork in keeping with the stereotomy on all exposed concrete surfaces. In the case of the new north platform, it was necessary to build new foundation slabs in reinforced concrete, 35 cm thick, with A400NR galvanized steel rebars and wooden plank formwork in keeping with stereotomy on all exposed concrete surfaces.

The slab of the suspended walkway had to be rebuilt given its advanced state of rebar corrosion. A new 22 cm thick slab was built, with the lower and lateral faces in exposed concrete and the upper in troweled cement plaster, including neoprene supports, concrete drip inducers with BS 1.4362 (EN 10088-1) stainless steel reinforcements, and wooden plank formwork.



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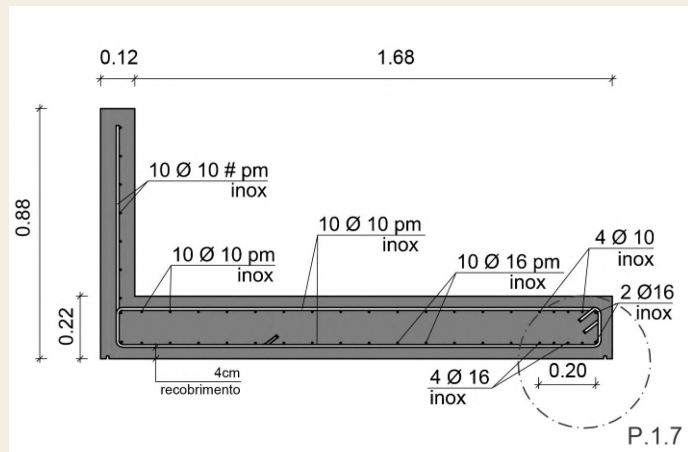

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ACTION LINES	
i. Inspection	Annual condition check-up and record to ensure that there is no damage or signs of moisture-induced degradation such as staining or cracking.
ii. Cleaning	Daily cleaning of the surfaces (housekeeping routine). Every ten years, the surfaces must be cleaned with nebulized water and a brush, without adding any chemical products.
iv. Repair	If necessary, existing pavements may receive localized or integral repairs, provided the new concrete is carefully studied and tested to prevent disparities in color and texture with the existing one. These works must include a previous diagnosis.

Frames and hardware

Wooden frames (Fw)

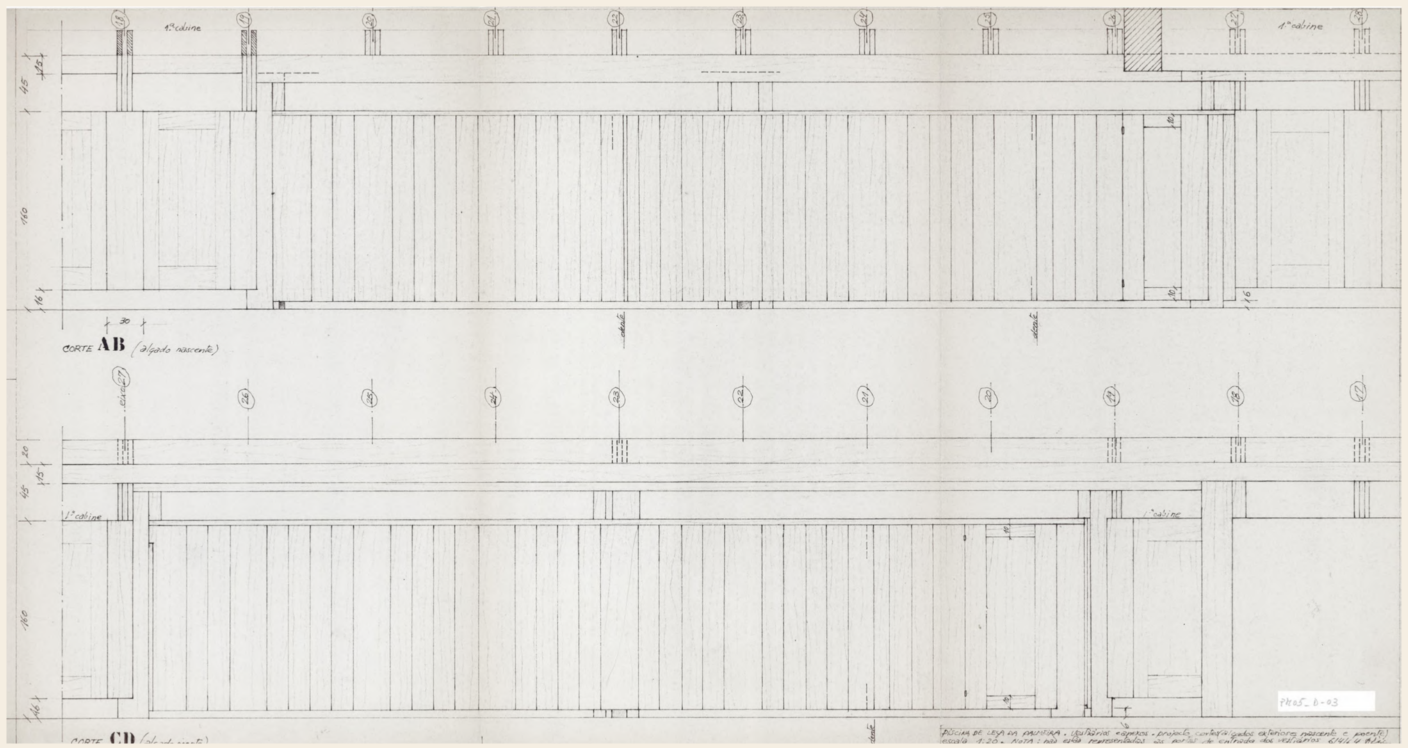
"Baltic pine is used in frames." (Siza, 1973)

5.82

Original design (1960-1973)

All the doors of the building are paneled and were made in reclaimed Baltic pine, 2.5 cm thick. For the frames and finishing of the walls and doorways, 3 cm thick boards of reclaimed Baltic pine were used, fixed with brass screws. The wooden surfaces were first impregnated with a coat of boiled linseed oil, applied hot. This protection was replaced with two coats of varnish, 'BONDEX-DYRUP' type, after previous scraping, between 1971 and 1973. All building doors include galvanized hardware and brass or copper fittings.

5.82 Entrance doors for shoed users, n/d.
5.83 Changing room's doors, 1964.
5.84 Changing room's doors, 2018.
5.85 South bathrooms' door, 2021.
5.86 Copper and brass hardware and fittings, 2021.



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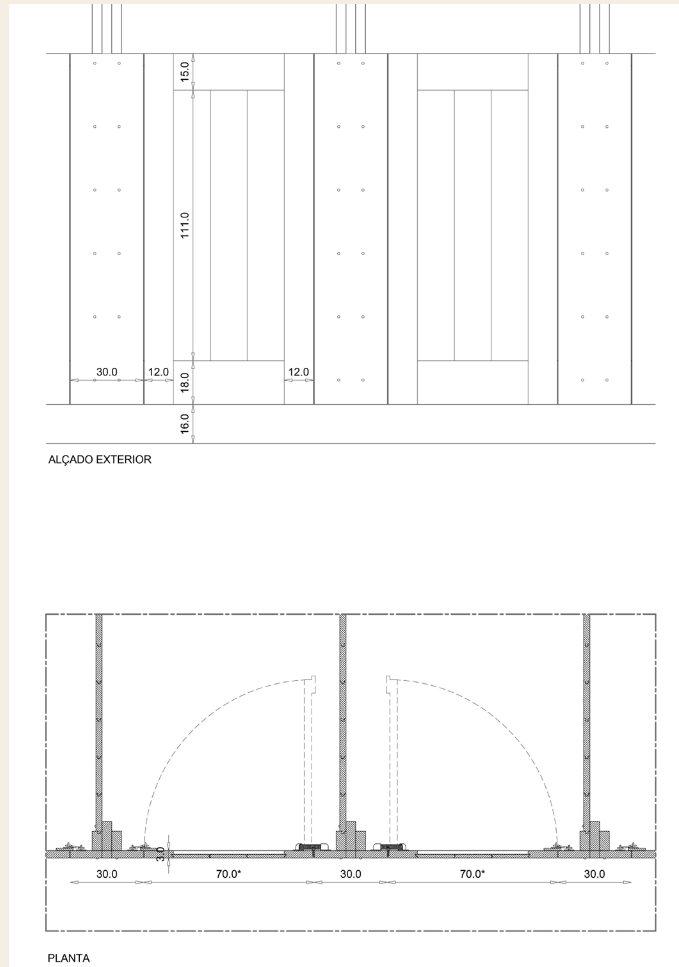
Conservation (2018-2021)

The wooden frames were subjected to a functioning review of all its components. They were cleaned to remove all contaminants from the surfaces. To do so, a universal stripper (ref. 8015) and a steel wire brush were applied following the wood grain direction until it was in its natural state. This was followed by cleaning with a water jet and the application, without dilution, of a coat of 'Bondex Classic Mate' stain (ref. 4385 black) with a brush following the wood grain direction. New doors were installed in the new north building as well as in the bar, replacing the previous sliding door and the counter shutters with new elements in reclaimed Baltic pine that faithfully reproduce the original design.



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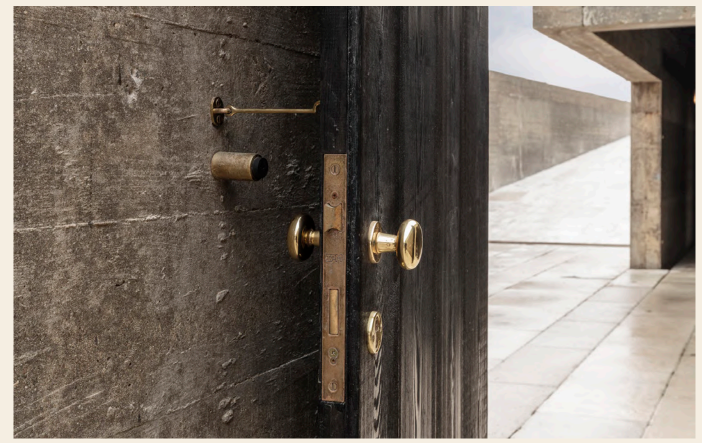

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ACTION LINES	
i. Inspection	Annual integrity check-up and record of the wood, in terms of degradation phenomena, observing the existence of warping and excessive gaps between profiles and frames, signs of rotting or signs of attacks by xylophagous organisms and its proper functioning - the opening, closing, and latches must be tested.
ii. Cleaning	Weekly cleaning with a damp cloth and, if necessary, a non-abrasive brush; every two years, wooden surfaces must be cleaned with water and manual brushing to remove any existing contaminants, such as fungi, algae, dust, and accumulated dirt.
iii. Proaction	Annual lubrication and tuning of hinges, locks, and pivots should be carried out. If superficial oxidization is detected, a rust converter (corrosion passivator) must be applied to remove the crumbling rust layers, or even microcrystalline wax (as a lubricant repairer). Every two years, if necessary, wooden surfaces must be lightly sanded without entirely removing the existing layer of coating, followed by the application of one coat of an alkyd-based solution (Bondex Classic Mate ref. 4385) with a brush following the wood grain direction.
iv. Repair	If necessary, damaged wooden elements must be repaired or replaced with new pieces of Baltic pine with similar characteristics. These works must include a previous diagnosis.

Frames and hardware

Metal frames (Fw)

"The metal parts (locks, drainage grates, etc.) are made of brass or copper." (Siza, 1965)

Original design (1960-1973)

The access doors to the water collection room and the south storage room were made of pickled and thermal sprayed steel, while the doors to the north bathrooms and storage room were made of stainless steel with a brushed finish. All building doors include galvanized hardware and brass or copper fittings. The water treatment room, the chlorine cabinet, and the women's changing room are equipped with skylights made of brass profiles and 6 mm tempered glass.

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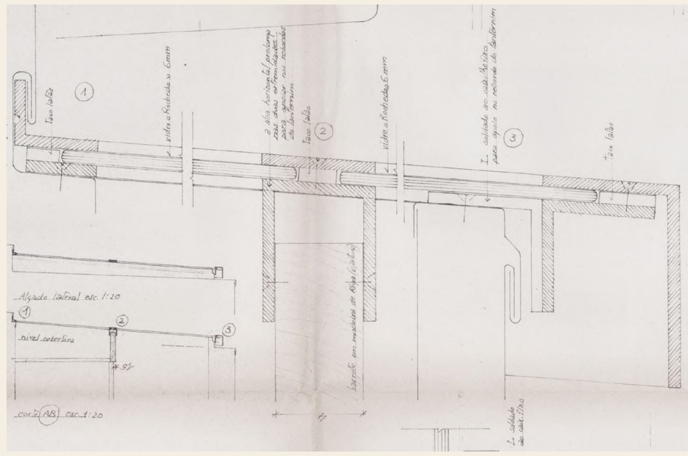

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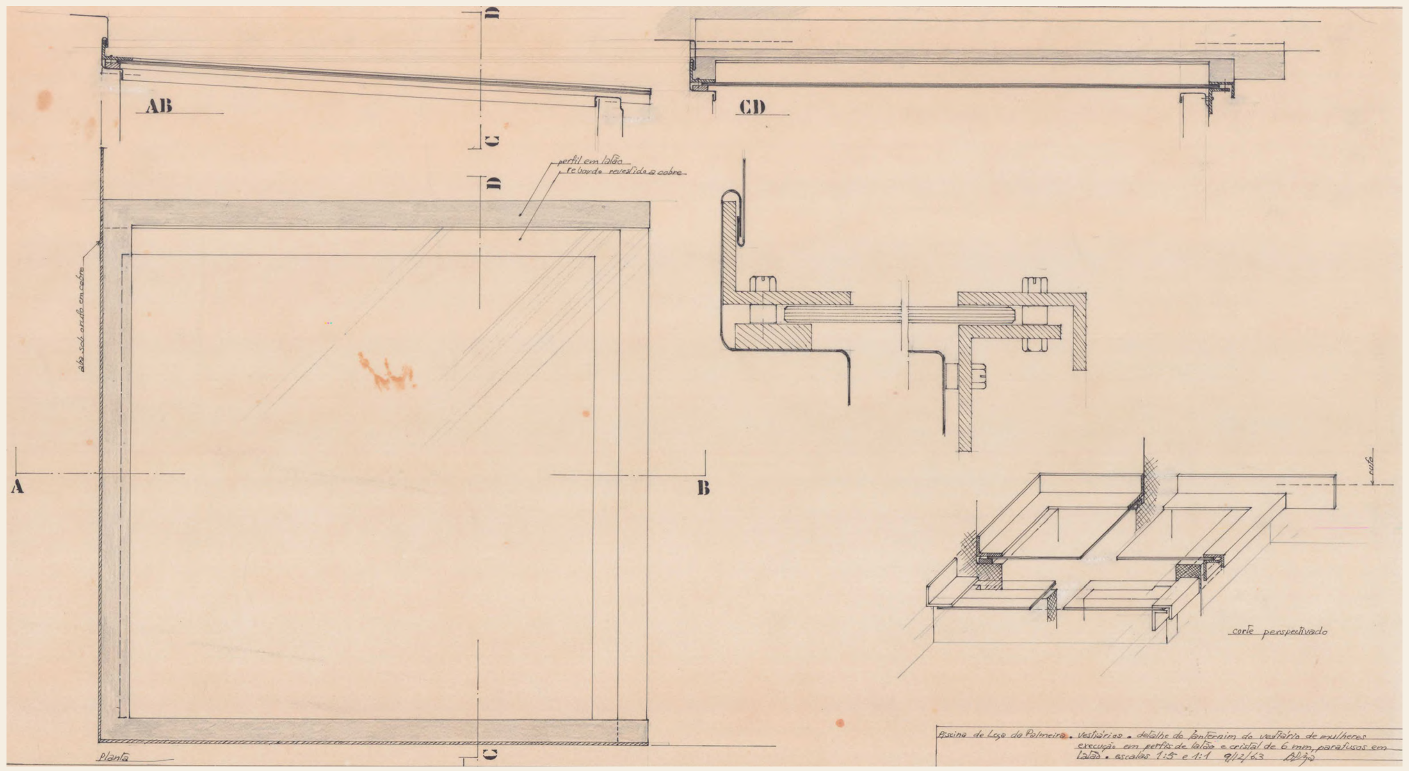

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Conservation (2018-2021)

New 1 mm thick copper sill plates were applied in the doorways of the new north building and the bar, fixed with brass screws, with recessed heads. The access door to the water collection room was restored by replacing the degraded hardware, and completely stripping all surfaces. A rust converter was applied before painting with gray forged enamel, 'Cinofer' type. On the north wall of the adults swimming pool, a new removable railing was installed, consisting of vertical rods, cables, and AISI316 stainless steel mesh.

5.90

5.87 Women's changing room's skylight, 1995.
5.88 Water treatment room's skylight detail, 1964.
5.89 Women's changing room's skylight, 1963.
5.90 Roof's copper cladding and skylights, 2021.

ACTION LINES	
i. Inspection	Annual integrity check-up and record of the metallic elements in terms of degradation phenomena (control of the following factors: joints between frames, elasticity of the protective fence, functioning of the condensate drainage channels), observing the existence of warping, excessive clearances and adhesion to the support, and the existence of cracks or breaks in the perimeter seal and its proper functioning.
ii. Cleaning	Every two years, the metallic surfaces must be cleaned with a damp cloth and/or a neutral cleaning product (5<PH<8), mixed with water in the proportion of 5%, using a non-abrasive well-impregnated sponge.
iii. Proaction	Lubrication and annual tuning of hinges, locks, and pivots shoud be carried out. If superficial oxidization is detected, a rust converter (corrosion passivator) must be applied to remove the crumbling rust layers, or even microcrystalline wax (as a lubricant repairer).
iv. Repair	If necessary, the metallic elements must be repaired and replaced with others of similar design and characteristics. These works must include a previous diagnosis.

Furniture and fittings (Ff)

"All the equipment in the bar, preparation area and pantry will be in stainless steel and removable, so that during the winter it can be moved to the protected storage room. The terrace equipment (tables and chairs) will be made of Baltic pine." (Siza, 1973)

Original design (1960-1973)

The south bathrooms are equipped with 6 toilets, 2 washbasins with round mirrors, 3 urinals, and 6 stainless steel shower tubs with brass drains, copper tube shower heads, and brass taps. The north bathrooms have the same number of toilets, washbasins, and urinals but only 2 shower tubs. Each of the changing rooms is equipped with a washbasin and a round mirror. The men's and women's changing rooms also have 10 foot washes and 29 brass hangers, while the collective changing room only has a single marble foot wash and 6 brass hangers. The cloakroom is equipped with a brass hanger suspension structure.

The bar was equipped with a full kitchen fit for the preparation of hot meals. The terrace was equipped with chairs and folding tables in varnished beech wood and stainless steel fittings.

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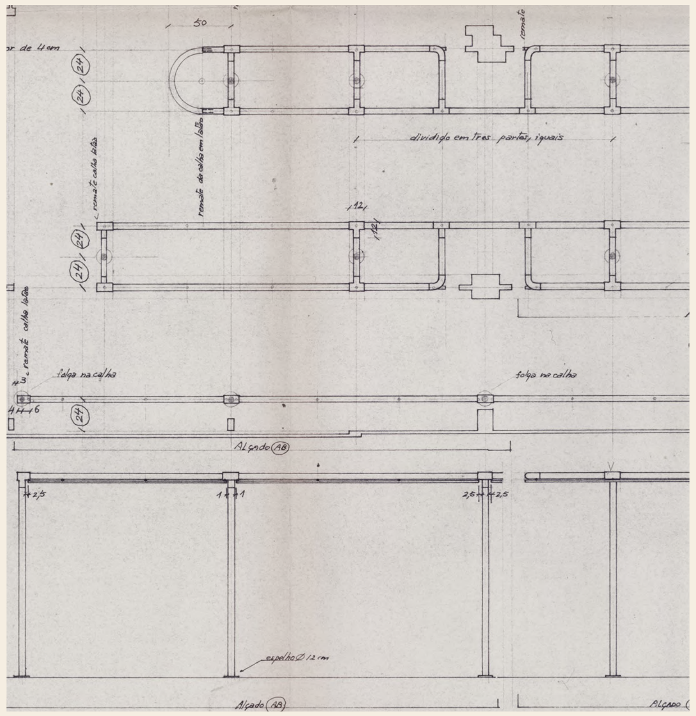

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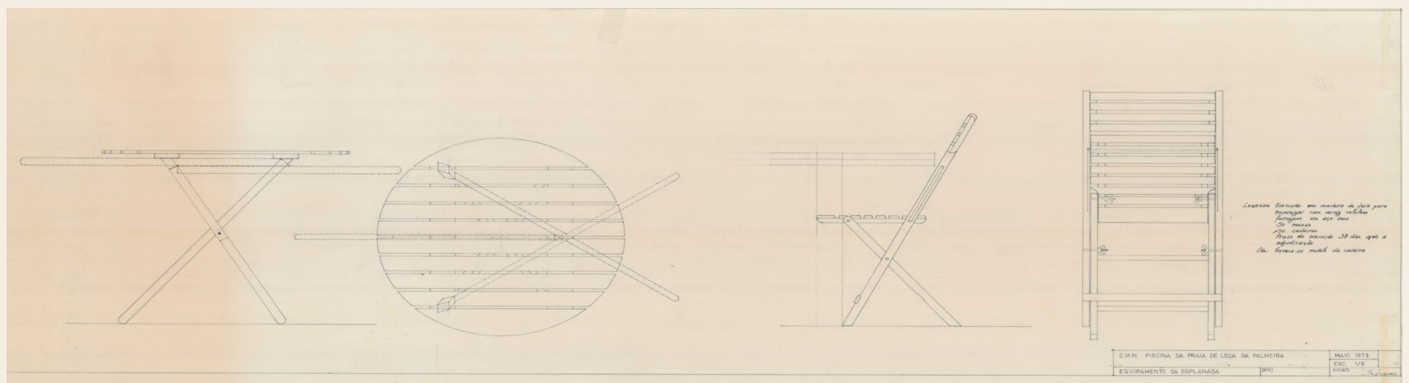

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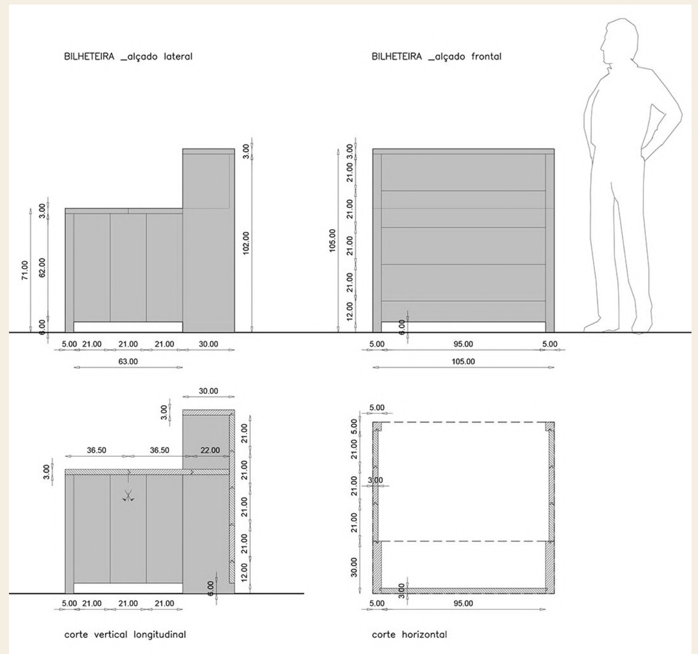
5.91 Cloakroom with the clothes hanging structure, n/d.
5.92 Clothes hanging structure, 1964.
5.93 Terrace furniture, 1973.
5.94 Reception counter, 2018.
5.95 Terrace furniture, 2021.

Conservation (2018-2021)

With the exception of the foot washes in the changing rooms, all bathroom fixtures, the round mirrors in polished stainless steel and the brass hangers have been replaced with new elements that faithfully reproduce the original design. Toilet brush holders, paper dispensers, litter bins, and wall-mounted liquid soap dispensers in stainless steel with a white epoxy finish were also installed. The foot wash in the collective changing room was repaired with a new piece of Estremoz marble, with the same characteristics as the existing one. Support cabinets were built in the employee's changing rooms in solid wood from reclaimed Baltic pine. For the new reception counter marine plywood was used. The existing hanger suspension structure in the cloakroom was repaired, including complete stripping, replacement of degraded elements, and protection with two coats of aliphatic polyurethane enamel. The bar counter and the kitchen equipment were replaced with stainless steel components. The terrace furniture was replaced with new elements in varnished ipe wood and synthetic fabric, designed by Álvaro Siza.



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ACTION LINES	
i. Inspection	Annual integrity check-up and record of furniture components, in terms of degradation phenomena, observing the existence of warping, non-solid connections, and gaps between components or damaged parts.
ii. Cleaning	Weekly (housekeeping routine) cleaning with a damp cloth and, if necessary, a non-abrasive brush. Every two years, the furniture must undergo a technical cleaning suitable for the type of dirt observed.
iii. Proaction	Every five years, furniture must be tuned, namely varnishing wooden surfaces to restore the protective finish and lubricating hardware and fittings. If superficial oxidization is detected in metallic components, a rust converter (corrosion passivator) must be applied to remove the crumbling rust layers, or even microcrystalline wax (as a lubricant repairer).
iv. Repair	If necessary, any future repairs or replacements of furniture and fittings must be in keeping with the shape, scale, proportion, material, texture, and finish of the original components. Any replacement of components must be properly documented.

Tanks (T)

"It was when I was invited to participate in this project that this idea emerged: instead of making a tank with concrete walls, as the engineer had designed, to use, as much as possible, the rocks as the limit of the pool." (Siza, 2015)

Original design (1960-1973)

The leveling of the bottom and the boundary walls of the swimming pools were carried out in cyclopean concrete consisting of coarse crushed aggregates smaller than 30 cm, agglomerated with 210 kg concrete and 90 kg/m³ of pozzolan. The top of these walls was coated with cement mortar in a 1:4 ratio, with a rough finish to prevent slipping. The adults swimming pool has a general drain around the north, east, and south perimeter, cast in the concrete of the walls and with an inner coating made of 1/2 cane of fiber cement. Along the entire length of these walls, there is a footrest ledge consisting of a reinforced concrete leveled console at a depth of 1.3 m with a projection of 0.15 m. The access ladders are removable and made of brass tubes and wooden steps.

The foot wash is 0.25 m deep and variable in width, with a minimum of 1.3 m. The edge on the side of the pool is straight and parallel to it, and the one on the opposite side has an irregular outline along the rocky edge. It is equipped with 2 copper tube showers with pedal control. There are two more foot washes, one next to the children's pool with a shower, and another by the south bathroom's entrance. They are all equipped with a bottom sewer and 'trop-plein'.

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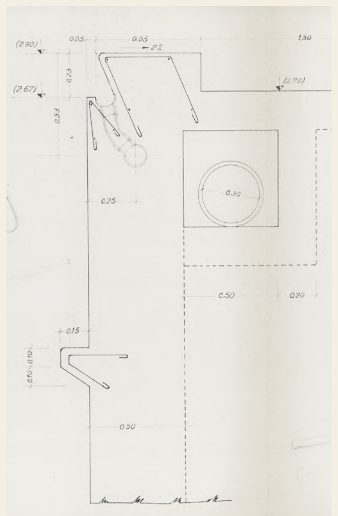

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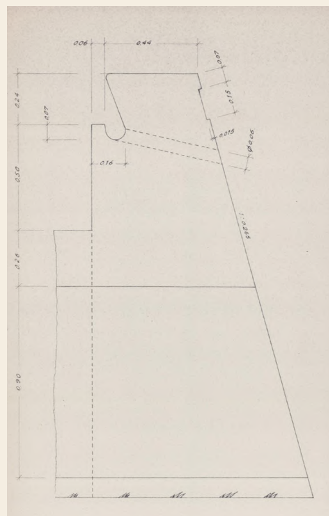

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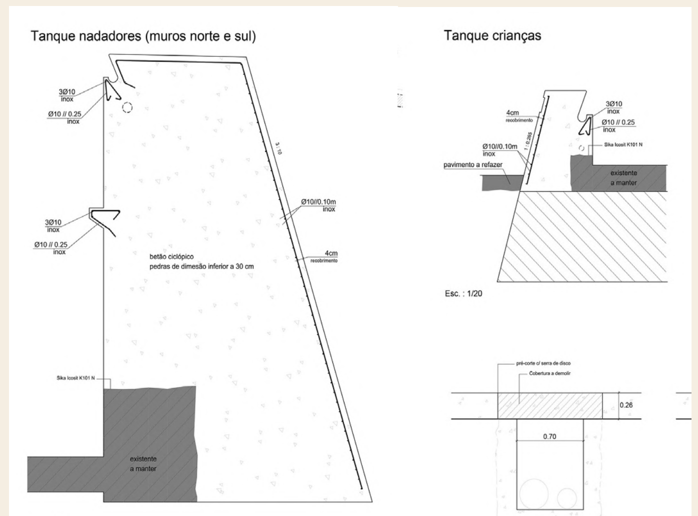
5.96 Adults and children swimming pool, 1968.
5.97 Detail of the adults swimming pool wall, 1965.
5.98 Detail of the children swimming pool wall, 1965.
5.99 Beginning of the pool's construction, 1961.
5.100 Details of the swimming pool walls, 2018.
5.101 Adults swimming pool and foot wash, 2021.

Conservation (2018-2021)

The inner face and top of the north and south walls of the adults swimming pool and the wall of the children's swimming pool were demolished to replace the embedded pipes. They were later rebuilt in cyclopean concrete with 90/280 coarse crushed aggregates (30% of the total volume), the outer face in exposed concrete, the inner face prepared to be painted and the upper face troweled, including the application of a 2-component structural epoxy binder in all new/existing/rock bonding surfaces, edging gutters and steps. A concrete wall was built on the rocky edge of the adults swimming pool to contain the water, as a depression in the rocks prevented the tank from being completely filled, including drilling and fixing stainless steel rods using a high-quality heavy-duty performance bonding chemical and the application of a 2-component epoxy binder to all new/rock bonding surfaces. Two coats of white chlorinated rubber paint were applied to the inner face of the walls and bottoms of the tanks, after previously washing the surfaces with water jet and repairing cracks. In the paint used for foot washes, an additive with non-slip properties was incorporated. The removable ladders of the adults swimming pool were restored, including the replacement of the steps with pieces of solid ipe wood, with a grooved surface, and brass screws.



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ACTION LINES	
i. Inspection	Annual condition check-up and record of the anti-slip surfaces, observing the presence of stains, color changes and cracking. Every ten years, a structural inspection of the concrete elements must be carried out by a structural engineer to verify the existence of new anomalies or the aggravation of existing ones.
ii. Cleaning	Daily vacuuming, for one hour and a half to three hours, to remove impurities such as sand, algae, plastics, and other residues. Daily cleaning and disinfection (with bleach) of the swimming pools' surroundings and foot washes during the day and after the building closure, in order to leave the place ready for opening the next day. Annual cleaning of painted surfaces with a water jet, followed by their repainting (if necessary) with waterproofing white plastic paint.
iii. Proaction	Some of the routines may be somewhat conditioned by weather conditions and cumulatively by the exposure of the building to the maritime environment, especially during the winter. Therefore, any adjustments and corrections to the implementation of maintenance actions must be foreseen beforehand.
iv. Repair	If necessary, repair works must be carried out on the white-painted surfaces. In case of cracking, the measurement of the opening of important cracks must be carried out by the technician responsible for the inspection. These works must include a previous diagnosis.

Installations

Plumbing (Ip)

"*The plumbing will be in copper piping.*" (Siza, 1973)

Original design (1960-1973)

The water used to fill the pools is collected directly from the sea through a collection gallery connected to a well with a diameter of 3 m and 18 m of depth. It is lined with prefabricated concrete blocks where two porous concrete filtering wells were installed, 1 m in diameter and 12 m deep. From this well, a gallery measuring 1.50 × 1.80 m extends 102.90 m under the sea. Both galleries and wells were filled with 'Caia borgau' and coarse sand. At convenient points in the gallery, deep cracks were opened in the rocks by means of explosions, which allowed water to enter the gallery and the filtering wells. The water is then sent to the treatment room, which is equipped with 3 clarifying filters. Subsequently, the water circulates to the pools through cast iron and fiber cement pipes. Both pools are equipped with water inlets, foot washes, and showers.

The remaining water supply piping is made of copper when exposed and galvanized iron when embedded. All the faucets are in copper-plated brass while the showers are in copper tube.

Drainage of rainwater and wastewater is carried out using glazed stoneware pipes, patio siphons and manholes, siphoned boxes, and connection boxes with brass grids. The bottom discharge of the adults swimming pool is located at the lowest point of the sill, leading directly to the beach through a 250 mm diameter cast iron pipe fitted with a drain. This tube is embedded in the south wall, closed from the inside by a special sand and salinity-proof valve, controlled remotely from the top of the wall. The valve is located in a niche so that it can be inspected and removed if necessary.

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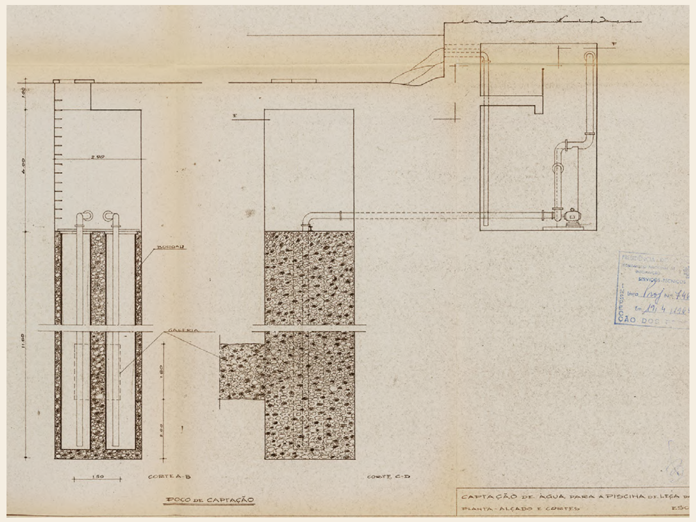

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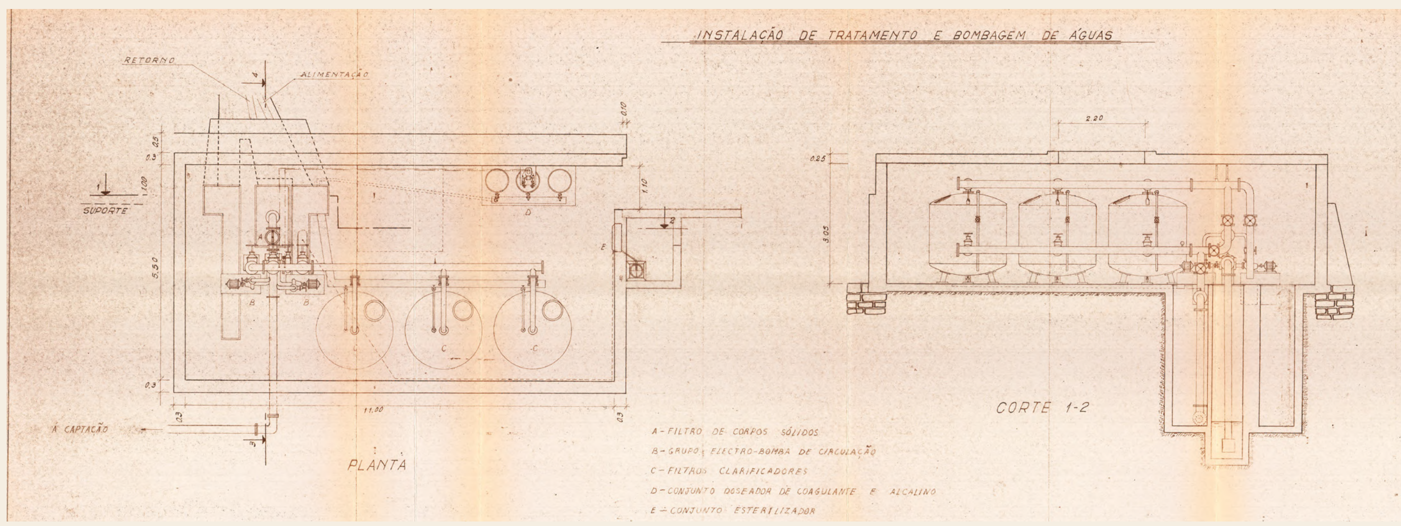

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Conservation (2018-2021)

The water supply system was entirely refurbished, with the external network in HDPE pipe installed in a buried trench and the interior network installed in the open, in copper pipe with copper-plated brass clamps. The pipes of the wastewater collection system, which were in poor condition, were replaced with new ones made of PVC embedded in the floors or buried in a trench in the case of the external collectors. Lids with a rim for filling and finishing were applied to the manholes, in accordance with the surrounding floor. The washbasins and urinals were equipped with bottle siphons, in copper-plated brass, connected to this network via exposed stainless steel tubes, duly ventilated. The existing rainwater drainage system was maintained. To drain the roof and pavement of the new north building, collectors buried in a ditch were installed in rigid PVC 6 kg/cm². The grids of the existing drains were replaced with a model similar to the original, in brass. All iron pipes and accessories in the pools' recirculation system were replaced with new HDPE or PVC PN10 kg/cm² pipes. In the adults' swimming pool, the existing water outlets were reformulated and 4 water inlets were inserted on the east wall to improve the disinfection capacity. The treatment circuit for the children's swimming pool was separated, equipped with a closed-type winding fiberglass reinforced polyester filter, with a single filtering bed in sand 1.20 m high, and a filtration pump in marine bronze with a 12h regeneration cycle. In the water treatment room, the 3 existing physical treatment filters and respective collectors were replaced, as well as the chemical treatment process. For this purpose, 3 membrane dosing pumps were installed to automatically measure and regulate the chlorine, the pH value, and the flocculant for each treatment circuit. The existing fire-fighting means were complemented with sprayed water extinguishers.

5.102 Water treatment room, n/d.
5.103 Water collection well, 1965.
5.104 Water treatment and pumping system, 1965.
5.105 Water supply network in copper tube, 2021.
5.106 Updated equipment inside the water treatment room, 2021.

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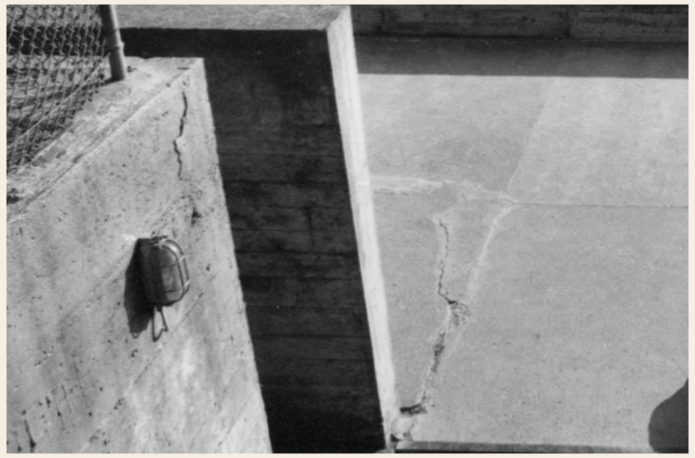
ACTION LINES	
i. Inspection	Annual check-up and record of the plumbing system to prevent water leaks, signs of clogging, corrosion, or damage to joints. Verification of fire extinguisher supports and safety seals/pins, carried out by an entity duly authorized for this purpose.
ii. Cleaning	Two times a day, pool filters should be cleaned. Annual cleaning of the water collection galleries and plumbing system must be conducted, resorting to a speleology team (if necessary).
iii. Proaction	Every five years, fire extinguishers must be loaded with new extinguishing agent by an entity duly authorized for this purpose.
iv. Repair	If necessary, repair or replacement of any component must be in keeping with the characteristics of the existing ones. In the event of future interventions that require access to the pool plumbing system, a superficial demolition must be carried out to avoid damaging the slabs. These works must include a previous diagnosis.

Installations
Electrical wiring (Ie)

"The site will be equipped with artificial lighting, with particular attention to the entrance, bar and annexes, since only in this area is night-time operation foreseen." (Siza, 1973)

Original design (1960-1973)

Initially, only the lighting of technical areas such as storage rooms or the water treatment room was planned, together with the occasional installation, outside, of oval wall-mounted fixtures, with an aluminum grille. Later, spotlights were installed on the west façade. The water collection system is equipped with electric motors and has its own electrical panel, as well as the bar.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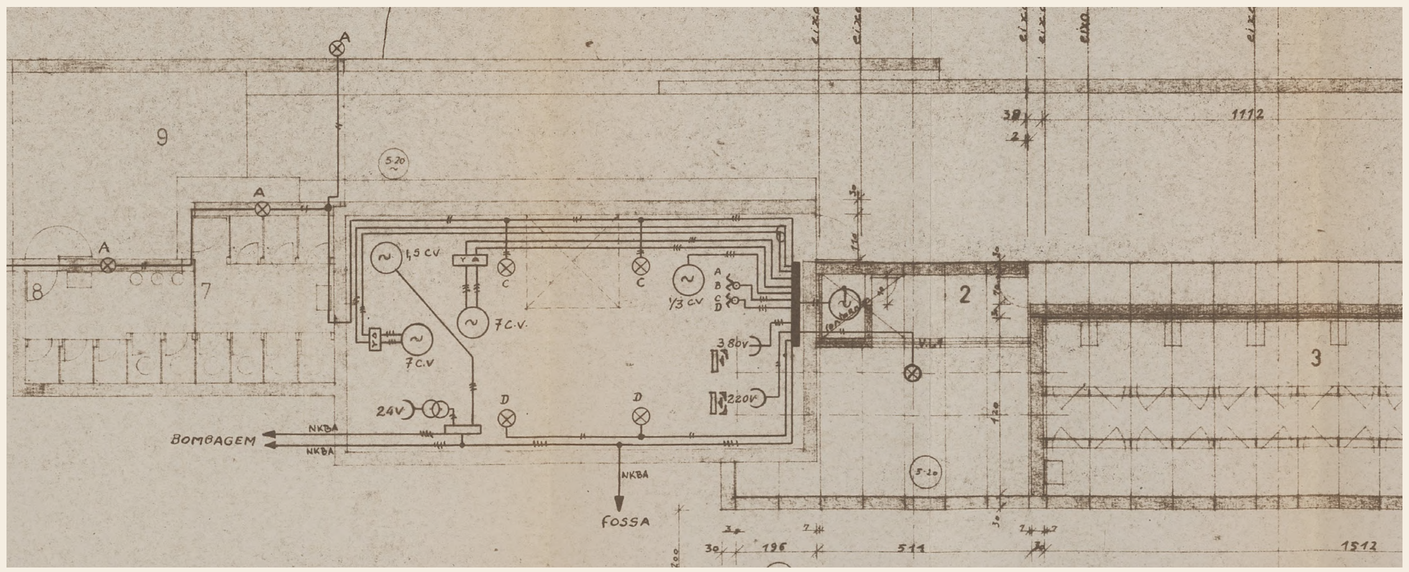

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5.107 Wall mounted exterior light fixture, 1965.
5.108 Wall mounted exterior light fixture, 1965.
5.109 Electrical installation plan, 1965.
5.110 Copper tubes for the electrical network, 2021.
5.111 Exposed electrical network inside copper tubes and light fixtures, 2021.
5.112 Exterior technical cabinet drawings, 2018.
5.113 Exterior technical cabinet, 2021.

Conservation (2018-2021)

The electrical wiring was entirely replaced with HDPE-type cables in embedded tubes (on the floors, walls, and ceilings) or XG-type cables inside exposed copper tubes, fixed with copper-plated stainless steel clamps. Outside the building, the electrical installation was buried, consisting of cables with double or reinforced outer sheaths threaded into tubes placed at the bottom of 1 m deep trenches. The pipes used in the embedded network are made of semi-flexible PVC when inside concrete structures and VD in other cases. In the underground network, HDPE pipes were installed. Most of the premises were equipped with circular light fixtures for ceiling or wall installation, 21 cm in diameter, natural aluminum body, frosted glass diffuser with anti-insect surfaces, equipped with LED lamps with low energy consumption. Inside the building, the telecommunications network was made with hidden or embedded VD pipe. In the water treatment and collection rooms, a dedicated circuit was added for the children's pool water recirculation system. As part of the landscape design, two technical cabinets were built at the waterfront level, in solid granite with a fine peaked bush-hammered finish and stainless steel doors with a brushed finish.


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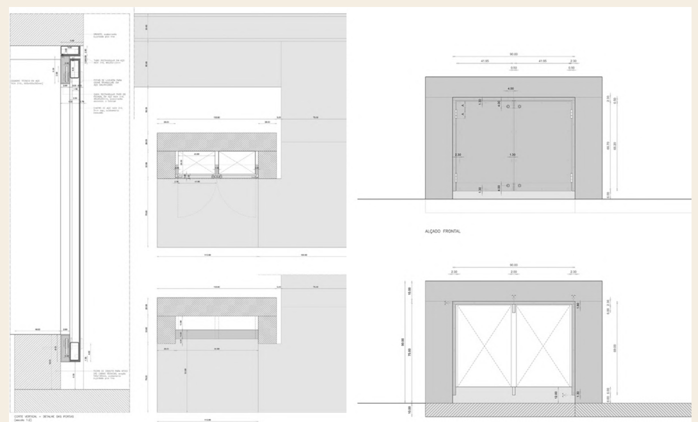
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ACTION LINES	
i. Inspection	Semi-annual check-up and record of the electrical wiring condition, assessing the functioning of light fixtures, circuits, and equipment.
iii. Proaction	Annual control and record of the electrical circuits and lighting through testing the electrical/mechanical operation of the equipment.
iv. Repair	If necessary, repair or replacement of any component must be in keeping with the characteristics of the existing ones. Immediate replacement of defective lamps or cables must be carried out. These works must include a previous diagnosis.

5.4.3 Maintenance schedule

Having identified the specifications for the maintenance actions of each Maintenance Source Element and its components, it is important to organize them to allow their planning throughout the expected useful life of the building in the context of a Maintenance Plan. Therefore, a schedule was prepared that simultaneously allows the definition of the works that will have to be carried out and contracted, the estimated periodicities (daily, weekly, semi-annual, annual, every two years, every five years, and every ten years), and those responsible for its implementation. In addition to the scheduled maintenance actions, the allocation of intervention priorities can also be outlined depending on the severity and urgency of the occurrence of a given failure or damage.

PERIODICITY	MAINTENANCE ACTION	SPECIALIST
Daily (bathing season)	Inspection rounds before closure to ensure all electrical and plumbing installations are properly turned off.	Maintenance manager/ Technical operator
	Record of housekeeping routines, filter cleaning, water and light consumption, and number of users in the pool.	Maintenance manager/ Cleaning assistant
	Vacuuming, for one hour and a half to three hours, to remove impurities such as sand, algae, plastics, and other residues.	Technical operator
	Cleaning of the water treatment filters two to three times a day.	Technical operator
	Disinfection treatment of the swimming pools' water.	Technical operator
	Cleaning (housekeeping routine) of interior and exterior pavements and disinfection (with bleach) of the surroundings of the swimming pools, foot washes, and bathrooms.	Technical operator/ Cleaning assistant
Weekly	Cleaning (housekeeping routine) of furniture and frames with a damp cloth and, if necessary, a non-abrasive brush.	Cleaning assistant
	Cleaning of garden spaces, with the removal of waste and weeds, as well as grass and shrub trimming.	Gardener
Semi-annual	Condition check-up and record of the water drainage components, to ensure that no blockages occur from the accumulation of waste or sand.	Maintenance manager/ Technical operator
	Condition check-up and record of the electrical wiring, assessing the functioning of light fixtures, circuits, and equipment.	Electrician
	Maintenance of the plumbing system, such as pumps and filters.	Technical operator
Annual	Condition check-up and record of the roof's copper cladding to ensure that there is no damage, such as signs of corrosion (especially from pitting and/or interstitial), cracks in the joints between the sheets, deformations (kinks and warping) or other anomalies, observing if the copper plates are mounted correctly.	Technical operator
	Condition check-up and record of the wooden structures and partition walls, focused on their stability and degradation phenomena, observing the existence of cracks, deformations, defects of the structural elements, signs of rotting, or signs of attacks by xylophagous organisms.	Technical operator/ Carpenter
	Condition check-up and record of the reinforced concrete structures to ensure that there is no damage, such as cracking, evidence of efflorescence, concrete delamination, oxidized rebar, and accumulations of dirt.	Technical operator
	Condition check-up and record of the wooden frames, in terms of degradation phenomena, observing the existence of warping and excessive gaps between profiles and frames, signs of rotting or signs of attacks by xylophagous organisms, and its proper functioning.	Technical operator/ Carpenter
	Condition check-up and record of the metallic elements in terms of degradation phenomena (control of the following factors: joints between frames, elasticity of the protective fence, functioning of the condensate drainage channels), observing the existence of warping, excessive clearances and adhesion to the support, and the existence of cracks or breaks in the perimeter seal and its proper functioning.	Technical operator/ Carpenter
	Condition check-up and record of furniture components, in terms of degradation phenomena, observing the existence of warping, non-solid connections, and gaps between components or damaged parts.	Technical operator
	Condition check-up and record of the anti-slip surfaces, observing the presence of stains, color changes, and cracking.	Maintenance manager/ Technical operator
	Condition check-up and record of the plumbing system to prevent water leaks, signs of clogging, corrosion, or damage to joints.	Technical operator/ Plumber
	Verification of the fire extinguisher supports and safety seals/pins.	ANEPC certified company
	Control and record of the electrical circuits and lighting through testing the electrical / mechanical operation of the equipment.	Gestor de manutenção/ Electrician
	Cleaning of the copper cladding using a soft brush so as not to damage the patina including the water drainage components.	Technical operator
	Cleaning of painted surfaces with a water jet, followed by their repainting (if necessary) with waterproofing white plastic paint.	Construction helper/ Painter
	Cleaning of the water collection galleries and all plumbing systems.	Speleology team
	Lubrication and tuning of hinges, locks, and pivots, and, in case superficial oxidization is detected, a rust converter (corrosion passivator) must be applied to remove the crumbling rust layers, or even microcrystalline wax (as a lubricant repairer).	Technical operator/ Carpenter
Every 2 years	Cleaning with water jet and manual brushing of all wooden structures, partition walls, and frames. If necessary, wooden surfaces must be lightly sanded without entirely removing the existing layer of coating, followed by the application of one coat of an alkyd-based solution (Bondex Classic Mate ref. 4385) with a brush following the wood grain direction.	Technical operator/ Carpenter
	Cleaning of metallic surfaces with a damp cloth and/or a neutral cleaning product (5<PH<8), mixed with water in the proportion of 5%, using a non-abrasive well-impregnated sponge.	Carpenter/ Cleaning assistant
	Technical cleaning of furniture suitable for the type of dirt observed.	Technical operator
Every 5 years	Condition check-up and record of the roof's copper cladding, assessing the existence of early degradation in the joints/overlays and in the seam clips and screws of the copper plates.	Technical operator
	Condition check-up and cleaning of the concrete slabs' waterproofing with water and a soft brush, without damaging the membranes. Special attention should be paid to the edges and overlaps that must be perfectly adhered, evaluating their elasticity.	Technical operator
	Clean and treat the surfaces of the cyclopean concrete retaining walls by removing any biological colonization without damaging the patina.	Construction helper
	Load fire extinguishers with new extinguishing agent.	ANEPC certified company
	Tuning of furniture, namely varnishing wooden surfaces to restore the protective finish and lubricating hardware and fittings.	Technical operator/ Carpenter

Every 10 years	Inspection of structural elements' integrity, to evaluate the appearance of new anomalies or the aggravation of existing ones, paying special attention to supports and connections.	Structural engineer
	Cleaning of the white concrete slabs with sandblasting air compressor, without adding any chemical products.	Sweeper
	Cleaning of the cement plaster pavements with nebulized water and a brush, without adding any chemical products.	Sweeper
	Treat (if necessary) oxidized rebars in the walls, through the complete removal of the oxidized layer to determine the loss of section. Provide for its correct replacement, with the application of a protective layer against corrosion.	Structural engineer/ Construction helper

5.114

5.114 Maintenance calendar.
5.115 Housekeeping routines in the adults swimming pool foot washes, 2021.

C.2	*Inspection routines*	Promote regular inspection routines that should be more frequent during bathing season. Any anomalies identified in the building must be communicated to the site managers.
C.3	*Maintenance Plan*	**C.3.1** *Framework* - Develop and implement a Maintenance Plan that takes into account the detailed conservation framework and guidelines outlined in this CMP. **C.3.2** *Budget* - Consider an estimate of annual maintenance costs (estimated annual average charges, at nominal current value and without updating rate) for each maintenance action, quantifying the expected and accumulated investment over determined time periods. **C.3.3** *Manuals* - Develop cyclical maintenance and treatment manuals to establish priorities and short and long-term conservation interventions, thus maintaining a proactive conservation approach.

5.4.4 Operational management and use policies

Operational management and use aim at establishing a set of policies to ensure the correct functioning of the building. Thus, the Portuguese standard (IPQ, 2009) defines guidelines for the implementation of a maintenance management system, namely:

i) Statement of maintenance policy and objectives;

ii) Maintenance manual;

iii) Documented procedures and records required by the Portuguese standard;

iv) Documents, including records, determined by the maintenance managers to be necessary to ensure the effectiveness of the planning, operation, and control of its processes.

The maintenance management system documentation may differ according to the type and complexity of the building. It is also necessary to consider the role of management responsibility, which must provide evidence of commitment to the development of the maintenance management system and the continuous improvement of its effectiveness, ensuring the pre-established objectives and the availability of resources.

The Ocean Swimming Pool CMP establishes a set of policies that aim to ensure proper functioning and use, outlining a set of operational management requirements that must include: i) description of suppliers and product guarantees (materials and equipment); ii) description and operation of the hydraulic and mechanical systems (includes regulations, if applicable); iii) description and operation of the security system (includes regulations, security patrols and signaling) and action plan and risk awareness; iv) description and operation of the lifesaving and rescue conditions; v) description and operation of the fire prevention system (includes regulations and signage, if applicable); vi) description and operation of the housekeeping routines.

Furthermore, the admission and accessibility conditions must be stated in the user manual, which should include: the first actions to be carried out upon entering the building; information on the suppliers of the various components and elements, in order to facilitate contact in case of need; rights and responsibilities of users; regulations and legislation related to the building; prohibitions, warnings and recommendations of use; health and safety measures.

5.115

Accessibility

The building is located on Liberdade Avenue with access to public transport through bus route number 507, connecting it to the city center of Porto. The bus stops by every half an hour by the building's entrance where there is also parking for cars and motorcycles. Access and parking inside the building are prohibited both to bicycles, scooters, and motor vehicles. Even though it is easy to find parking close to the site, there is a lack of traffic signage indicating its precise location. Therefore, many tourists and visitors, who do not know the area, have difficulty reaching the place.

Both community expectations and legal requirements for accessibility have changed considerably since the Ocean Swimming Pool's opening. Public facilities such as this are now expected to be accessible to everyone. Consequently, in the last conservation works, bathrooms for users with impaired mobility were introduced. However, accessibility is no longer just about providing facilities for people with impaired mobility. It includes people with sensory disabilities, older people, and families with young children. Therefore, more needs to be done in what respects ensuring accessibility to everyone as most exterior areas, including the swimming pools, remain largely inaccessible. Mitigation or adaptation measures, however, must not affect Álvaro Siza's vision for the site, ensuring that future interventions are respectful of the design principles identified in section 2.5.2.

Admission

During the bathing season (June to September) the site is open every day from 9h00 to 19h00. Access is subject to an entrance fee and is conditioned to weather conditions. The number of visitors is permanently controlled to ensure the premises' maximum capacity is not surpassed and in this way preserve the asset's integrity. During the rest of the year, access is limited to guided visits, which must be booked in advance.

Housekeeping

Different housekeeping routines are carried out to keep the space functional. For the correct operation of the swimming pools, it is necessary to carry out a daily water maintenance routine. Thus, it is required to perform several procedures consistently throughout the day to ensure that the water remains clean and safe for public use. There is a daily routine related to water quality which includes water disinfection, filter maintenance, pool vacuuming, and sanitary record (cleaning register, chlorine control and logistics, pH level, temperatures, water and electricity consumption, and number of users). Weekly preventive maintenance of equipment should be performed to ensure continuity of service. The atmospheric conditions often do not allow to carry out part of the daily routine maintenance tasks, since it exposes technical operators to strong winds and rain, preventing the proper performance of their functions. The most common problem when daily routines in the swimming pools are not performed is clogging of the plumbing system (see detailed policies for the plumbing system in section 5.4.2).

During bathing season, when the Ocean Swimming Pool is open to the public, there is a daily cleaning routine that consists of an early morning inspection to detect and eventually report any anomaly or missing materials. Then, during the day there is a repeated cleaning and disinfection routine between the pools, foot washes, and bathrooms. The latter suffer from intensive use during summer, being more prone to problems related to misuse such as clogging.

5.116 Bus stop at the building's entrance, 2021.
5.117 Wristband entrance identification, 2021.
5.118 Housekeeping routines in the water treatment room, 2021.
5.119 Housekeeping routines in the south bathrooms, 2021.
5.120 Pool and building housekeeping routines.

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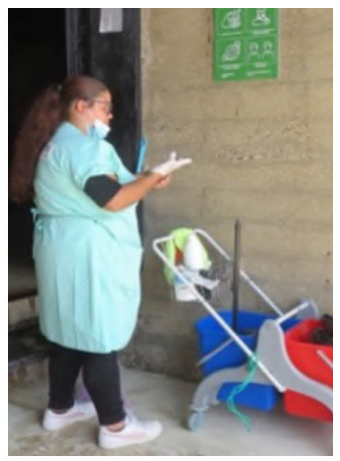

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C.4	*Accessibility Plan*	Develop and implement an Accessibility Plan for users with mobility impairments, ensuring the designated circulation areas and spaces remain free of physical obstacles.
C.5	*Capacity and entrance control*	**C.5.1** *Occupancy* - Ensure the building's occupancy is permanently controlled to prevent any damage to the site from exceeding its designated capacity. **C.5.2** *Visitor information* - Display occupancy information (low, high, and "sold out") on the exterior of the building to avoid the formation of long lines and the consequent frustration of visitors who are prevented from entering. The possibility of making this information available online should be considered.

POOL: the pool needs a constant cleaning routine to maintain the optimal conditions for use. Different procedures are followed during the day.

Water disinfection

A water disinfection plan is carried out constantly during the day on the pools through a pump system preventing any seaweed formation.

Filters maintenance

The filters of the pool must be cleaned. This process is carried out depending on the number of users of the pool, but it must be done at least twice a day.

Pool vacuum

The pool must be vacuumed every morning during one and a half to three hours to clean impurities like sand, seaweed and plastics.

Exterior daily cleaning

Daily maintenance cleaning of the beach and pool areas must be done to avoid waste accumulation. Also, the pavement near swimming pools and foot washes must be disinfected (with bleach).

BUILDING: during the day it is necessary to repeat a cleaning routine for the building in order to maintain the areas in perfect conditions for visitors and users.

Equipment check and inventory

Check changing rooms, foot washes and bathrooms (including toilet paper and hand gel).

Sanitary control and record

A daily record of sanitary cleaning, filters, water and electricity consumption, pH level, temperature and number of users on the pool is carried out to inform the cleaning routine.

Bathroom cleaning and maintenance

Maintenance cleaning and replenishment of the bathroom must be conducted (toilet paper, soap, etc.).

General cleaning

The general cleaning routine of the building is performed both in interior and exterior areas (pool surroundings, beach and foot washes). The complete routine is performed at night after building's closure in order to leave the site ready for the following day.

5.120

C.6	*Housekeeping routines*	Define and implement housekeeping routines that are permanently updated to the best international and technical standards. They must be clearly conveyed to the technicians responsible for carrying them out on a daily basis as they are fundamental for the long-term preservation of the asset's significance.

Security

During the day, in the bathing season, four security guards are in charge of the site surveillance: one is controlling visitor access by the main entrance, two are patrolling the north and south boundaries to prevent trespassing, and the last stands in the proximity of the pools to ensure that the public complies with the regulations of the facility. During the night and off the bathing season, only one security guard patrols the premises to prevent acts of vandalism. Any occurrences or anomalies detected during the patrols must be reported to the site managers. The Ocean Swimming Pool, however, is a complex area to control since it is not an enclosed space, being easily accessed through the beaches.

Lifesaving and rescue

During the bathing season two lifeguards surveil the premises to respond to any aquatic emergency. The lifeguard station is equipped with all the elements necessary for rescue at sea or first aid response. Lifeguards are also responsible for evaluating sea conditions in order to raise the appropriate flag that informs users whether they can or cannot go for a swim.

Fire safety

The Ocean Swimming Pool is equipped with fire extinguishers and has personnel trained on how to use the equipment properly. Nevertheless, until now, not all fire prevention measures have been fully implemented in the building, and there is a lack of proper signage and emergency lights. Even though the implementation of a fire prevention plan is of the utmost importance, any new elements introduced must be integrated in ways that do not hinder the cultural significance of the place.

Risk awareness

The Civil Protection department of the Municipal Council of Matosinhos has learning programs to mitigate risks. One of these projects, named “Casa do Alertinha”, is destined for children and implemented in schools, where they are taught to face different types of risks and mitigate them through face-to-face and online activities.

5.121 Guard securing the premises, 2021.
5.122 Emergency lights, 2021.
5.123 Lifeguard station, 2021.
5.124 Bathers, 1992 (following page).

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C.7	*Security system*	Implement a more comprehensive security system that simultaneously prevents misuse during operating hours and acts of vandalism during closing hours.
C.8	*Lifesaving and rescue*	Ensure the permanent availability of lifeguards on the site during the bathing season as immediate emergency responders charged with rescue at sea. Lifeguards’ instructions regarding the safety of the bathers must be respected.
C.9	*Fire Prevention Plan*	Develop and implement a Fire Prevention Plan. The implementation of safety regulations namely emergency exit signs, fire extinguishing means, staff training, evacuation routes, and protocols on the premises is mandatory.
C.10	*Risk awareness learning plan*	Enhance risk awareness activities to raise public awareness about the most significant factors threatening the Ocean Swimming Pool and the possible responses to mitigate them.

User regulations

The use of the Ocean Swimming Pool implies compliance with a series of regulations to ensure users' comfort and safety, as well as the preservation of the site. Also, health emergencies such as the COVID-19 pandemic (2020-2021) demonstrated the need for preventive guidelines to ensure user safety on the premises. Thus, it is essential to develop specific measures for aquatic facilities.

Successful management and maintenance are only possible with community involvement and empowerment, namely with the support of user manuals, which clearly convey information and guidelines. Hence, users are a key factor in built heritage maintenance, helping to avoid improper use, preventing risk situations, contributing to the recording of information, and collaborating in daily maintenance activities. From this point of view, civil society has an important role to play in preserving heritage, as well as in contributing to a sustainable and culturally integrated development. The Ocean Swimming Pool illustrated User Manual (fig. 5.128) provides information on prohibitions, warnings, recommendations, and emergency protocols.

5.125 Use restrictions warnings, 2021.
5.126 Warning signage, 2021.
5.127 Visitor temperature control during COVID-19 pandemic, 2021.
5.128 User Manual.

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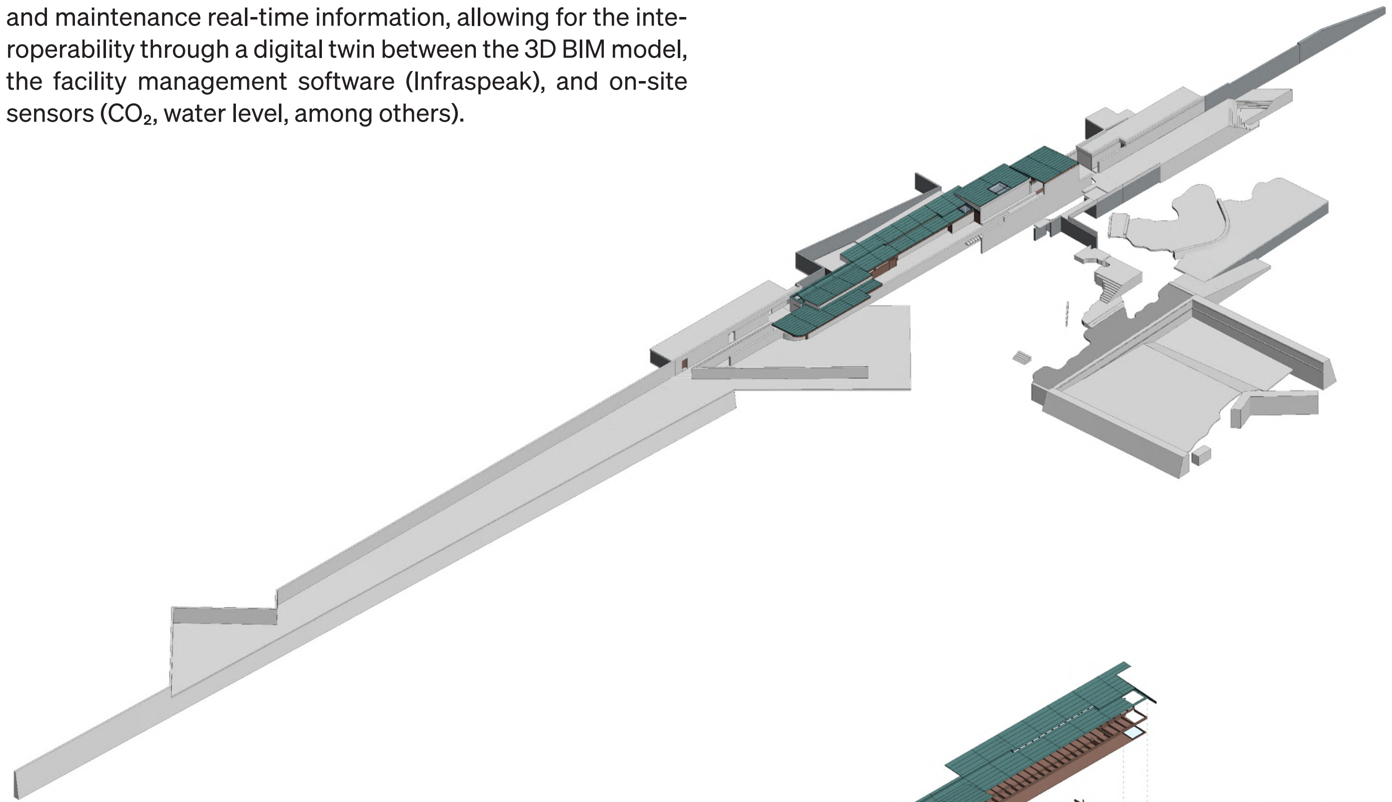
C.11	*User regulations*	Enforce the Ocean Swimming Pool User Regulations, developed by Matosinhos Sport, to ensure visitors' safety and quality of experience.
C.12	*Health Emergency Plan*	Enforce and implement, whenever necessary, transitory regulations in case of declared health emergencies that introduce disruptions in the normal functioning of the Ocean Swimming Pool. Health Emergency Plans must comply with health authorities' instructions.

Building information documentation

During the elaboration of this CMP, a large amount of data was collected, namely from archival research, interviews, and fieldwork. The Municipal Council's Department of Conservation keeps records of interventions, nevertheless, data regarding building management, conservation, and maintenance is dispersed, as there is not an integrated and digitized database. The Municipal Council is working on the implementation of a Building Information Management System with management and maintenance real-time information, allowing for the interoperability through a digital twin between the 3D BIM model, the facility management software (Infraspeak), and on-site sensors (CO_2, water level, among others).



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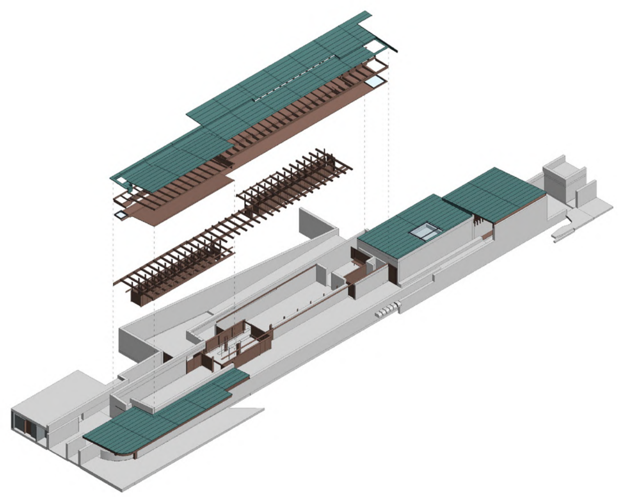

5.130

5.129 BIM model general view.
5.130 BIM model detailed view of the changing rooms.

C.13	*Archival database*	Gather and organize all information related to conservation interventions, namely techniques, methodologies, and materials employed, as well as graphic, photographic, digitized, or other documentation on the adopted procedures.
C.14	*Building information management system*	Develop and implement a building information management system with facility management tools for inspection and maintenance routines including notifications and alerts in real time.

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6. MONITORING

6.1 Introduction
6.2 Management system and sources of finance
6.3 Monitoring
6.4 Priority of actions, implementation and phasing

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6. MONITORING

6.1 Introduction

Chapter 6 presents the monitoring recommendations for the conservation of the Ocean Swimming Pool. Based on the previously developed policies, it aims at providing a comprehensive framework for future management decisions, defining priorities and a timeframe for the implementation of conservation actions, according to funding and the availability of other resources.

The chapter is structured in three sections, starting with the description of the management framework and the available resources for conservation (6.2). The following section (6.3) presents a monitoring methodology based on general issues and pressing hazards (identified in chapter 4). Finally, priority actions, implementation, and phasing (6.4) are detailed through the prioritization of policies and the definition of a timeframe for their implementation.

All of these aspects are tightly related to the management system. The success of monitoring and assessment depends on a robust management system, capable of handling the articulation of different and varied entities, conflicts, and visions (Court *et al*., 2022). As the Burra Charter sustains, while "*conservation is an integral part of good management of places of cultural significance*" (ICOMOS Australia, 2013, article 2.3), monitoring "*should guide managers towards giving emphasis to maintenance and preventive measures, thus relieving the need for curative/restorative interventions*" (Boccardi & Stovel, 2004, p. 131).

Thus, adequate monitoring inside a well-functioning management system allows the development of a sustainable intervention culture in which the stakeholders act based on preventive measures instead of reactive ones (Ferreira, 2020). This is the ultimate goal of this CMP. In the end, while preserving the property for future generations, it also entails a positive impact through time on improving the quality and efficiency of public services for the visitors and users of the Ocean Swimming Pool, with responsible use of resources (Feilden; Jokkilehto, 1998).

6.2 Management system and sources of finance

6.2.1 Management system

As the Ocean Swimming Pool is a listed building since 2011, the property is subjected to a specific management system created to maintain its heritage values. In the most recent government structure for safeguarding heritage (Decree-Law 78/2023, of September 4) the licensing of any work, intervention or change of use concerning a listed property or in the respective Buffer Zone requires prior consent from the competent Regional Coordination and Development Commission with a binding decision subsequently made by Cultural Heritage, I. P.

Each listed property has a Buffer Zone to reinforce its landscape setting, safeguard the surrounding architectural specificity, and preserve the property's visibility and contemplation conditions (article 43, Law No. 107/2001). The Buffer Zone serves as an administrative control area for the Municipal Council and the other competent authorities (Cultural Heritage, I. P. and Regional Coordination and Development Commission), for construction licenses and any other works that alter the topography, alignments and height and, in general, the distribution of volumes and roofs or the external finishings of buildings.

In addition, on a local level, all Portuguese Municipalities have mandatory Municipal Master Plan that defines the strategic framework for the municipality's spatial planning. All plans include a Heritage Map, and contribute to the safeguarding of cultural heritage while defining policies for conservation and monitoring.

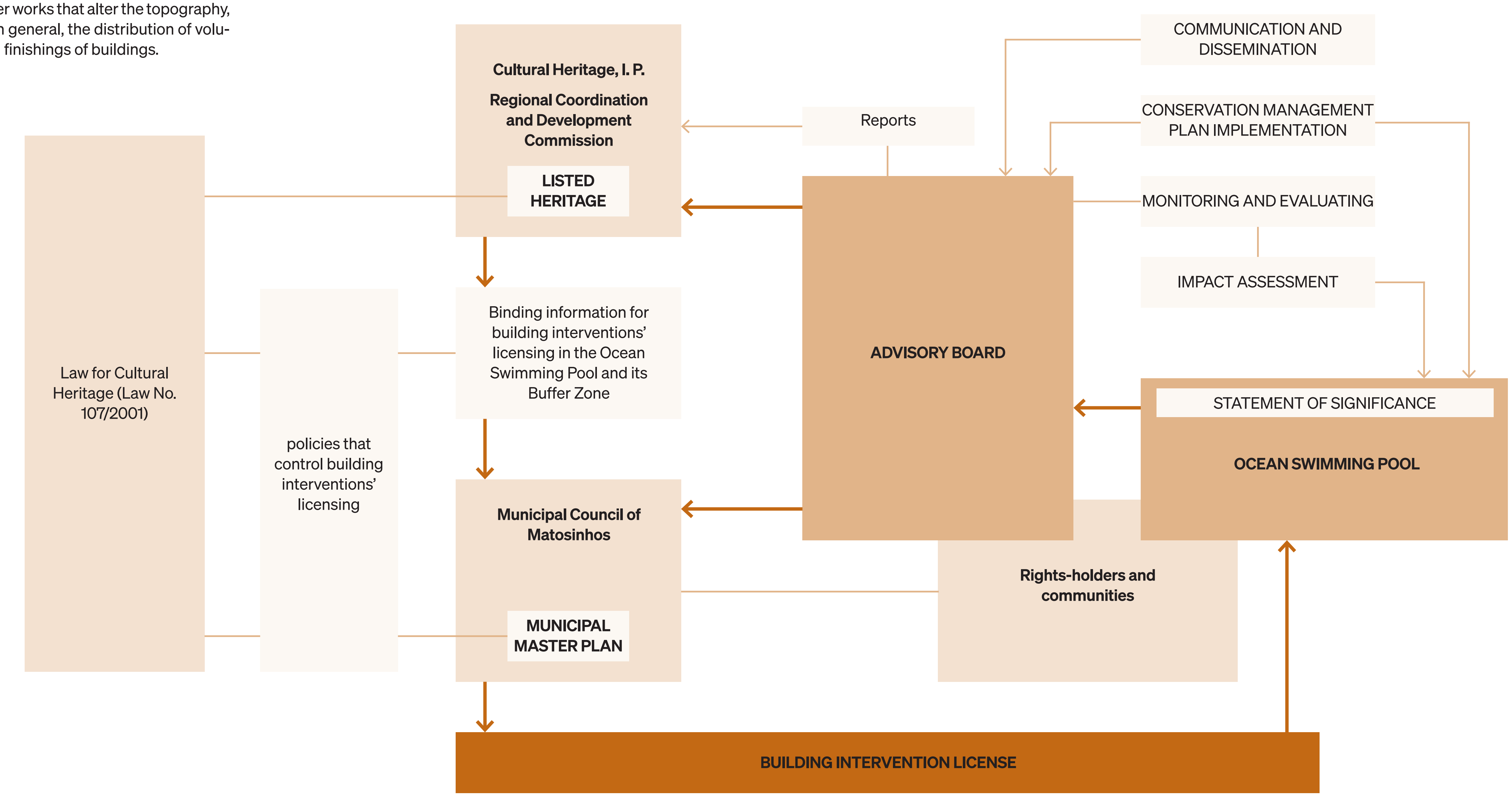
As expressed in Policy A.1 (see chapter 5), this system conveys rights and obligations that must be acknowledged by an Advisory Board in charge and acting in line with Álvaro Siza's design principles (Policy A.2). Formed by a group of managers and experts, this Advisory Board can also be responsible for disseminating information about the property, engaging visitation and adequate communication, while developing evaluation of conservation status through assessments and monitoring reports.

A graphical scheme of this system is shown below:

6.2.2 Sources of finance

The Municipal Council of Matosinhos is the owner and original commissionaire of the property, from which it obtains relevant yearly revenue. The Ocean Swimming Pool was visited by a total of 57 904 visitors in 2018, the last year that the site was opened to the public before the start of the recent conservation and extension intervention (2019-2021). This resulted in an income of 207 728 euros, from which 30 381 euros were allocated to functioning expenses such as security, lifeguards, and cleaning, representing 14,63% of the total revenue. Therefore, there was a profit of 177 347 euros.

Other than local use during the bathing season, the sources of finance available for the management of the Ocean Swimming Pool are also associated with the bar concession and guided visits organized by Casa da Arquitectura. Every year, Matosinhos Sport promotes a public procurement procedure to select a supplier that will be in charge of the bar's management during the bathing season.



6.1

6.1 Ocean Swimming Pool management system.

6.3 Monitoring

6.3.1 Monitoring and evaluation

Monitoring and evaluating the management framework of a listed property is a necessary part of a management plan, guaranteeing that the management process is functioning as intended, conforming to established rules, and meeting external reporting requirements (Court *et al*., 2022). Monitoring, then, can be defined as a cyclical planning system whose activities lie on conservation evaluations and impact assessments carried out frequently (Stovel, 2004). As a form of preventive management, monitoring also requires awareness of threats and impacts that take into consideration the vulnerabilities affecting the place and their influence. Therefore, attention to hazards can help the monitoring process and guarantee heritage protection and conservation.

The monitoring of the Ocean Swimming Pool shall be based on qualifying when and how corrective measures are conducted, but also accepting input such as spontaneous reporting, or even suggesting new forms of articulation and organization (i.e., a memorandum of understanding). This system facilitates multidisciplinary decision-making to achieve this CMP strategic objectives.

Since this goal is also subjected to indicators linked to the place's integrity and authenticity, one level of monitoring must convey general subjects that are related to responsible functioning of the property under the guarantee of preserving its heritage significance. Another level of monitoring, which must be combined – not subjected – with the previous one, is based on considering the most pressing hazards, vulnerabilities, and risk levels (see section 4.4). These hazards are then associated with a priority level, through a scale in which the unacceptable ones must be prioritized in the monitoring process.

The tables that summarize these monitoring levels are presented below:

SUBJECT	ACTION	PERIODICITY	RESPONSIBLE
Authenticity and Integrity	Verify the condition of the elements under ranges of authenticity and integrity.	Annually	Advisory Board
Finance	Review and evaluate the budget available for maintenance, repairs, and conservation of the property.	Annually	Matosinhos Sport
Buffer Zone	Identify irregular interventions or changes in land use within the protected area.	Annually	Municipal Council of Matosinhos
Real Estate Development	Identify real estate developments in the surrounding area and analyze impacts on the property.	Annually	Municipal Council of Matosinhos
Management	Evaluate the application of maintenance plans and provide reports.	Annually	Matosinhos Sport
Responsible Visitation	Record the number of daily visits. Define building capacity according to the effect it has on the property.	Daily	Matosinhos Sport
Responsible Use	Identify changes in the behavior of visitors after implementing the 'good practices' manual. Report the number of incidents created by visitors not following the rules.	As reported	Matosinhos Sport

6.2

	HAZARD	RISK LEVEL	PRIORITY	MONITORING METHOD	PERIODICITY	RESPONSIBLE
NATURAL	Sea level rise	Unacceptable	1	Regular monitoring of sea level rise to understand the likelihood of damage to the property and identify measures that can minimize the expected impacts.	Annually	Municipal Council of Matosinhos
NATURAL	Increase of atmospheric carbon dioxide	Tolerable	2	Regular monitoring of concrete elements to maximize the likelihood of early-damage detection, and minimize the level of repair that might be needed.	Annually	Municipal Council of Matosinhos
NATURAL	Chloride action	Unacceptable	1	Regular monitoring of concrete elements to maximize the likelihood of early-damage detection, and minimize the level of repair that might be needed.	Annually	Municipal Council of Matosinhos
NATURAL	Storm surge	Unacceptable	1	Regular monitoring of concrete elements and other components that may be damaged by storm surges, to maximize the likelihood of early-damage detection, and minimize the level of repair that might be needed.	Annually	Municipal Council of Matosinhos
ANTHROPIC	Vandalism	Acceptable	4	Regular monitoring of components prone to vandalism to maximize the likelihood of early-damage detection, and minimize the level of repair that might be needed.	Annually	Municipal Council of Matosinhos
ANTHROPIC	Misuse	Acceptable with monitoring actions	3	Regular monitoring of components prone to misuse, to maximize the likelihood of early--damage detection, and minimize the level of repair that might be needed.	Annually	Municipal Council of Matosinhos
ANTHROPIC	Lack of maintenance	Acceptable with monitoring actions	3	Regular monitoring of components prone to weathering over time, to maximize the likelihood of early-damage detection and minimize the level of repair that might be needed.	Annually	Municipal Council of Matosinhos

6.3

These data will be obtained through operational routine reports in the property. Furthermore, information surveyed by different experts is necessary, as well as field observation by researchers or specialists and the assessment of legislation and its possible changes. Therefore, the monitoring process will evaluate the implementation and impact of this CMP, ensuring the protection of heritage values in the future and keeping the development in balance through adequate conservation management. The guidelines for Heritage Impact Assessment (HIA) (Court et. al., 2022) should also be implemented when needed. This is also an important tool for informed decision-making regarding various factors affecting heritage sites and providing recommendations to mitigate their negative impacts and enhance their potentialities, as detailed in the following section.

6.2 General subjects monitoring actions.
6.3 Pressing hazards monitoring actions.

6.3.2 Impact assessment

Impact assessment is an important part of heritage management systems. As such, policies, plans, and interventions in listed properties must demonstrate *a priori* their impact on heritage significance, by identifying, evaluating, avoiding, and mitigating potential environmental and social impacts, in order to guarantee its full protection. If necessary, revisions must be conducted to existing impact assessments and frameworks, especially those pertaining to land use and other use restrictions.

For the conservation management of the Ocean Swimming Pool, the consideration of existing assessment frameworks is of particular importance, as well as the articulation of the different entities and experts involved in assessments, and in turn their articulation with the rights-holders, as they are particularly vulnerable to conflict within management systems, due to their complexity. Through the property's management process, its monitoring cycle, and the research work conducted cyclically within its context, the Advisory Body is supported in building the necessary capacity to engage with these situations and promote a strong involvement of the management framework with these various coordination and articulation needs.

The monitoring process includes an evaluation of the implementation and impact of this CMP for the property, to ensure its protection in the future and keep the development in balance through adequate heritage conservation management. When impact assessments are not required by national and supra-national frameworks for all interventions affecting the property, this plan proposes the possibility of employing a Heritage Impact Assessment or "stand-alone" impact assessment (ICOMOS, 2011), thus widening the reach of the management system. This assessment tool was established to specifically manage the challenges related to the loss of heritage values and constitutes an important tool for informing decision-making regarding various factors affecting heritage and providing recommendations for mitigating negative impacts to the Ocean Swimming Pool and enhancing its potentialities

6.4

6.5 Shoed users access.
6.4 Priority actions to be implemented immediately.

6.4 Priority actions, implementation and phasing

6.4.1 Priority actions

As presented in chapter 5, policies were established for the safeguarding of the Ocean Swimming Pool. They organize different types of actions that should be taken in this CMP. However, implementation should also respect feasibility, emergency, and available resources and funds, leading to phasing strategies. The following Management guidelines are based on a 5-year timeframe (Feilden; Jokkilehto, 1998). After this period, all recommendations should be reviewed by the Advisory Body (Policy A.1), based on frequent monitoring reports.

Priority Actions are the most urgent tasks cross-referenced by the conservation detailed policies described in the chapter 5. Priorities are also established having in mind the sustainability of a cyclical system to guarantee conservation interventions, regulations, and adequate use.

The tasks proposed to be implemented immediately are:

POLICY	TITLE	DESCRIPTION
A.1	*Advisory body*	Promote the creation of an advisory body, which manages to articulate the different stakeholders to generate mechanisms for reaching consensus and enhancing participation with the interested parties in the implementation and monitoring of the CMP.
A.2.1	*Álvaro Siza's design principles - Program*	Ensure the site maintains its current use as established by Álvaro Siza in the original design.
A.2.2	*Álvaro Siza's design principles - Interventions*	Ensure any intervention in the Ocean Swimming Pool, determined by future needs, follows Álvaro Siza's design principles, defined in section 2.5.2.
A.3	*Investigation and knowledge*	Ensure any intervention in the Ocean Swimming Pool is preceded by a detailed investigation, condition survey, expert analysis, and the consultation of Álvaro Siza. The techniques, methodologies, and materials applied must follow the best international and technical standards.
A.5	*Administrative control*	Ensure the building's management roles and responsibilities are clearly defined, assigned, and understood by all stakeholders. This CMP recommendations should be formally adopted by the Municipal Council of Matosinhos.
B.1	*Spatial Planning*	The Ocean Swimming Pool's management and conservation must comply with the legal instruments that regulate spatial planning, such as the Municipal Master Plan and others at the national, regional, and local levels.
B.2	*Cultural Heritage Safeguarding*	Comply with the Law for Cultural Heritage (Law No. 107/ 2001), which forbids any interventions, inside or outside listed properties or any change of use likely to affect it, without prior consent from the cultural heritage administration.
B.3	*Buffer Zone preservation*	Respect the restrictions posed by the Buffer Zone, defined by Ordinance No. 608/2012, to ensure the preservation of views and the integration of the property into the landscape.
B.4	*Coastal protection regulation*	Comply with the Caminha-Espinho Coastal Zone Program, which determines that new constructions, soil sealing actions, changes to the coastline, and activities that result in the direct destruction of relevant marine ecosystems or rock outcrops are forbidden along the Coastal Protection Strip in which the property is set.
C.1	*Significance and tolerance for change*	All elements of the Ocean Swimming Pool are to be maintained, used and managed in accordance with their relative level of significance, defined in chapter 3, and the identified tolerance for change for their component parts.
C.11	*User regulations*	Enforce the Ocean Swimming Pool User Regulations, developed by Matosinhos Sport, to ensure visitors' safety and quality of experience.
C.12	*Health Emergency Plan*	Enforce and implement, whenever necessary, transitory regulations in case of declared health emergencies that introduce disruptions in the normal functioning of the Ocean Swimming Pool.

6.5

In continuity with these priority principles, it is recommended that the following tasks must be developed up to 12 months:

POLICY	TITLE	DESCRIPTION
A.2.3	*Álvaro Siza's design principles - Urban policies*	Consider Álvaro Siza's design principles in the definition of landscape and urban policies regarding the site's surroundings.
A.4	*Engagement of stakeholders*	Engage with ICOMOS, DOCOMOMO, and other heritage related organizations, universities and schools in disseminating and sharing knowledge about the Ocean Swimming Pool.
A.6	*Sustainable Development Goals*	Comply with the good practices of the Sustainable Development Goals (SDG – UN 2030 Agenda) contributing to the inclusion, education, knowledge sharing, and sustainability of the world.
B.8.1	*Landscape Management Plan - Landscape Integration*	Develop and implement a Landscape Management Plan that ensures the preservation of the site's surrounding context characteristics, essential for the building's significance. Any intervention in the site or inside its Buffer Zone must be submitted to the Cultural Heritage, I. P. and the Regional Coordination and Development Commission to ensure the close relationship between the property and the surrounding landscape is retained.
B.8.2	*Landscape Management Plan - Urban planning*	Enforce urban planning restrictions on building height by the seaside avenue, preventing further visual impacts over the site's immediate context.
B.8.3	*Landscape Management Plan - Visual relations*	Ensure the prohibition of any intervention or structure that obstructs the visual relations between the Ocean Swimming Pool and its surroundings.
C.2	*Inspection routines*	Promote regular inspection routines that should be more frequent during the bathing season. Any anomalies identified in the building must be communicated to the site managers.
C.3.1	*Maintenance Plan - Framework*	Develop and implement a Maintenance Plan that takes into account the detailed conservation framework and guidelines outlined in this CMP.
C.3.2	*Maintenance Plan - Budget*	Consider an estimate of annual maintenance costs (estimated annual average charges, at nominal current value and without updating rate) for each maintenance action, quantifying the expected and accumulated investment over determined time periods.
C.4	*Accessibility Plan*	Develop and implement an Accessibility Plan for users with mobility impairments, ensuring the designated circulation areas and spaces remain free of physical obstacles.
C.5.1	*Capacity and entrance control - Occupancy*	Ensure the building's occupancy is permanently controlled to prevent any damage to the site from exceeding its designated capacity.
C.6	*Housekeeping routines*	Define and implement housekeeping routines that are permanently updated to the best international and technical standards. They must be clearly conveyed to the technicians responsible for carrying them out on a daily basis as they are fundamental for the long-term preservation of the asset's significance.
C.7	*Security system*	Implement a more comprehensive security system that simultaneously prevents misuse during operating hours and acts of vandalism during closing hours.
C.8	*Lifesaving and rescue*	Ensure the permanent availability of lifeguards on the site during the bathing season as immediate emergency responders charged with rescue at sea. Lifeguards' instructions regarding the safety of the bathers must be respected.
C.9	*Fire Prevention Plan*	Develop and implement a Fire Prevention Plan. The implementation of safety regulations namely emergency exit signs, fire extinguishing means, staff training, evacuation routes, and protocols on the premises is mandatory.

6.6

6.4.2 Implementation

Implementation gathers procedures that should be undertaken in a period of 12 to 60 months phased by yearly intervals, depending on the complexity of actions and resources to be administrated by the Advisory Body.

It is recommended that the following tasks should be taken up to 24 months:

POLICY	TITLE	DESCRIPTION
A.7	*Interpretation Plan*	Develop and implement a comprehensive Interpretation Plan based on a clear understanding of the significance of the place that establishes how the cultural significance will be communicated through specific programs, visits, and activities, engaging the community and its users.
A.8.1	*Communication strategy - Online platform*	Create a single online platform easily accessible by the general public that gathers all relevant information regarding the Ocean Swimming Pool, such as opening schedules, entrance fees, use regulations, or information on the site's history and significance.
B.5.1	*Risk Management Plan - Risk Management*	Develop and implement a Risk Management Plan which includes regular risk assessments, the development of mitigation measures and emergency preparedness measures.
B.6.1	*Green procurement - environmental analysis*	Conduct an environmental analysis of the Ocean Swimming Pool's regular functioning to identify energy-saving opportunities.
B.7.1	*Climate change adaptation - Adaptation measures*	Compile a set of measures, or actions (as a study case), for implementation in other cases with similar constraints, to help other listed sites to adapt to climate change. Similarly, the knowledge obtained from this case study should also suggest additional measures or guidelines for local and regional policies.
B.8.4	*Landscape Management Plan - Landscaping*	Implement a landscaping plan for the gardens on the building's roof, with regular maintenance cutting and pruning of the vegetation to avoid obstructing the view from the avenue.
B.8.5	*Landscape Management Plan - Beach cleaning*	Implement a cleaning routine of the beach and rock outcrops to avoid the accumulation of waste on the site.
B.8.6	*Landscape Management Plan - Placement of furniture*	Limit the presence of furniture such as chairs and tables to the bar terrace. Parasols for the use of bathers must be requested to the bar concessionaire and abide by uniform design features. The bar concessionaire should restrain from placing equipment (such as ice cream freezers) on the exterior.
B.8.7	*Landscape Management Plan - Placement of signage*	Control the placement of signage (such as security warnings) and other elements in the building, swimming pools, or rocks to prevent the disturbance of the visual relation with the landscape and the sea.
C.3.3	*Maintenance Plan - Maintenance manuals*	Develop cyclical maintenance and treatment manuals to establish priorities and short and long-term conservation interventions, thus maintaining a proactive conservation approach.
C.5.2	*Capacity and entrance control - Visitor information*	Display occupancy information (low, high, and "sold out") on the exterior of the building to avoid the formation of long lines and the consequent frustration of visitors who are prevented from entering. The possibility of making this information available online should be considered.

6.7

6.6 Priority actions to be implemented in 12 months.
6.7 Actions to be implemented in 24 months.

It is recommended that the following tasks should be taken up to 36 months:

POLICY	TITLE	DESCRIPTION
A.8.2	*Communication strategy - Shared knowledge network*	Establish a shared knowledge network with those responsible for the management of other Álvaro Siza's works, creating an integrated dissemination and safeguarding strategy.
A.9.1	*Community engagement - Learning programs*	Develop learning programs for schools and families, composed of didactic activities for children, related to the Ocean Swimming Pool.
B.5.2	*Risk Management Plan - Disaster recovery*	Develop and anticipate lines of action for emergency response and disaster recovery.
B.6.2	*Green procurement - Strategies*	Adopt green procurement (energy, waste, and water) and carbon offsetting strategies, emphasizing green products, services, and business models.
B.7.2	*Climate change adaptation - Permanent flooding*	Study future lines of action for building conservation in case of permanent damage or flooding that makes the normal use of the built structures and infrastructures impossible (be it relocation, the construction of more permanent protection measures like walls or spurs, etc.).
B.7.3	*Climate change adaptation - Staff training*	Train staff/stakeholders and inform users on more efficient management strategies, and promote the use of sustainable practices while working, using, or managing the place. It would be beneficial to the implementation of these strategies if there were participatory activities, presentations, or workshops to raise public awareness on appropriate mitigation measures.
C.10	*Risk awareness learning plan*	Enhance risk awareness activities to raise public awareness about the most significant factors threatening the Ocean Swimming Pool and the possible responses to mitigate them.

6.8

It is recommended that the following tasks should be taken up to 48 months:

POLICY	TITLE	DESCRIPTION
A.9.2	*Community engagement - Broadening access*	Promote specific visits and knowledge dissemination activities aimed at visitors with additional access needs, such as deaf and visually impaired audiences, promoting inclusiveness and broadening access to the site.
A.10.1	*Archives and collections - Archives*	Gather, catalog, and digitize all documentation related to the Ocean Swimming Pool that is dispersed throughout different institutions, creating a comprehensive digital database available for consultation of interested parties from all over the world.
B.7.4	*Climate change adaptation - Archival information*	Organize an archive containing exhaustive information on the Ocean Swimming Pool (3D and 2D mapping, visual information, etc.) to assure its proper reconstruction and future preservation in case of damage or material loss.
C.13	*Archival database*	Gather and organize all information related to conservation interventions, namely techniques, methodologies, and materials employed, as well as graphic, photographic, digitized, or other documentation on the adopted procedures.

6.9

While also a first revision can be conducted to verify the actions that could not be completed accordingly, it is recommended that the following tasks should be taken up to 60 months:

POLICY	TITLE	DESCRIPTION
A.10.2	*Archives and collections - Collections*	Create an inventory of all the furniture and objects specifically designed by Álvaro Siza for the property with information on their location and condition to assure their future preservation and exhaustive documentation.
C.14	*Building Information Management System*	Develop and implement a building information management system with facility management tools for inspection and maintenance routines including notifications and alerts in real time.

6.10

6.8 Actions to be implemented in 36 months.
6.9 Actions to be implemented in 48 months.
6.10 Actions to be implemented in 60 months.

6.4.3 Phasing

In the following table, all policies are summarized to highlight their importance and correlation in phases of implementation:

POLICY	DESCRIPTION	PHASING *(up to - in months)*					
		0	12	24	36	48	60
A | OVERARCHING POLICIES							
A.1	*Advisory body*	■					
A.2.1	*Álvaro Siza's design principles - Program*	■					
A.2.2	*Álvaro Siza's design principles - Interventions*	■					
A.2.3	*Álvaro Siza's design principles - Urban policies*		■				
A.3	*Investigation and knowledge*	■					
A.4	*Engagement of stakeholders*		■				
A.5	*Administrative control*	■					
A.6	*Sustainable Development Goals*		■				
A.7	*Interpretation Plan*			■			
A.8.1	*Communication strategy - Online platform*			■			
A.8.2	*Communication strategy - Shared knowledge network*				■		
A.9.1	*Community engagement - Learning programs*				■		
A.9.2	*Community engagement - Broadening access*					■	
A.10.1	*Archives and collections - Archives*					■	
A.10.2	*Archives and collections - Collections*						■
B | SITE POLICIES							
B.1	*Spatial Planning*	■					
B.2	*Cultural Heritage Safeguarding*	■					
B.3	*Buffer Zone preservafion*	■					
B.4	*Coastal protection regulation*	■					
B.5.1	*Risk Management Plan - Risk Management*			■			
B.5.2	*Risk Management Plan - Disaster recovery*				■		
B.6.1	*Green procurement - Environmental analysis*			■			
B.6.2	*Green procurement - Strategies*				■		
B.7.1	*Climate change adaptation - Adaptation measures*			■			
B.7.2	*Climate change adaptation - Permanent flooding*				■		
B.7.3	*Climate change adaptation - Staff training*				■		
B.7.4	*Climate change adaptation - Archival information*					■	
B.8.1	*Landscape Management Plan - Landscape integration*		■				
B.8.2	*Landscape Management Plan - Urban planning*		■				
B.8.3	*Landscape Management Plan - Visual relations*		■				
B.8.4	*Landscape Management Plan - Landscaping*			■			
B.8.5	*Landscape Management Plan - Beach cleaning*			■			
B.8.6	*Landscape Management Plan - Placement of furniture*			■			
B.8.7	*Landscape Management Plan - Placement of signage*			■			
C | CONSERVATION AND MANAGEMENT POLICIES							
C.1	*Significance and tolerance for change*	■					
C.2	*Inspection routines*		■				
C.3.1	*Maintenance Plan - Framework*		■				
C.3.2	*Maintenance Plan - Budget*			■			
C.3.3	*Maintenance Plan - Maintenance manuals*		■				
C.4	*Accessibility Plan*					■	
C.5.1	*Capacity and entrance control - Occupancy*						■
C.5.2	*Capacity and entrance control - Visitor information*		■				
C.6	*Housekeeping routines*		■				
C.7	*Security system*			■			
C.8	*Lifesaving and rescue*		■				
C.9	*Fire prevention plan*		■				
C.10	*Risk awareness educational plan*		■				
C.11	*Use regulation*		■				
C.12	*Health Emergency Plan*				■		
C.13	*Archival database*					■	
C.14	*Building Information Management System BIM*						■

6.11

6.11 Policies implementation phasing.

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APPENDICES

A Design reports of the original design (1960-1995)
B Interviews with the Heads of Municipal Council Departments
C Interviews with the Site Managers and Staff
D Inspection and diagnosis report
E Detailed tolerance for change assessment
F Listing information
G Admission conditions and user regulations

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APPENDIX A

Design reports of the original design (1960-1995)

Leça da Palmeira Ocean Swimming Pool – 1st phase
Design report, 1960

General considerations: location

The construction of a saltwater pool in the vicinity of the Leça beach, for the use of its bathers, is an old aspiration that the Matosinhos Municipal Council believes it is time to fulfil.

It chose, for its location, a small rocky cove that develops in an approximate north-south direction, parallel to the wall of the so-called "Meia-laranja", of the "Centenários Avenue", which limits it to the east (see "Drawing 1" of this project and the photographs in the "Appendix" to the "Report").

The situation is ideal, not only for the beauty of the site, but also for its short distance to the Leça beach, which can be reached without going up to the avenue, through the picturesque path among the rocks to be regularized in the future, or from the avenue, with which it is indirectly connected by the "Meia-Laranja".

On the other hand, the natural conditions allow for the inscription of the swimming pool with minimum intervention and without disruption of the local arrangement of rocky outcrops and, also, the future creation of solarium areas, cabins and auxiliary constructions, in the natural rock amphitheatre, now covered by the "Meia-laranja" embankment and under the same embankment in the part that was judged to be conserved, on the north side, for natural protection of the swimming pool and solarium, from the summer winds.

In November 1959, the Matosinhos Municipal Council decided to consult the firm "Ribeiro da Silva, Lda", public works contractors, specialized in maritime works, about the viability of the project and its probable cost for a first phase, consisting essentially of the creation of the pool pit, which would fill or empty with the natural movement of the tides, the dismantling of the rock indispensable for its insertion and the execution of the support walls limiting the natural water inlets.

Since the natural conditions allowed for it, it was settled to foresee the swimming pool with the plan dimensions of 20 x 33.33 m., but with the bottom following the existing bedrock, only regularized in longitudinal section, for economic reasons.

Within this program, the aforementioned firm sent to the Matosinhos Municipal Council, with a letter dated 12/11/1959, a description of the works considered essential and the respective estimate, importing in esc. 200 000$00 (see "Appendix I" and "Appendix II" to this "Report", the second explains how the estimate in question was prepared).

By letter nº 3927, of 12/30/1959, the Municipal Council communicated the inclusion of that amount in its budget for 1960 and requested the presentation of the definitive project for the swimming pool and an indication of the conditions under which the aforementioned Contractor Firm could undertake the execution of the work, so that it can be used in the 1960 bathing season (see "Appendix III" to this "Report").

During the elaboration of the project, in February this year, the Municipal Council decided, and rightly so, that it was essential to study the local urban arrangement with the conditioning posed by the swimming pool to be built, and for this purpose indicated the Architect Siza Vieira, who should also collaborate in this project for the 1st phase of the pool construction.

From the joint discussions with the Head of the Municipal Council and its Technical Department, the aforementioned Architect and the signatory, fundamental alterations were made to the initial plan of the construction work, and it was decided that it would be advisable to give the base a regular outline, and to test its coating and the cuts to be made in the peripheral rocks.

For aesthetic reasons, it was decided to use cyclopean concrete for the construction of the support walls that were initially planned to be built in masonry, and it was considered essential to build a cleaning spillway on its periphery and top, and a sidewalk 2 m. wide on the east side, while the definitive arrangement of the solarium area was not settled.

The tops of the north and south support walls, planned to be 1m. wide, with plans to be widened as they were manifestly narrow for the peripheral circulation of bathers, – especially in the south, where the diving boards will be located in the future – were maintained, on the basis of an accepted proposal from the architect, who believes that the enlargement and railing should consist of a removable structure to be placed only in the bathing season, along with the aforementioned boards and the walkways to be studied to connect the pool to the Leça beach.

There was also the need to build a children's swimming pool in the site, in a location to be chosen, for which part of the dismantled rock would be used to raise the sill.

Finally, it was decided that it was not feasible to use the natural tides to fill, empty and refill the pool, so the Municipal Council will consider, in another phase, the installation of the necessary adductor and motor-pump groups.

The project here presented takes into account the new program that fundamentally changes the scheme initially laid out, leading to an undoubtedly more perfect solution but costing exactly twice as much.

General description of the pool: dimensioning

As shown in "Drawing 1" of this project, the natural arrangement of the rock facilitates the inclusion of the 20 m. wide pool, without the need for any major rock removal, which allows the possibility of 10 lanes with the usual width of 2 m.

The length that most harmonizes with that provision is the classic measurement of 33.33 m.

The main axis of the pool runs parallel to the wall of the "Meia-laranja", with a 4 m. distance from its east edge, taking advantage of 2 m for the execution of a promenade.

The north and south walls of the pool are made up of support walls and curtains with variable heights depending on the irregular profile of the existing rock (see the transversal profiles P.1 and P.12 of the project).

The east limit is established by cutting the rock along the entire height of the pool (see the longitudinal profile P.B), duly coated, the same happening in the west limit at 20 m. wide, in which the rock does not, however, reach the level of the free surface (longitudinal profile P.F.). Thus, the water of the pool spreads on that side, over the rocks, forming a natural basin with irregular contours and variable depth, limited by the rocks, only foreseeing the need for a support to the west (longitudinal profile PG) filling a gorge to the west, lower than the free surface of the water in the pool.

The top of the walls is located at the level (+2.60) N.P., be 0.23 m. above the level (+2.37) which is that of the M.P.N.A.V. and was taken to that of the free surface of water inside the pool.

As for the bottom, the classic solution was adopted, as shown in "Drawing 2", which adapts well to the natural topography, reserving 21.21 m. of the pool length for swimmers and the remaining 13.12 m. for the jumping pit.

In that area the minimum depth, to the north, is 1.80 m. and the maximum, at 21.21 m., of 2.50 m.

In the jumping pit, the sill slope is transversal to allow the drainage through the lowest point, located at the limit of 20.00 m., with the minimum water height, to the east, of 3.50 m. and maximum, to the west, of 4.00 m.

The swimming and diving basin sills are connected by a slope at 1.3 m with 3.03 m. wide along the longitudinal axis of the pool.

On this axis, the depth of the diving pit is 3.75 m. which allows jumps with a maximum of 4 m. above the water.

Greater depth would only be achieved with costly dismantling at the bottom of the pool, and complementary dismantling to include the bottom discharge in a ditch, at the lower level.

The future diving boards should be facing north, on the south wall, as is usual.

The entire pool sill is covered in the 20.00 m. wide area, and appropriate devices should be used to mark the western limit, where the irregular natural basin begins.

Safety ledge: cleaning discharger: bottom discharge

In the parameters of the east support wall, in concordance with the jumping pit and of the south support wall, in all the extension, a safety ledge for the swimmers was foreseen, placed at a depth of 1.30 m. (see "Drawing 8").

At the crest and along the highest points of the north and south walls, fibre cement is foreseen for economic reasons, and it is certain that this material is known to have, until now, proven out in the pipeline of the saltwater pool on the Figueira da Foz beach.

The exit from the bottom of the pool, detailed in the "Drawing 9", is located at the lowest point of the sill, on the south support wall, leading directly to the beach through a 250 mm drain, embedded in that wall, internally closed by a special valve that is resistant to sand and the action of saline water, with remote control, on the top of the support wall. The valve is located in a niche so that it can be inspected and removed if necessary.

Support walls and coatings

The regularization of the bottom of the swimming pool, that of the eastern sidewalk (both with 0.30 m. of average thickness), the curtains at the base of the north and south walls (with 0.50 m. of average thickness) and the east and west limits' curtains (with an average thickness of 0.50 m. in the swimming basin and 0.60 m. in the diving basin), are expected to be executed on site with plain concrete, with a dosage of 210 kg. of cement and 90 kg. of pozzolan per m³ of concrete, given its permanent contact with sea water. This dosage is the one the A.P.D.L. has used in similar works.

The filling of the profile recesses at the bottom of the pool and of the north, south and west support walls, given their respective sections, will be executed with cyclopean concrete made of stone no larger than 0.30 m., agglomerated with concrete of the indicated type.

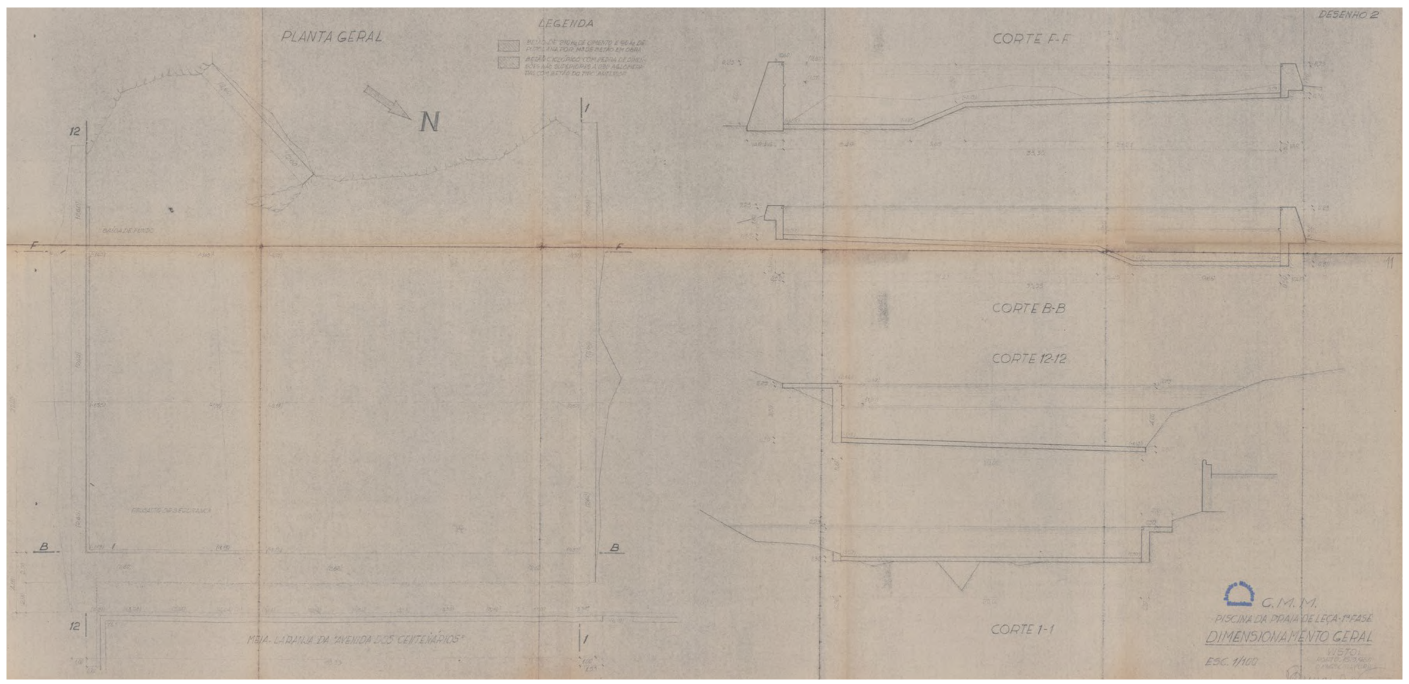
The stability of the support walls was verified for their maximum height and the most unfavourable conditions (having the pool full at low tide) shown in the graphics that are part of the "Appendix" to this "Report". The effect of a direct impact of the waves on the support walls was not considered, given the protection they enjoy due to their orientation, natural arrangement of the rocks and because it is possible to keep the pool full in the winter.

In this phase, plastering is only planned for the entire width of the eastern sidewalk and on the top of the north and south walls, to be executed with cement mortar with a 1:4 rough mix so it is not slippery.

Porto, March 15, 1960

Bernardo Ferrão

A.1



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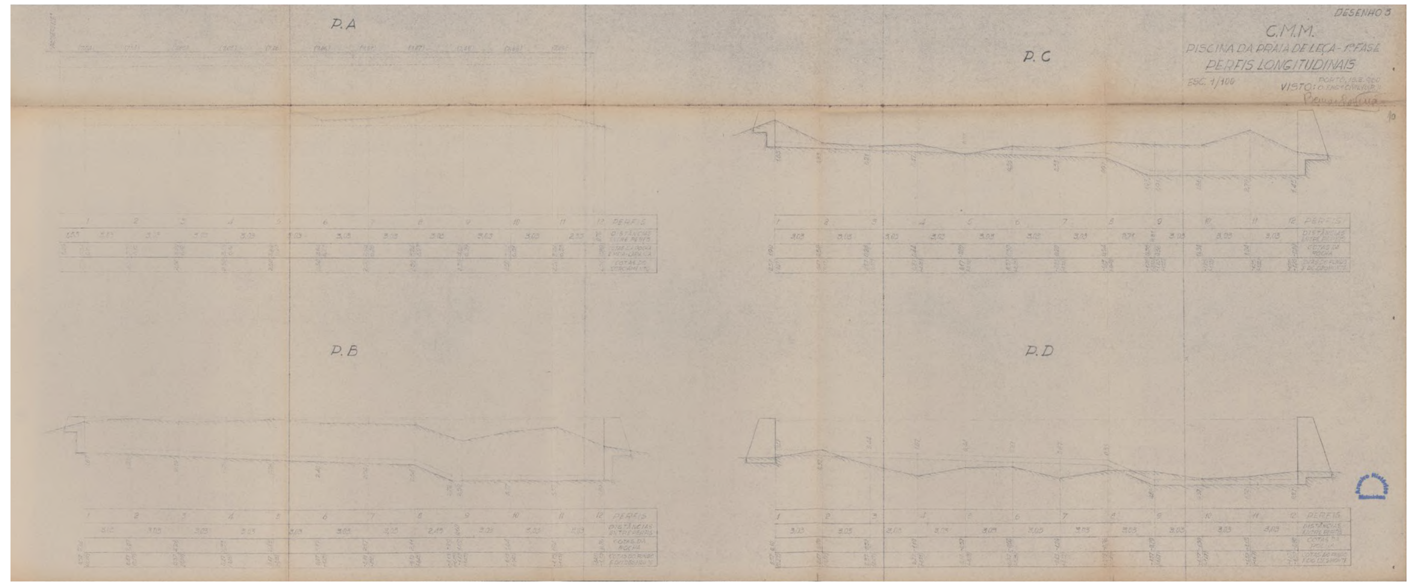
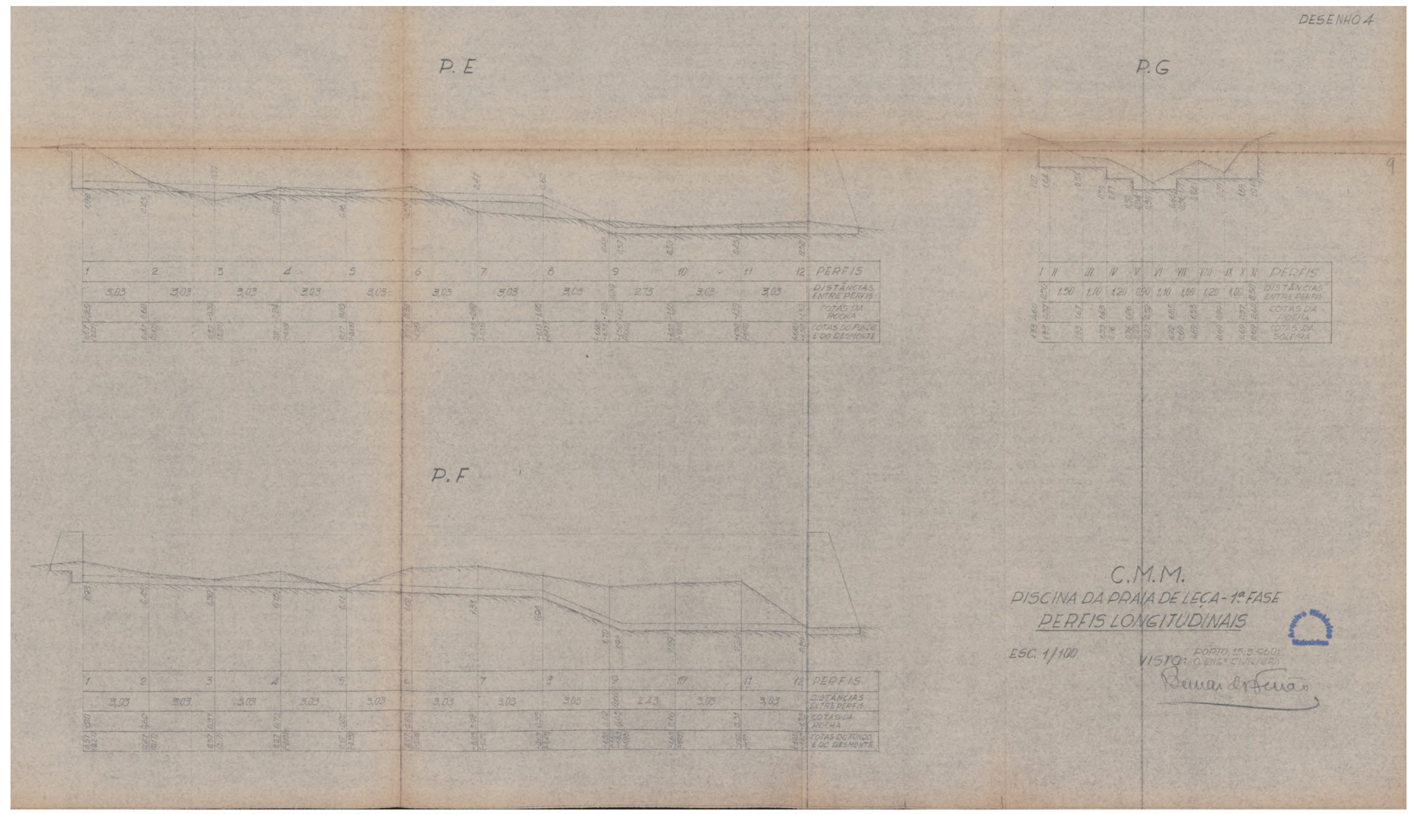
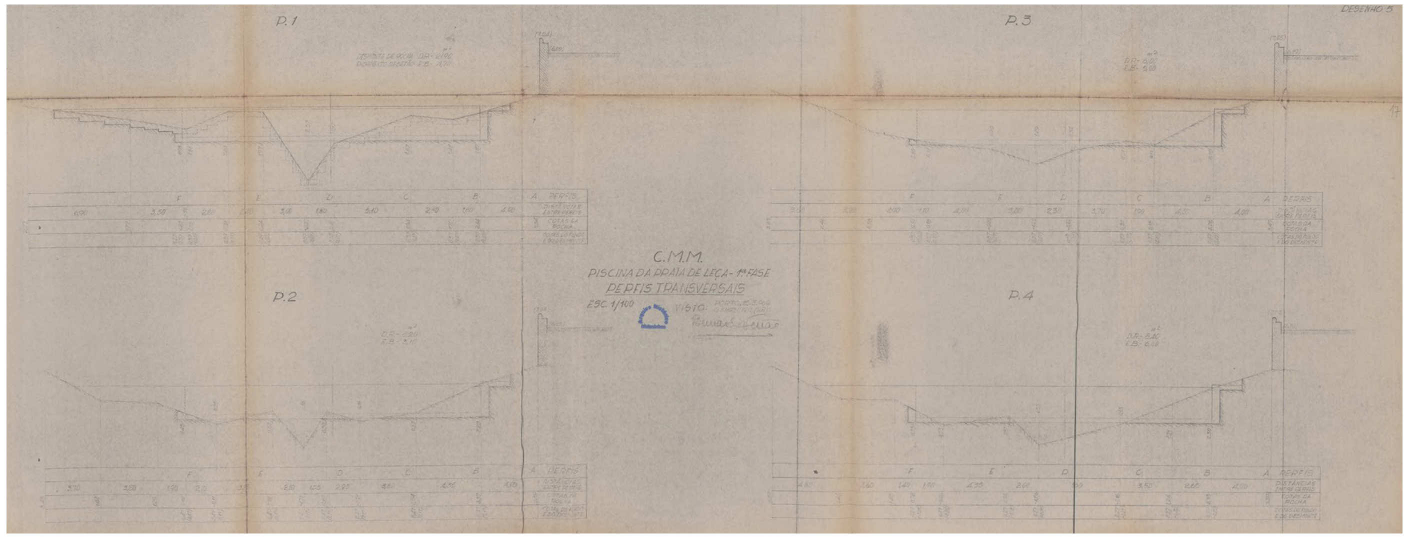


A.3



A.4

A.1 Site plan, 1960.
A.2 General dimensioning, plan and sections, 1960.
A.3 Longitudinal sections, 1960.
A.4 Longitudinal sections, 1960.



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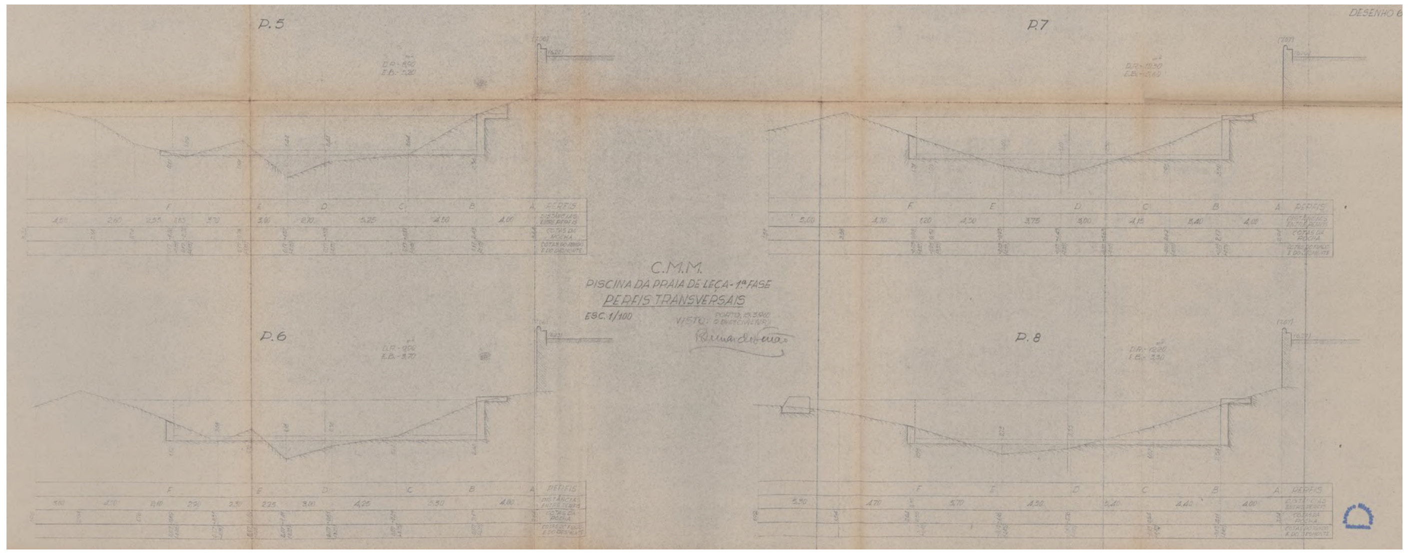

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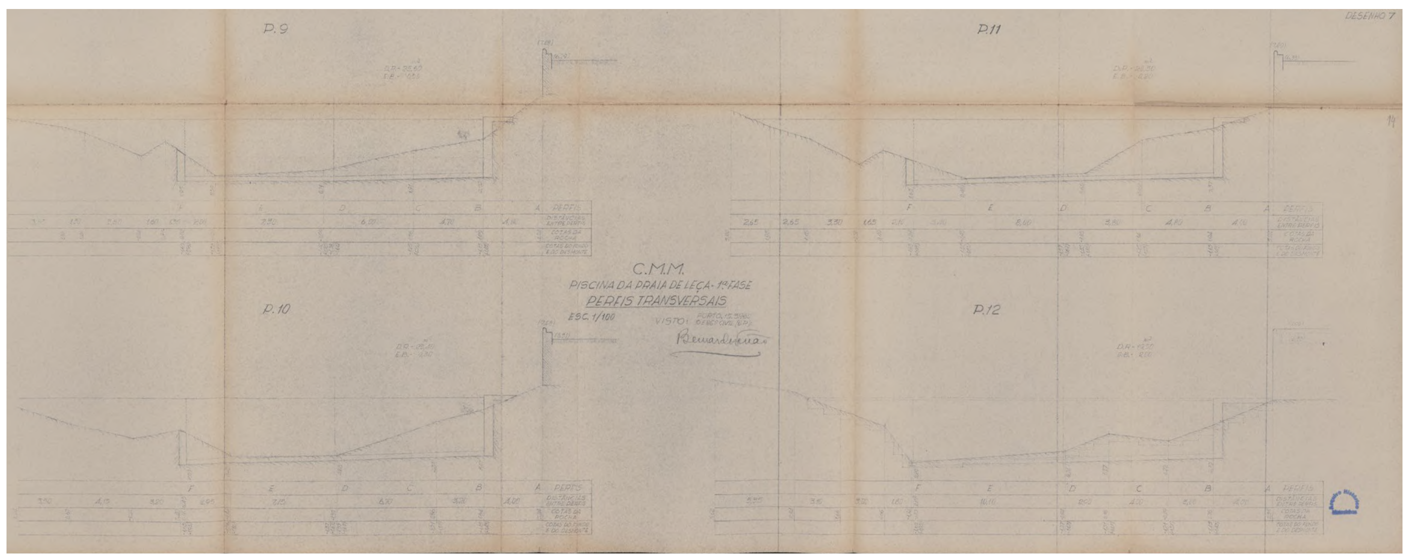

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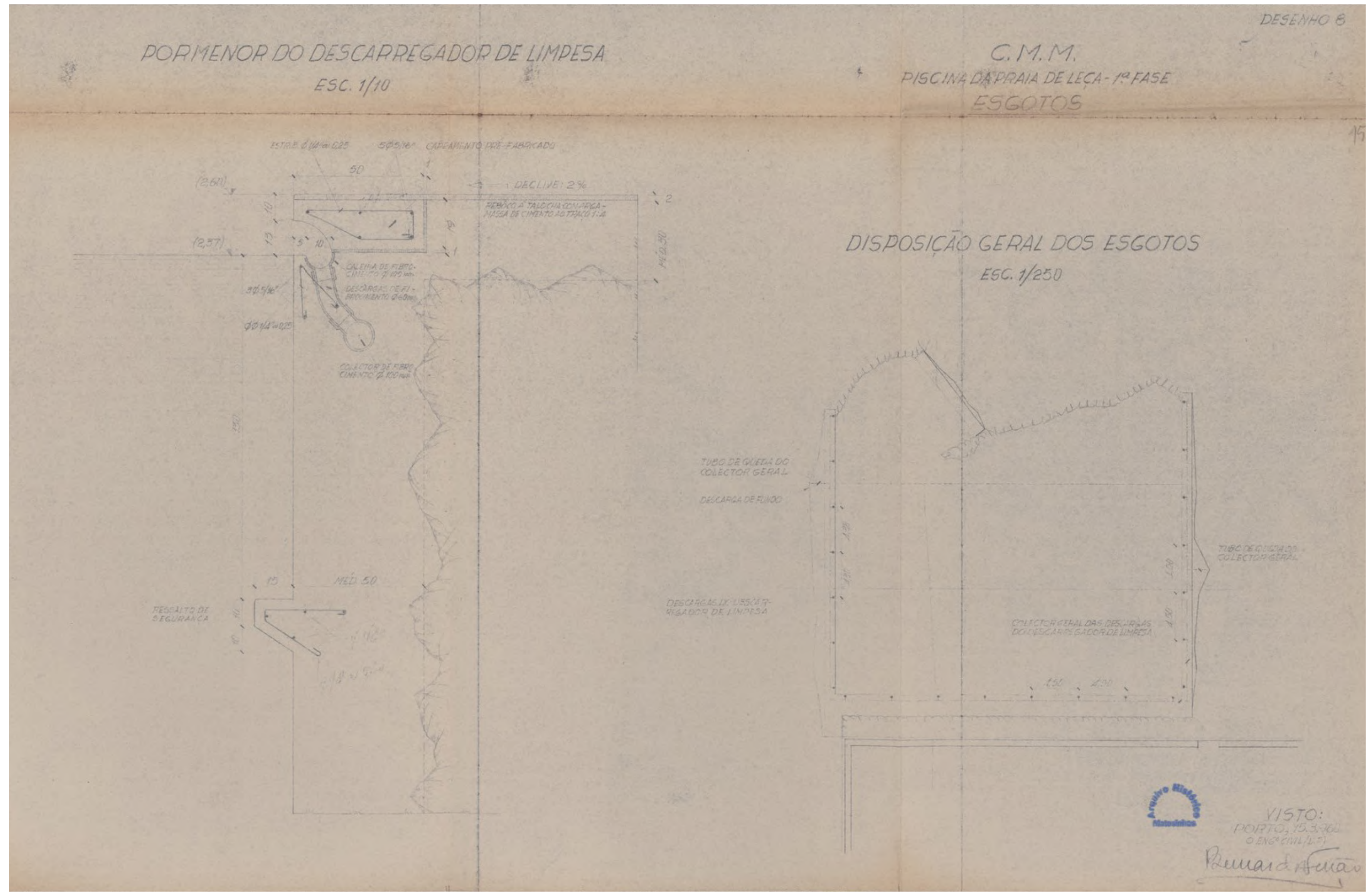
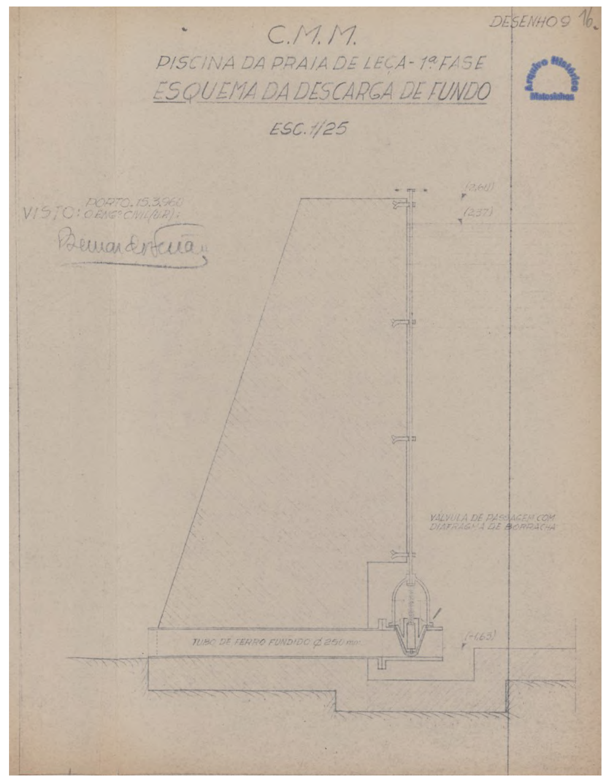


A.8



A.9

A.5 Cross sections, 1960.
A.6 Cross sections, 1960.
A.7 Cross sections, 1960.
A.8 Cleaning discharger detail and sewer layout, 1960.
A.9 Bottom discharge scheme, 1960.

Leça da Palmeira Ocean Swimming Pool
Design report, 1962

The Leça da Palmeira seafront enhancement plan is currently under study and is included in the urbanization of the area between the current nucleus and Boa Nova.

The Ocean Swimming Pool, whose preliminary project is now presented, is part of the aforementioned plan, of which the already planned coastal road, between Matosinhos and Póvoa, is the backbone.

The location chosen by the Matosinhos Municipal Council seems to gather excellent conditions, due to its situation in relation to the town, its future expansion, and the set of beaches in which the pool will be a vital element.

The construction of the two pools (one for children and one for adults) takes advantage of the topography of the terrain, not only for economic reasons, but also to avoid a violent section of the landscape, following the spirit that presides over the mentioned plan.

The adjoining facilities (changing rooms, toilets, and water treatment cabin) develop along the retaining wall that currently limits the beach, articulating perpendicularly to the north with a building destined for a restaurant and complementary services.

The development and capacity of the adjoining facilities were established on the basis of commonly adopted principles and taking into account the area of the swimming pool.

In opting for the cabin system for changing clothes, with a central deposit and a separation between shoed and barefoot people, 24 cabins were found to be necessary, assuming that the number of hangers in the deposit should be close to 3/5 of the number of square meters of the pool, that the daily use of each cabin is 40 people, and that each cabin is used twice a day (Prof. Ernest Neufert, “Architects’ data”).

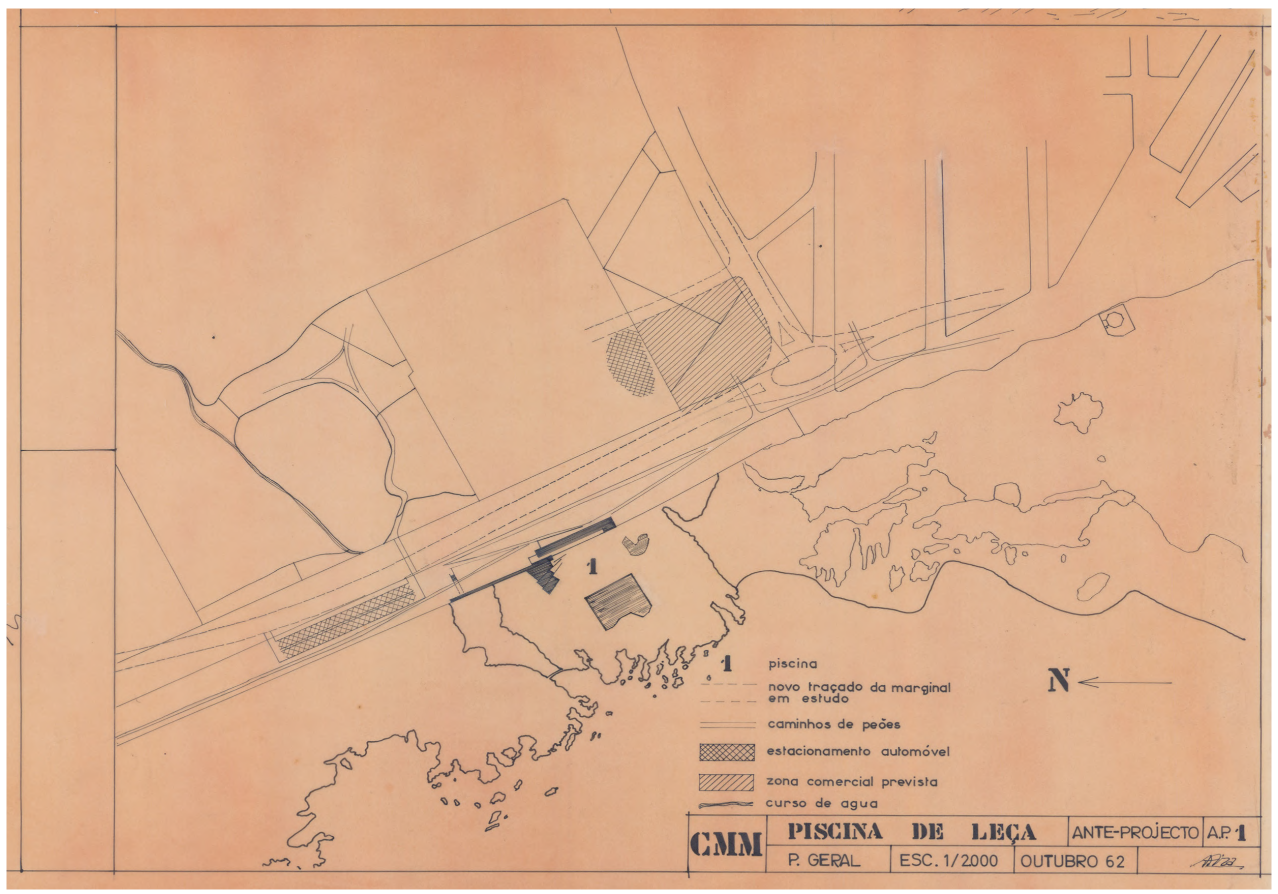
The buildings will be built with bare concrete walls and a wooden roof, covered with copper sheeting over asphalt fabric.

The floors will be washable, with a careful choice of materials, especially in the changing rooms and toilets, where hygiene care is more pressing.

Outside, areas for the exclusive use of the barefooted are foreseen, with showers and foot washes of mandatory passage, at the exit of the changing rooms and next to the pools.

Matosinhos, October 25, 1962

Álvaro Siza



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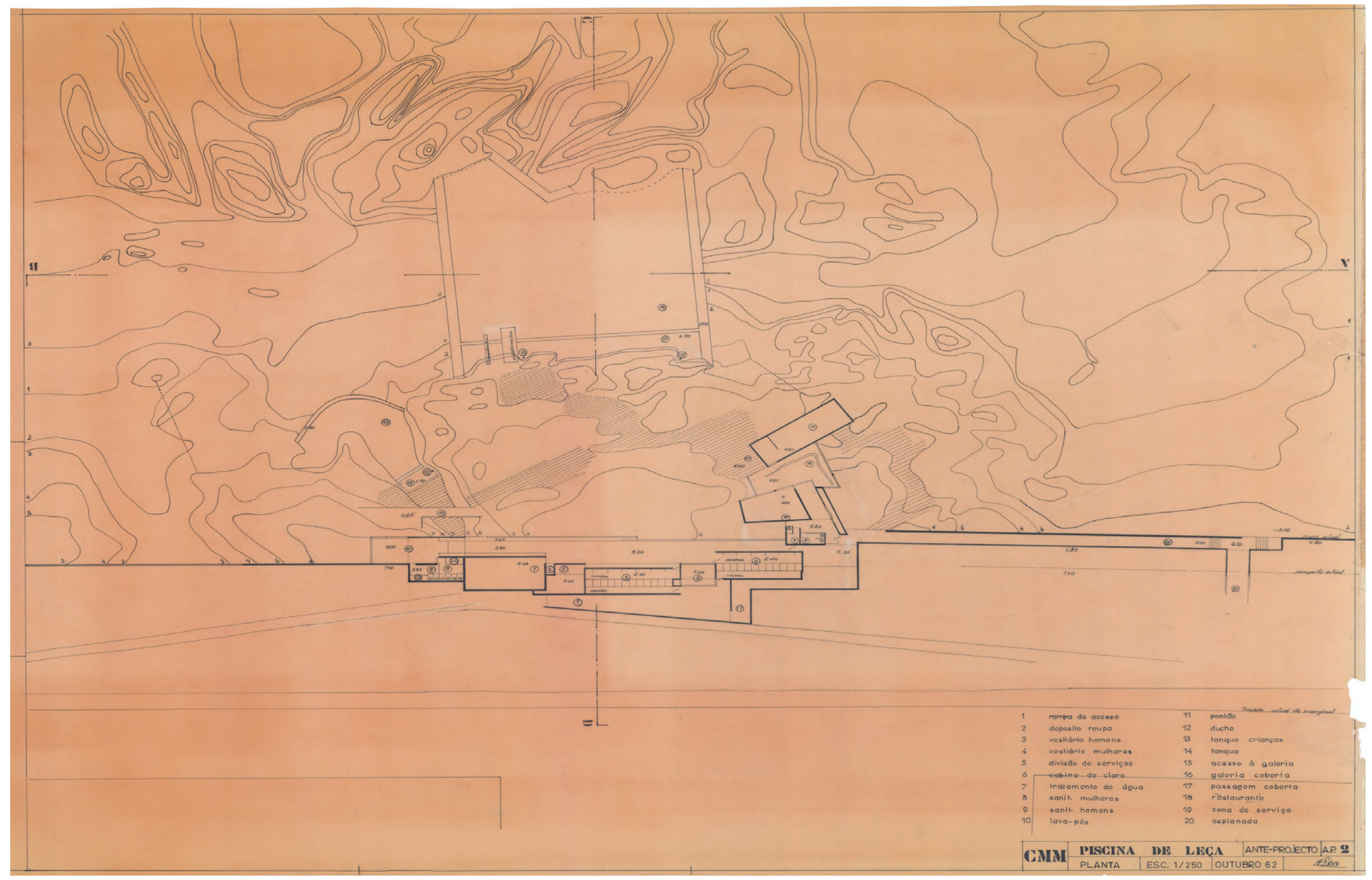

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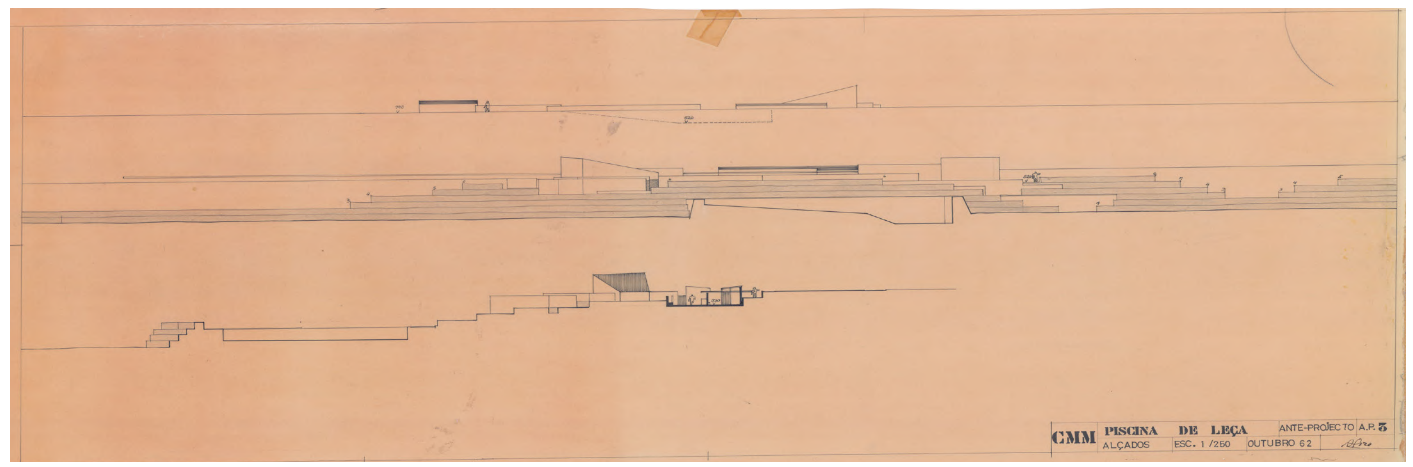


A.12

A.10 Site plan, 1962.
A.11 Plan, 1962.
A.12 Elevations, 1962.

Leça da Palmeira Ocean Swimming Pool – 2nd phase
Design report, 1965

1 – General considerations

The currently existing and projected ensemble is, according to drawing no. 2, constituted by:

– Adults' swimming pool

– Children's swimming pool

– Showers and sanitary facilities for women and men

– Changing rooms for men and women and warehouse

– Seawater collection

– Water treatment station

– "Snack-Bar" (to be executed)

– Solarium and accesses.

This complex is located to the north of the Leça beach and develops on the rocks that border the "Centenários Avenue", connecting Leça to the Boa-Nova lighthouse.

In the preliminary design of the swimming pool, dated from March 15, 1960, the successive phases of the initial evolution of the development are described: what had started as a simple pool that took advantage of the irregularities of the local rock and of the tides to serve the bathers of the Leça beach, ended up in the autonomous complex to which the present project refers.

On the preliminary draft in question, the Directorate of Health Services of the G.D. of the Urbanization Services through the Technical Services of Exploitation, in its information no. 201, of April 2, 1960, whose indications were duly considered in this project.

In the natural evolution of the project, a children's pool was added to the existing swimming pool; the common solarium was enlarged through the demolition of the "Meia-Laranja" (half-orange) terrace on the side of " Centenários Avenue"; the sewers leading to the beach were relocated to the south Beach; all the buildings for changing rooms, toilets and a snack bar were planned; the seawater collection was built through underwater galleries and its treatment in a closed circuit; the whole area and its accesses were urbanized and the site was fenced in.

2 – Location

According to "drawing no. 1" the adults' swimming-pool occupies a natural cove in the rocks of the beach, which develops roughly from north to south; the children's swimming-pool is placed taking advantage of a "Talweg" between the rocks to the south-west of the other swimming-pool; the sanitary facilities, treatment cabin and changing rooms lay out parallel to the avenue and the "snack-bar" will be built to the north, at an angle with the changing rooms, protecting the solarium, which develops in a rock amphitheatre limited by the buildings and the swimming pools, from the north winds.

3 – Accesses and car park

The planned accesses and car park are a 1st phase, to be included in the study being carried out on the new waterfront plan.

The access to the pool area is made by a ramp, overcoming the difference in level between the pool and the terrace on the waterfront. The entrance to the pool area for barefoot bathers is through the changing rooms. The area for shoed users has an independent entrance, at the northern end of the facilities. A second ramp is planned, in a north-south direction, allowing a more direct access from the car park.

4 – Changing rooms, showers and sanitary facilities

These facilities run parallel to the waterfront avenue. Their capacity was established on the basis of the swimming pool area, based on calculations transcribed by Prof. Ernest Neufert in "Architects' Data".

4.1 – Changing rooms – The option was made for the system of cabins for changing clothes, in two sections (men and women), with a central coat rack and separation between shoed and barefoot users.

It was found that 24 cabins were necessary, assuming that the number of hangers, in the coat rack, should be close to 3/5 of the number of square meters of the pool, that the daily use of each cabin is 40 people, and assuming that each cabin is used twice a day, (Prof. Ernest Neufert, "Architects' Data").

- Pool approximate area	800 m²
- No. of hangers (3/5 × 800)	480
- Daily use of the hangers	960
- No. of cabins (960 : 40)	24

Each changing room section is equipped with five foot-washes and one washbasin.

4.2 – Sanitary facilities and showers – They are located at the south end of the annexes, near the entrance to the barefoot area, and equipped as follows:

Men's section:	2 toilets
	3 showers
	3 urinals
	1 wash basin
Women's section:	4 toilets
	3 showers
	1 wash basin

The showers distributed by the barefoot area must be added to these numbers.

The entrance to each of the sections is mandatorily made through the same foot wash that separates the facilities of the barefoot area.

4.3 – Construction and materials – The construction system adopted is that of unplastered poorly reinforced concrete walls, supporting a baltic pine wood roof, covered with copper sheeting over asphalt fabric. The height of the timber beams allows for permanent cross ventilation of the entire facility.

The cabin partitions are made of wood, and hung from the roof, so as to allow easy washing of the floor. The floor is made of pre-cast concrete slabs. The connection with the longitudinal walls is made by gutters with semi-circular section. The walls are made of washable material (cement) or of wood, duly protected. In the sanitary facilities and showers, where greater care was needed, this protection achieved by a vinyl resin film. The metal parts (locks, drainage grates, etc.) are made of brass or copper.

4.4 – Sanitary facilities for shoed users – They will be integrated into the volume of the bar, currently under study. In the meantime, they will operate in a provisional installation, with two sections for men and women, next to the area destined for shoed users (north side).

5 – Bar project

It will be built on the northern side of the site, increasing the area sheltered from prevailing winds, as indicated on the topographical plan.

6 – Area for shoed and barefoot users

The terrain's natural conditions were taken advantage of as much as possible, especially where rock outcrops limited areas sheltered from the prevailing winds. These areas have at times been enlarged by light rock removal. A system of platforms and concrete stairs comfortably connects the different levels of these areas. A more systematic use of the terrain is being studied, particularly in the southern part of the site.

Private areas for barefoot users, connected to the pools, are planned, with foot washing basins with mandatory passage near the entrances. These areas will be in sand or paved with cement.

7 – Lighting

The respective project is under study and, as night use of the swimming pools is not foreseen, the current security lighting is made out of light points in the buildings and floodlights outside, which have functioned as a pilot installation on a temporary basis.

8 – Pool dimensioning

8.1 – Adults' swimming pool – The rectangular shaped swimming pool is limited to the north, south and east by support walls or artificial coatings and to the west by the irregular natural rock, of which only a lower part was also covered by retaining walls, as can be seen in "drawing no. 19".

The pool is 33.33 m. long and a variable width that, at its narrowest point allows for 8 swimming lanes, 2.5 m. wide, at full depth of 20.0 m.

The bottom is constituted by three levels: the small bathing area, sloping in the longitudinal direction with depths between 0.9 and 2.5 m.; an intermediate level, with a slope in the same direction and depths between 2.5 to 4.05 m., and the bottom of the jumping pit, with a transversal slope towards the bottom sewer, with depths between 3.8 to 4.0 m.

8.2 – Children's swimming pool – The children's swimming pool, as shown in "drawing no. 20", has the approximate shape of an "L", in plan, being limited by a curvilinear support wall, by the natural rock on the sides and on the back side by another straight support wall.

The bottom is flat with a slight slope towards the curvilinear wall where the sewer is located. The maximum water depth is 0.5 m.

9 – Collection

The swimming pools are filled with seawater. The initial intention was to capture it between the sinuous local rocks where the bottom sewage outlet is located, but this has proved to be unfeasible given the existence of a large amount of sand in suspension in the captured water.

Therefore, it was necessary to opt for underwater collection, as shown in the two respective "drawings no. 21 and 22", and described below.

A well with a diameter of 3.00 m. and a depth of 18.0 m., duly covered with prefabricated concrete blocks, was dug at about 3 m. from the support wall of the public walkway.

From this well there is a gallery with a section of 1.50 × 1.80, which bifurcates at 40.00 m. with a length of 29.00 m. and at 63.90 inflects on the same side in a section of 10.00 m. The total length of the gallery is 102.90 m.

During the construction works for the opening of the gallery, 159.00 m. of horizontal 3" pilot hole soundings were conducted because, as can be seen from the general plan, the galleries are located under the sea.

The galleries were opened in the rock and, therefore, were not covered, with the exception of an initial section with a length of one meter, in the connection with the well.

In the well, two filter wells in porous concrete were placed, with a diameter of 1.00 and a height of 12.00 m.

Both the galleries and the well were filled with Caia borgau and coarse sand.

Holes were drilled at convenient points in the galleries and, by means of explosions, deep cracks were opened in the rock, which allowed water to enter the gallery and, consequently, in the filtering wells.

For the location of the electric pump groups a well was dug under the sidewalk. The walls are in concrete and both the intermediate plate and the cover are in reinforced concrete. Outside access was achieved through a small gallery by the sidewalk retaining wall. An iron door with shutters seals off the entrance. As a ventilation complement, four circular holes with 0.20 m. of diameter were opened in the retaining wall to improve air circulation.

Two groups of "Pargete" centrifugal electric pumps, entirely made of phosphor bronze and stainless steel shafts, and "EFACEC" electric motors, protected flow type, each of 50 l./sec. were installed there. All the piping, from the filtering wells to the water treatment equipment, is made of cast iron with a diameter of 0.20 m.

The pumping installation was made in order to allow the functioning of only one group or both at the same time.

The electrical installation was carried out in accordance with regulatory standards.

10 – Filling and circulation

The 200 mm. wide adductor of the collection pumps connects to the treatment plant network to allow for the filling of the pools directly or through the respective equipment.

The circulation of water for regeneration in a closed circuit is indicated in drawing no. 23 and proceeds as follows: the water leaves the north wall of the swimming pool through 9 inlets equipped with brass drains, aligned at a depth of 0.5 m. and 2.1 m apart. These entrances, in fibre cement tube with a diameter of 100 mm. are connected by a collector made of the same material with a diameter of 150 mm., in turn discharging into the fibre cement pipe of 300 mm. which, along the aqueduct under the foot wash, on part of the beach, – duly protected by concrete wrapping, – and along the aqueduct under the children's pool and its solarium, opens into the well of the treatment centre in plunging the circulation pump group sucker. The return circuit described takes place entirely by gravity, with the water leaving the children's pool through a 75 mm copper pipe (equipped with a bronze wedge valve) located halfway between the water inlet and the centre of the support wall on the sea side.

The water inlet circuit is made up of a galvanized iron pipe at the output of the central pumping unit and in the respective 200 mm fibre cement sink pit, following the same route as the return pipe to the south side of the swimming pool.

There it splits into two levelled fibre cement branches measuring 150 mm., to which 9 outputs with 80 mm of diameter connect. equipped with a diffuser and rare brass cone, 4 of which are aligned at a depth of 1.0 m. and 5 at 2.5 m., spaced 4.0 m apart in each row and placed in quincunx.

In the children's pool, the entrance occurs in the same way as the exit, located on the support wall that limits it on the opposite side of the beach.

11 – Circulation, filtering, treatment

11.1 – General considerations – The adopted treatment principle was making the regeneration in a closed circuit, assuming a regeneration cycle of 12 hours, which means, for the total volume of the pools of about 2,250 m³, with an hourly flow of the purifying installation of 190 m³.

Proper regeneration requires:

– A physical treatment that ensures the clarity of water after use;

– A bacteriological treatment aimed at destroying living organisms (microbes, algae, etc.) in the water that cannot be retained through filtration, as well as providing it with some antiseptic properties.

Thus, treated water must comply with the following characteristics:

Physical

- Clarity: it must be crystalline and clear so that the turbidity is less than 10 drops of 1% alcoholic mastic solution verified with the Dienert apparatus.

- Colour: should be clear and bluish, without any yellowish tinge.

Chemical

It will remain constantly alkaline to methyl orange and free from caustic alkalinity; it will contain between 0.3 to 0.5 mg. of free chlorine per litre.

Bacteriological

The water will not contain a number of bacteria greater than 200 per cm³ in more than 10% of the samples examined. Nor will it contain coli bacilli in 50 cm³. of water.

11.2 – Circulation – Circulation is forced through the described circuits by two groups of electric pumps of 12.5 H.P. of power, with an hourly flow rate of 95 m³. each and for 17 m. head height (See attached drawing no. 24).

11.3 – Solid bodies filter – As soon as it enters the treatment cabin, the water goes through a solid bodies filter – retaining suspended substances that are harmful to filtration and pumping –, made of mild steel sheet with a hinged lid and a copper mesh retention sleeve. It has a height of 717 mm. and a diameter of 300 mm.

11.4 – Filtering – This filtration is intended to reduce the supply flow and retain suspended substances and is carried out in a battery of 3 quick-type vertical axis filters, under a working pressure of 1 kg/cm² and simple backwash of water, without the need for compressed air.

The filters, made of mild steel sheet, are cylindrical, with a diameter of 2m and 2.2m high, and contain filtering units made up of layers of sand and cobble of homogeneous and calibrated granulometry.

They are connected by 6-inch pipes, equipped with external valves to control the various operations, a set of 2 pressure gauges interspersed in the control tree and, inside, and at the bottom, has a branch of pipes that ensure the uniform distribution of water through the filter layers.

The water for washing the filters is received in a tank connected to the rainwater collector of "Centenários Avenue" by a fibre cement tube with a diameter of 200 mm. (see drawing no. 14).

11.5 – Chemical clarification – As accelerating reagents for the formation of the colloidal filtering film, aluminium sulphate is used for chemical bonding and sodium carbonate (for alkalizing the water so that it has a final pH between 7 and 8).

This preparation is made in 3 stoneware tanks of 200 l each and the dosage in a "Duplex M.68/70" electric dosing pump, which injects those reagents in intermittent periods, through plastic tubing of polyvinyl chloride to the circulation tubing, before the filters.

11.6 – Disinfection – Water disinfection is based on gaseous chlorine, whose bottle is located in a special compartment integrated in a storage room, insulated and conveniently ventilated.

Chlorine is applied after filtering and is dosed automatically through a "Degrément ACFI" chlorometer, model CVPA 150, where the chlorine and dilution water are mixed to form the sterilizing liquor that is then released through the antacid pipeline.

12 – Swimming pools sewage

Indicated on drawing no. 25.

The adults' swimming pool has 2 drains: one centred with the north wall, just below the bottom, equipped with a sandbox covered with a perforated slab, and consisting of a "Saunders" type valve with rubber diaphragm and 6-inch cast iron tubing coming out into an outer depression of the rock into which the sea enters at high tide; another in the deepest part of the pool, on the south side, also with a sandbox, "Saunders" valve and 10" cast iron piping.

This piping extends along the beach, embedded in the rocks, and wrapped in concrete, to open in a massif executed between two rocks within sea reach.

All valve parts are made of bronze or stainless steel as are their control rods up to the top of the support walls.

The children's pool has a single 6-inch bottom outlet located on the curved support wall, equipped with a wedge valve placed in a sandbox covered with a perforated slab and opening to the beach through cast iron tubing embedded in the wall.

13 – General drainage

The adults' swimming pool has a general drain around the perimeter of its three support walls, to the north, east and south, as does the children's pool along almost of the entire length of the curved support wall near the beach (see drawing no. 25).

The drainage is cast in the concrete of the support walls, in the case of the adults' swimming pool, with a lower lining of 1/2 fibre cement. In this pool, the drains are made of the same material, having a diameter of 60 mm and set 4.5 m apart, connecting to longitudinal collectors of 100 mm of diameter, also made of fibre cement.

Equipped with appropriate slopes, these collectors have two outlets, on the north and south support walls, vertically from the bottom sewers and at levels compatible with those of the adjacent beaches.

In the children's pool, there are only two outlet drains, opening directly onto the beach.

14 – Foot washes: showers

In the adults' swimming pool, due to its special conformation, there is only one longitudinal foot wash along the whole length of the east limit, intercepting the entrance of practically all swimmers, since the access from the south side is impossible, and the access from the north and west sides is not very comfortable due to the characteristics of the rocks.

The foot wash has a depth of 0.25 m. and variable width, with a minimum of 1.3 m. The edge on the pool side is straight and parallel to it and the edge on the solarium side is irregular, following the rocky contour.

It is equipped with two brass showers controlled by foot.

To the east of the children's pool there is another small foot wash with a shower at one end.

Finally, there is another foot washing basin at the entrance to the toilets, along the entire width of the passage and developed in the way indicated by drawing no. 14.

All the foot washing basins are provided with bottom and trop-plein drainage and are supplied, as are the showers, by fresh water from the public network.

15 – Ladders, footrest ledges: diving boards

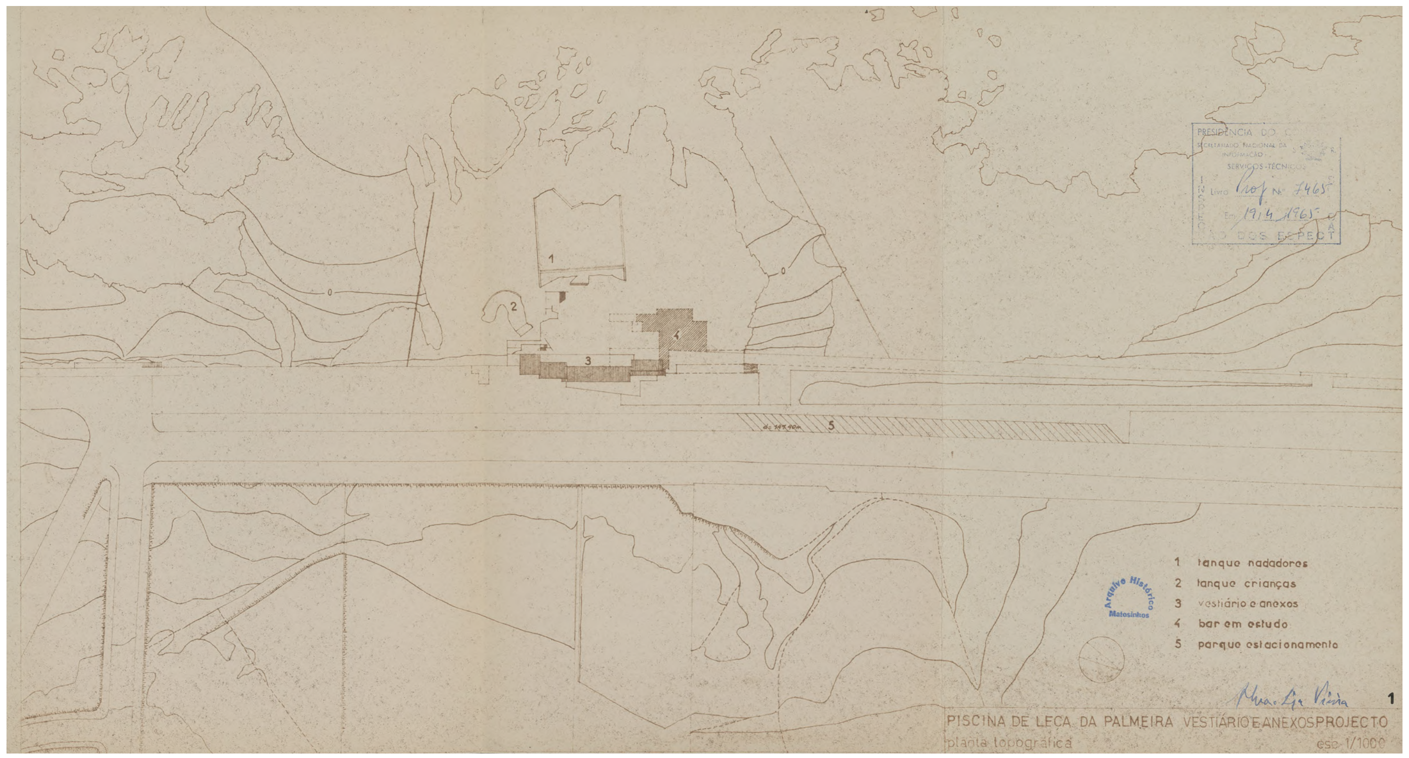
In the adults' swimming pool there are removable ladders made of brass tubing and wooden steps until the edge of the footrest ledge, as indicated in drawing no. .

This edge has a 0.15 m. projection and consists of a reinforced concrete levelled console at the depth of 1.3 m., extended along the entire support walls.

Porto, February 16, 1965

Álvaro Siza Vieira

Bernardo Ferrão



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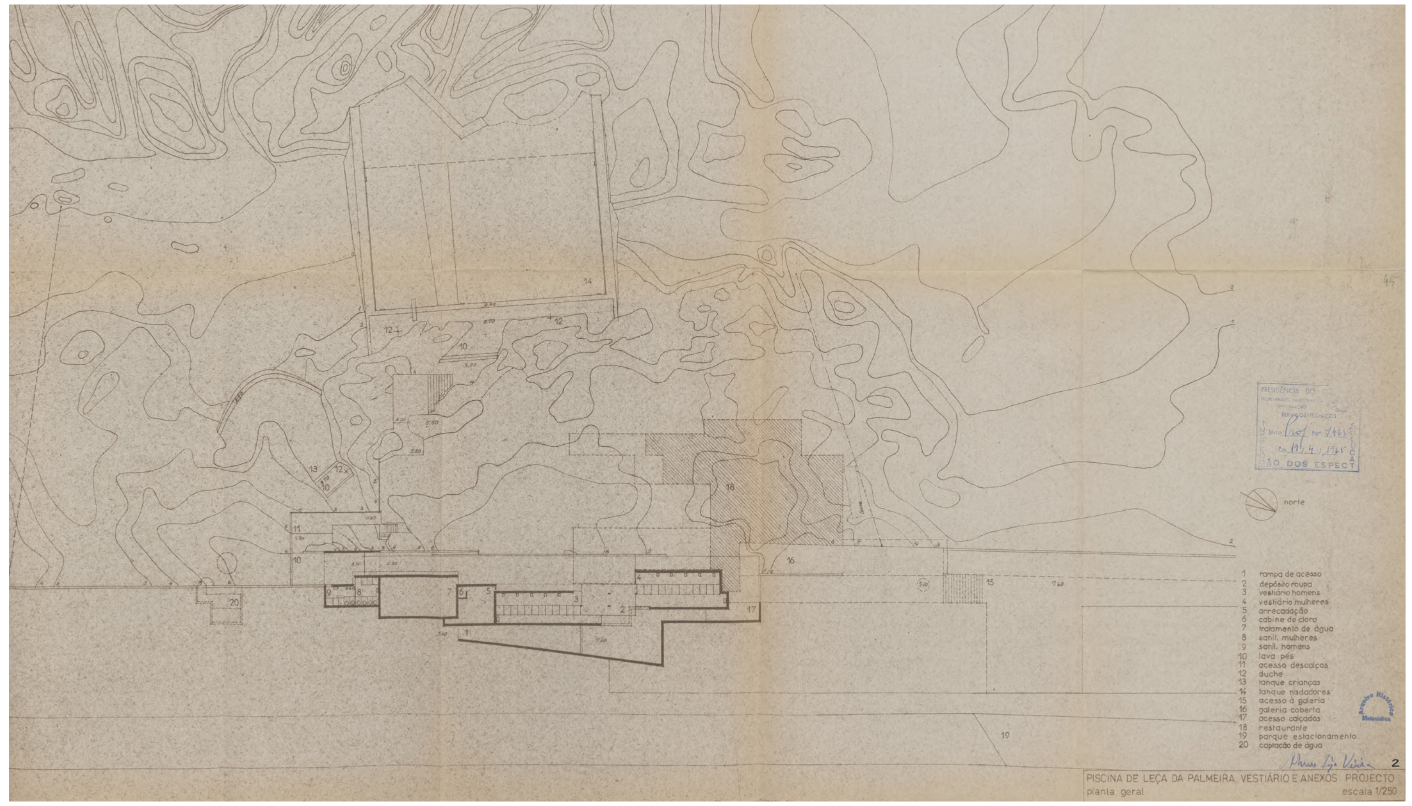

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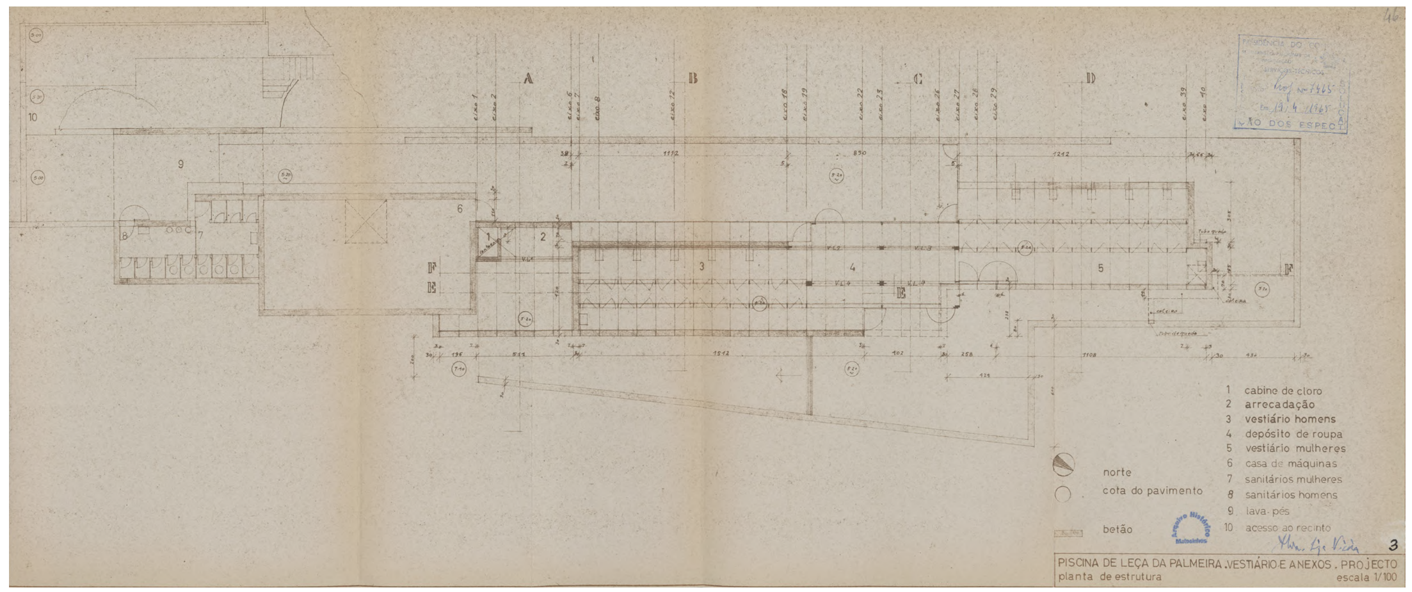

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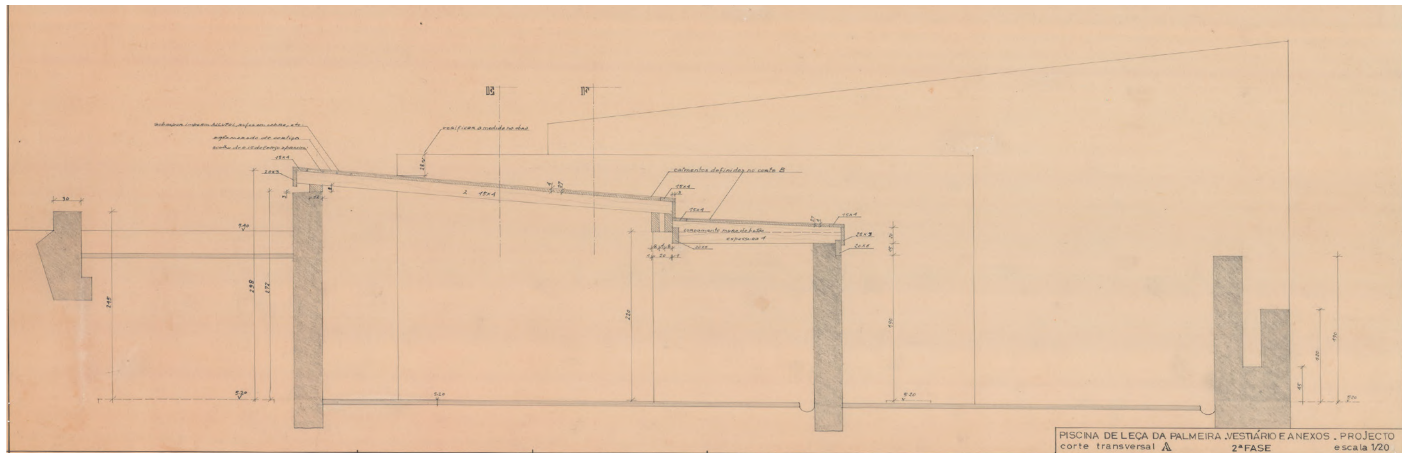
A.13 Site plan, 1965.
A.14 Plan, 1965.
A.15 Structural plan, 1965.



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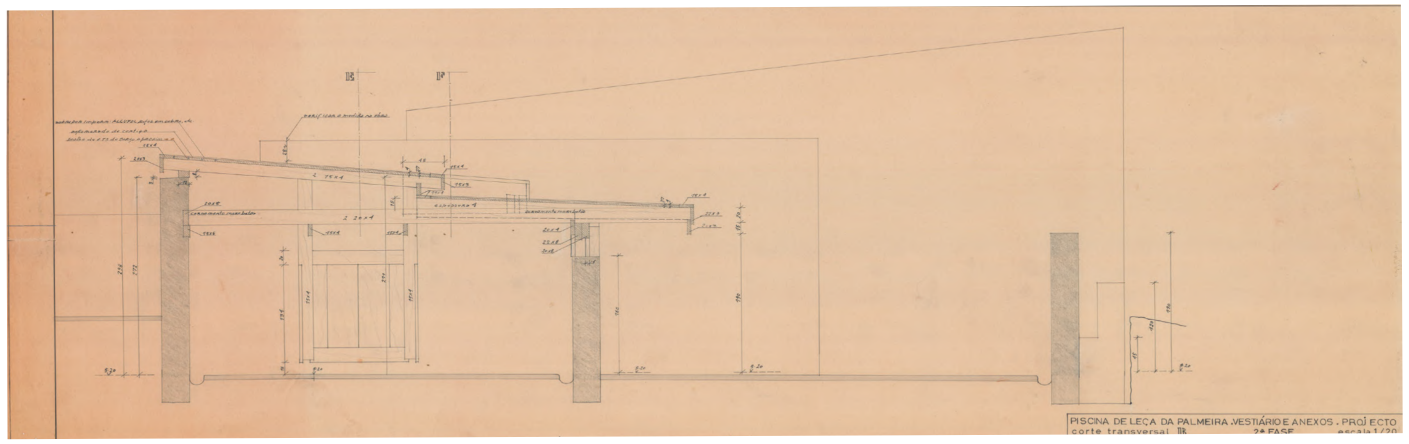

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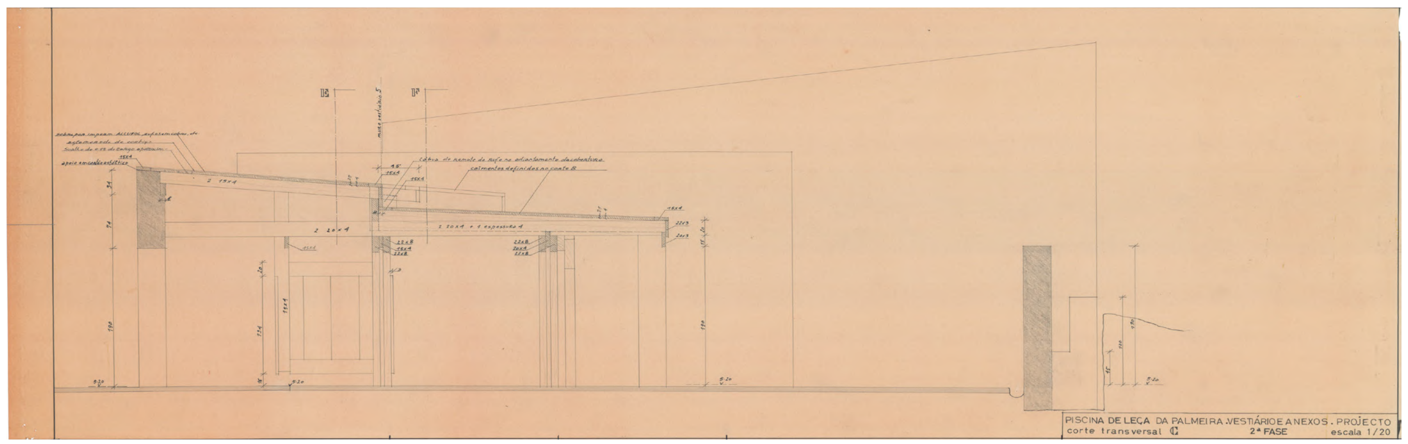

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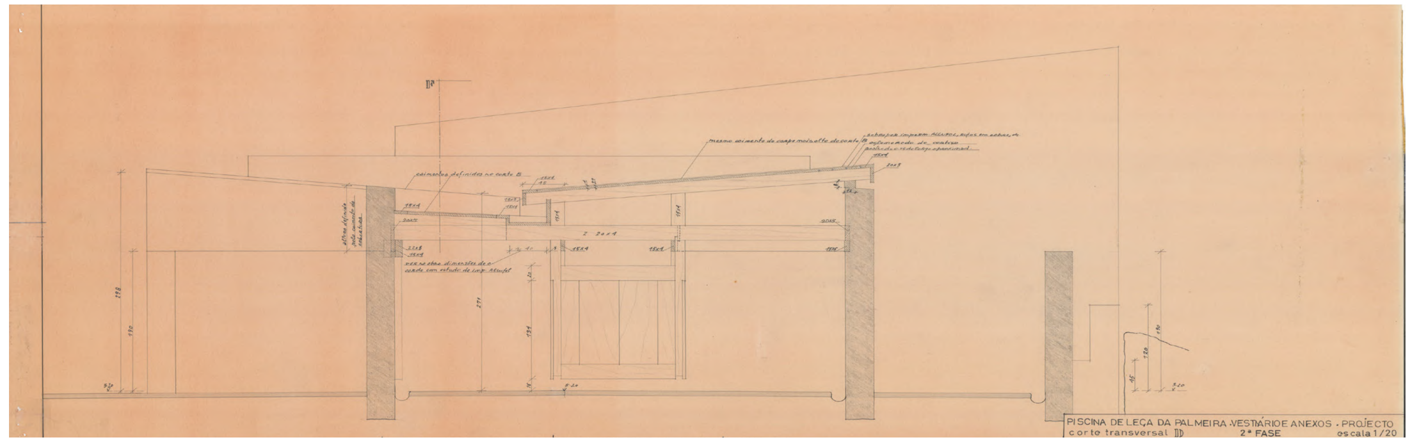

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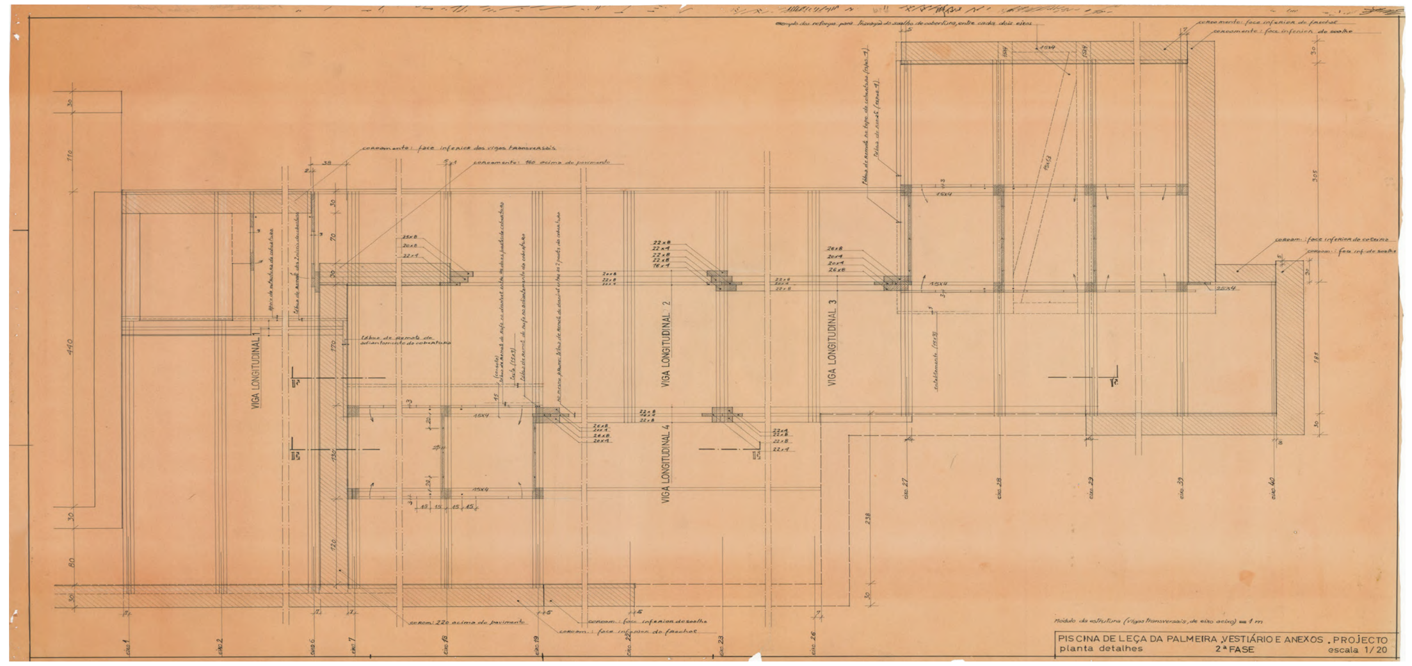

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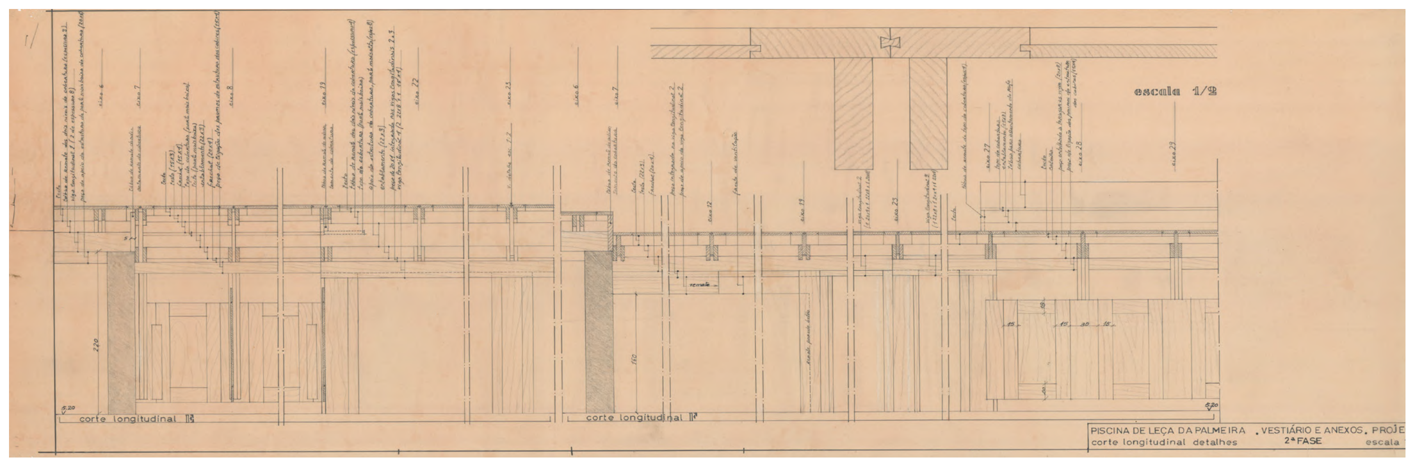
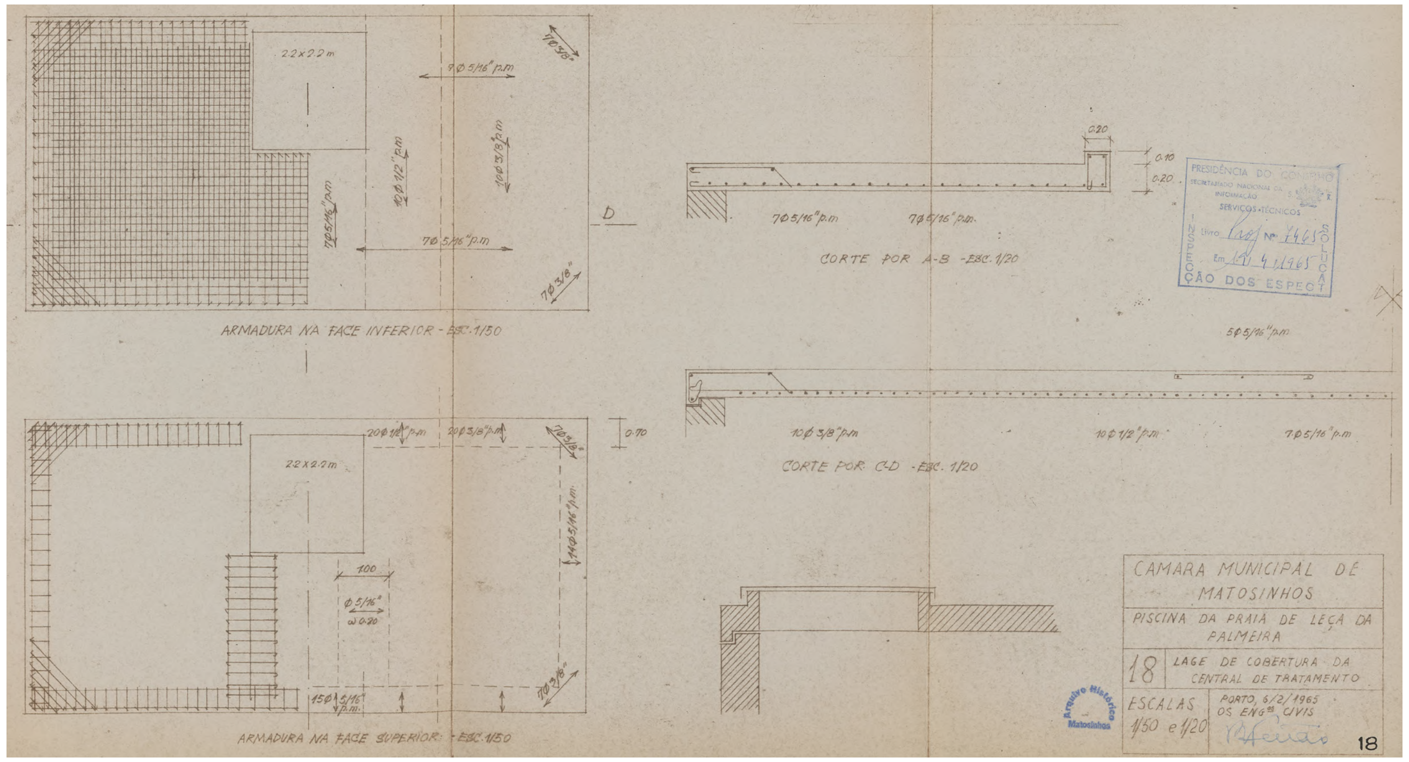


A.21

A.16 Cross section A, 1965.
A.17 Cross section B, 1965.
A.18 Cross section C, 1965.
A.19 Cross section D, 1965.
A.20 Detailed plan, 1965.
A.21 Detailed longitudinal section, 1965.



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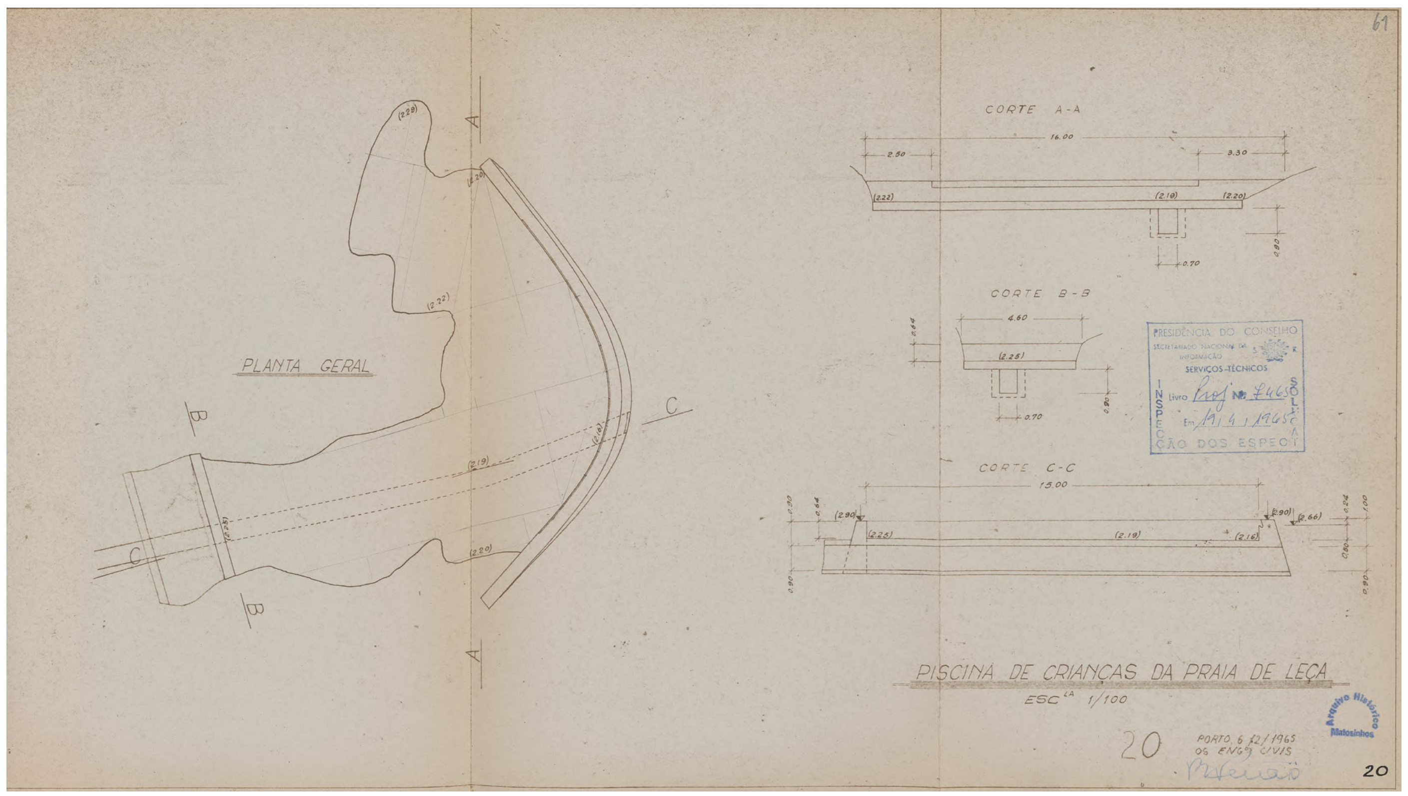
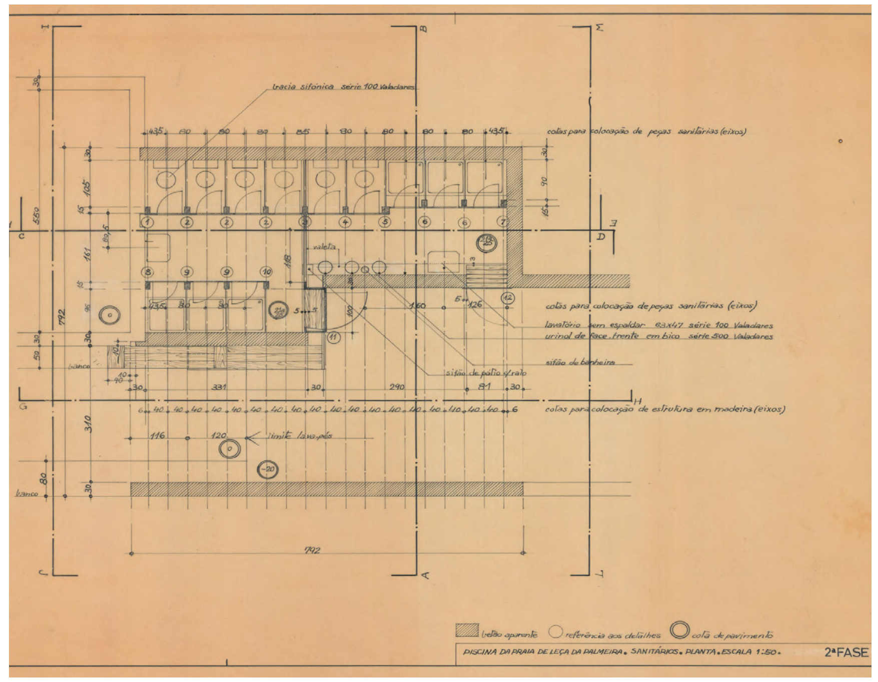


A.23

A.22 Water treatment room's roof slab, 1965.
A.23 Children's swimming pool plan and sections, 1965.
A.24 South bathrooms plan, 1965.
A.25 South bathrooms sections, 1965.
A.26 Water collection infrastructure, 1965.
A.27 Water treatment and pumping infrastructure, 1965.



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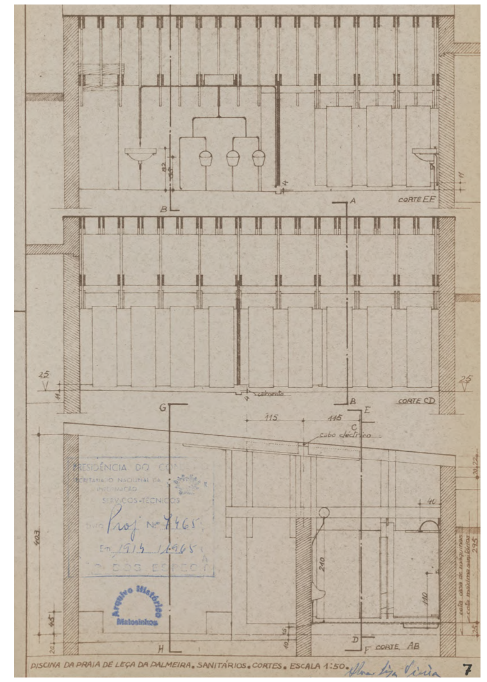

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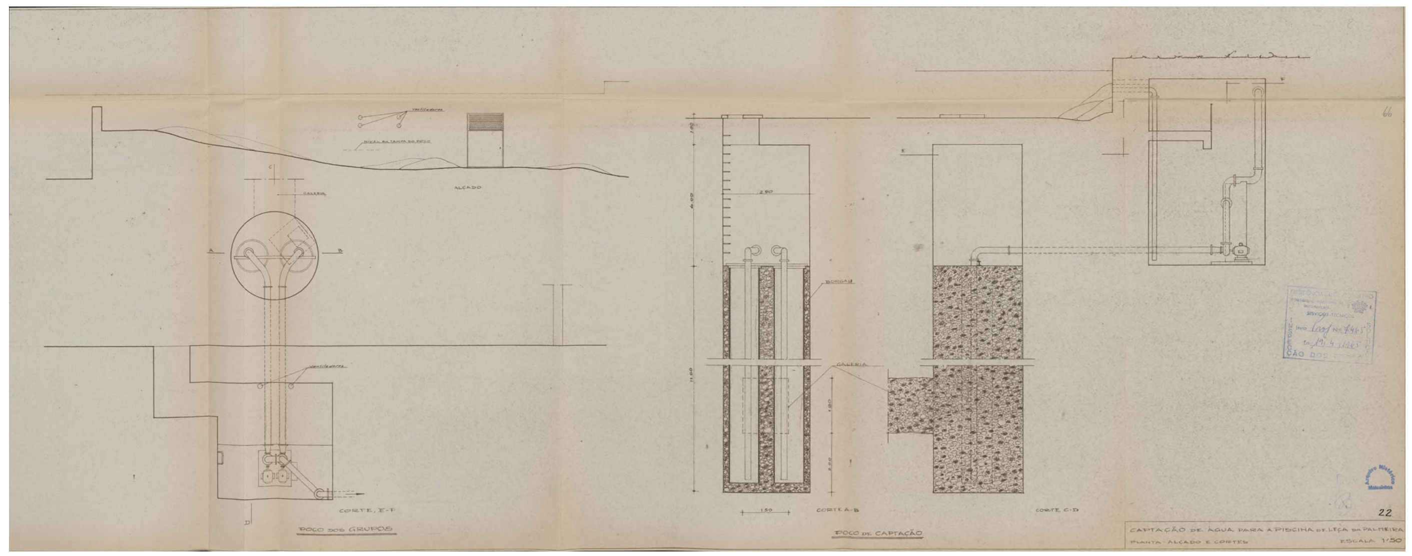

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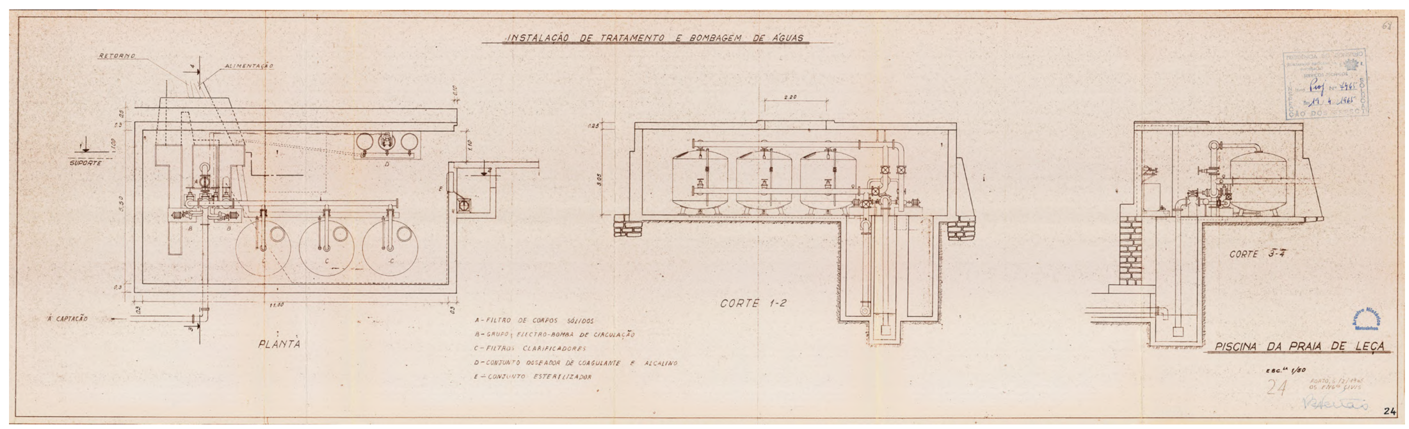


A.27

Leça da Palmeira Ocean Swimming Pool – 4th phase - Preliminary draft
Restaurant design report, 1965

The operating experience of the Ocean Swimming Pool demonstrated the need to enlarge the enclosure. Therefore, the study now presented was prepared, based on the following principles:

a) - Revitalization of the southern area through the creation of a comfortable access from the changing rooms.

b) - Annexation of the beach to the north of the enclosure and revitalizing it, creating comfortable connections and setting the (already planned) restaurant at the north end.

Considering the advantage of operating the restaurant throughout the year, an access close to the car park was studied, without prejudice to easy control, during the bathing season (at the north and south ends of the premises), providing for the possibility of functioning either exclusively to support the pool enclosure or independently of it.

The proposed solution is that, during the bathing season, the access to the restaurant is conditioned to the payment of the entrance fee to the premises, recoverable or not in the payment of consumption, according to the movement verified.

The restaurant building is set in a northeast/southwest direction, forming a 45º angle with the supporting wall of the avenue in order to shelter the wide area of the enclosure from the prevailing winds.

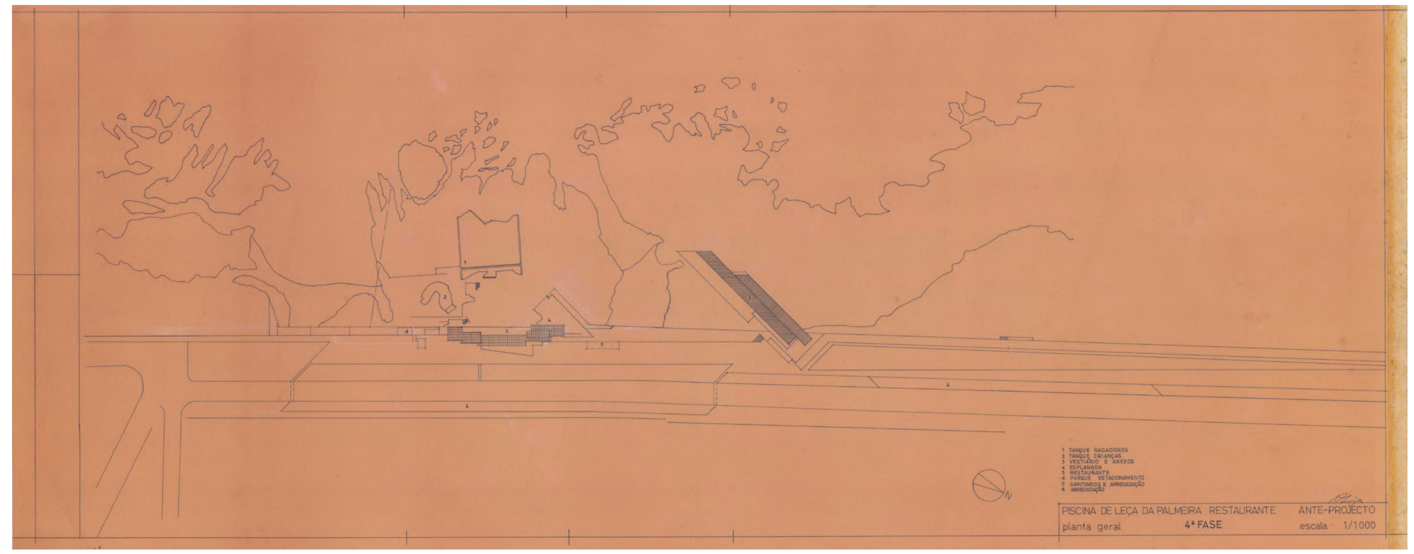
This location accentuates the boundary of the enclosure, already defined by the rock mass on which the building is set.

The lowering of the current support wall, and the construction of an almost parallel second wall to form a connecting platform to the changing rooms, allows the restaurant to be embedded in the avenue at the top level, framing the set of pool facilities, and solving the connection with the masonry wall that limits the beach area to the east, from the port's north pier to Boa Nova.

Porto, September 15, 1965

Álvaro Siza Vieira

A.28 Restaurant site plan, 1965.
A.29 Restaurant 1st and 2nd floor plans, 1965.



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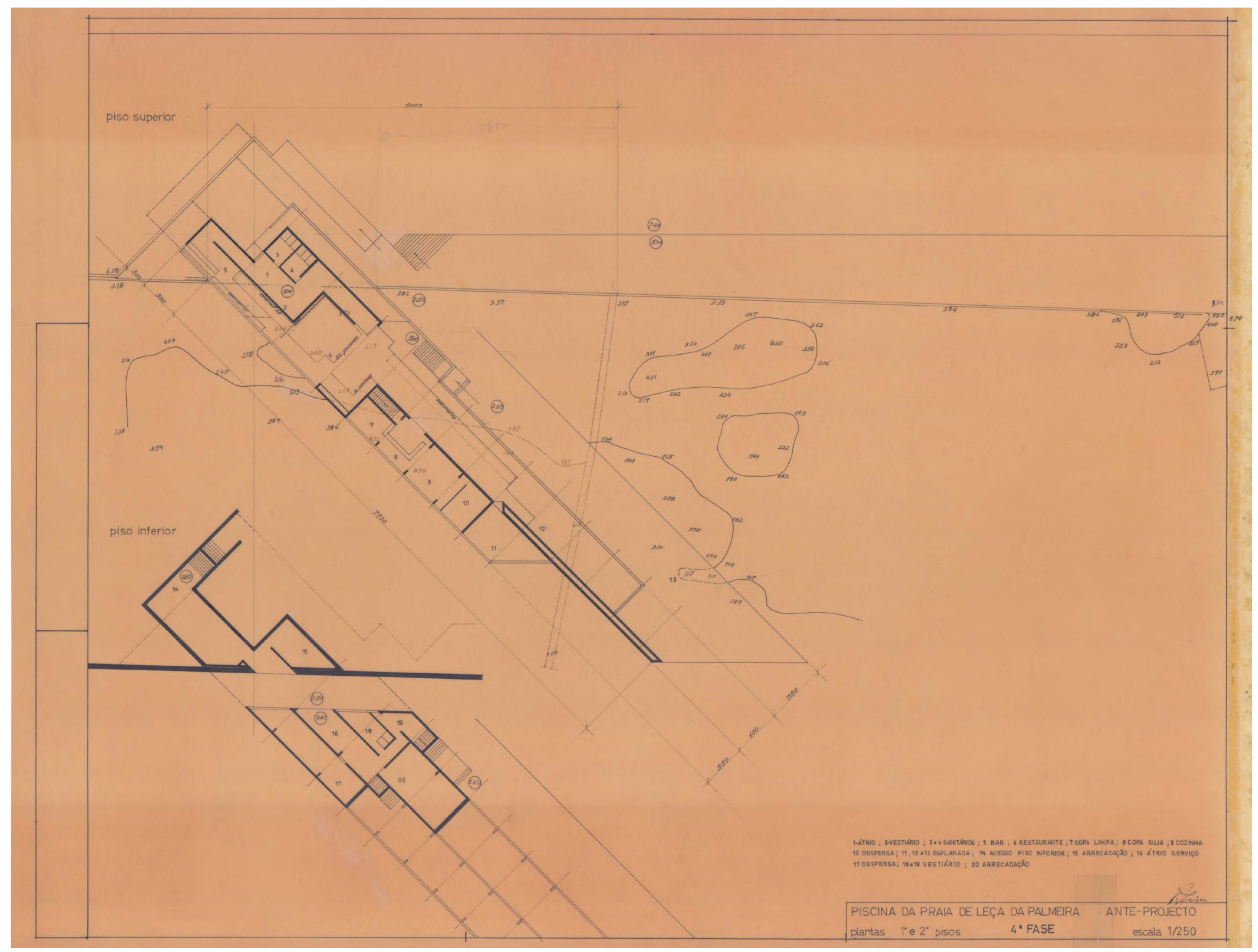


A.29

Leça da Palmeira Ocean Swimming Pool - 3rd phase
Design report, 1966

Enlargement of the enclosure, including storage rooms, toilets, bar, terrace, platform and retaining walls to the north and south – project.

The attached project concerns the elements for building the first phase of the work that is necessary for the site enlargement of the Leça da Palmeira Swimming Pool.

This first phase does not include the construction of the restaurant planned for the northern end of the premises.

In these complementary works, the principles initially adopted regarding the integration of the building into the landscape are maintained; integral conservation of the conditions of the site, where possible; and superimposition of built areas, where necessary.

The construction of retaining walls, to the north and south of the changing rooms, constitutes the necessary finishing to the buildings and, while simultaneously solving the access circuits and connection between areas, completes the embedding of the buildings in the retaining wall of the avenue and the meeting of two materials applied on large surfaces: granite masonry and bare concrete.

The criteria adopted so far concerning materials (bare concrete, riga wood and copper) and type of finish are still maintained.

Having demonstrated the correctness of the bar setting, built on a provisional basis, its definitive construction is now planned, with an added area of influence conveniently paved (screed) and protected from the prevailing winds.

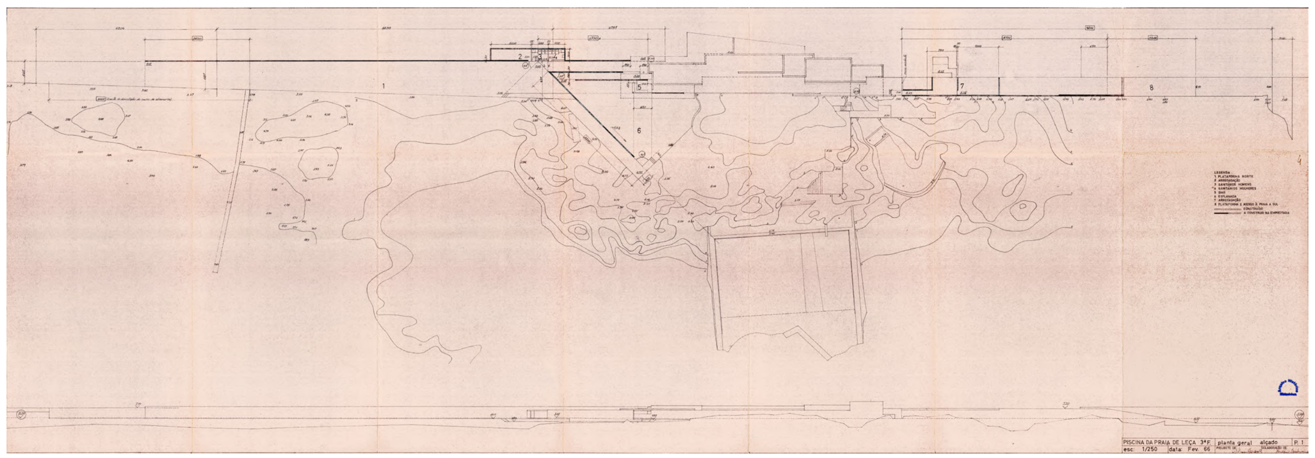
This contract includes sanitary facilities for shoed users and enough storage for the premises (to the north and to the south).

In addition to the definitive integration into the landscape, access solution and its control, the enclosure conditions and possibilities of use will be particularly benefited – decentralization, differentiation of areas and adaptation to local climate conditions.

Porto, February 21, 1966

Álvaro Siza Vieira

Bernardo Ferrão



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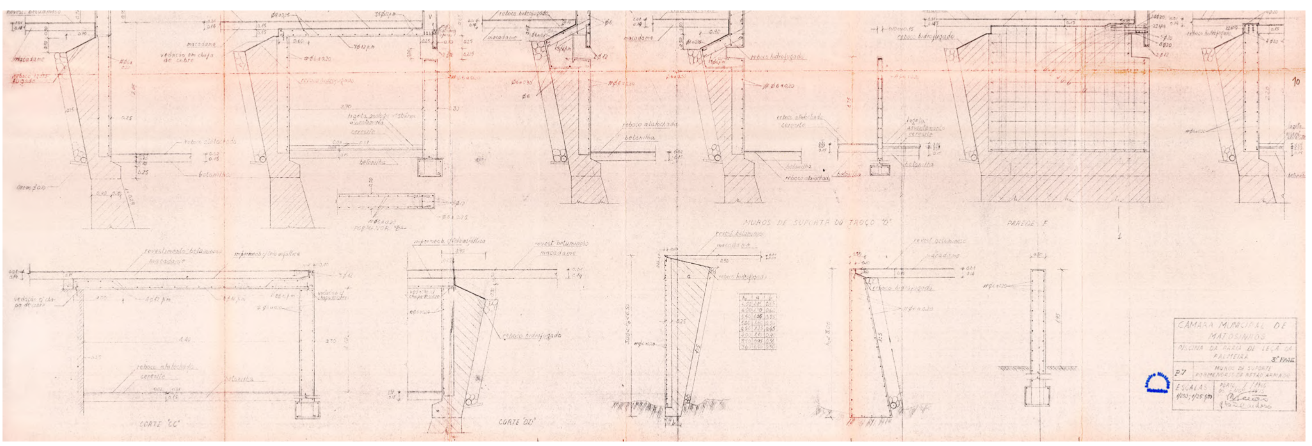

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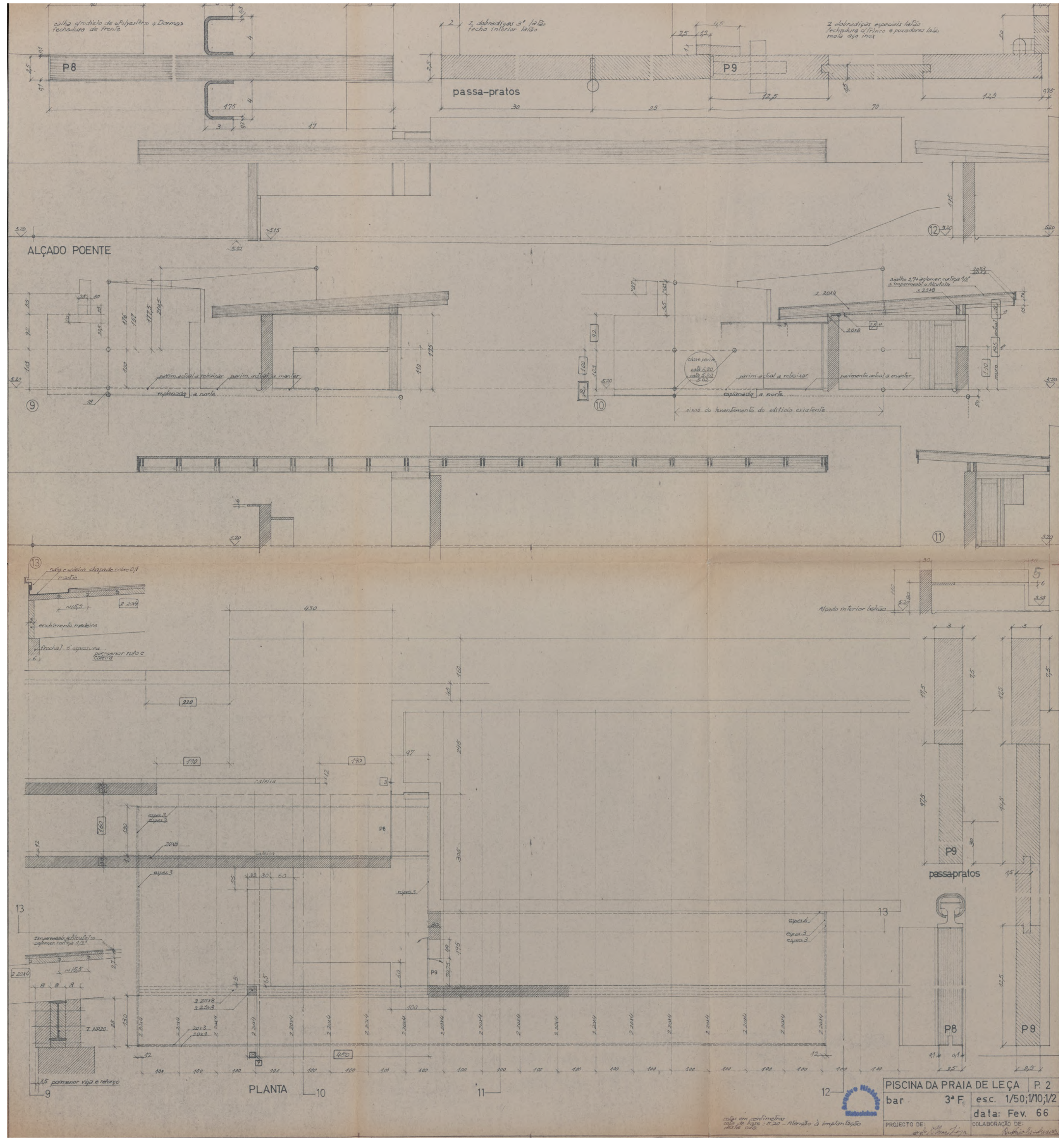
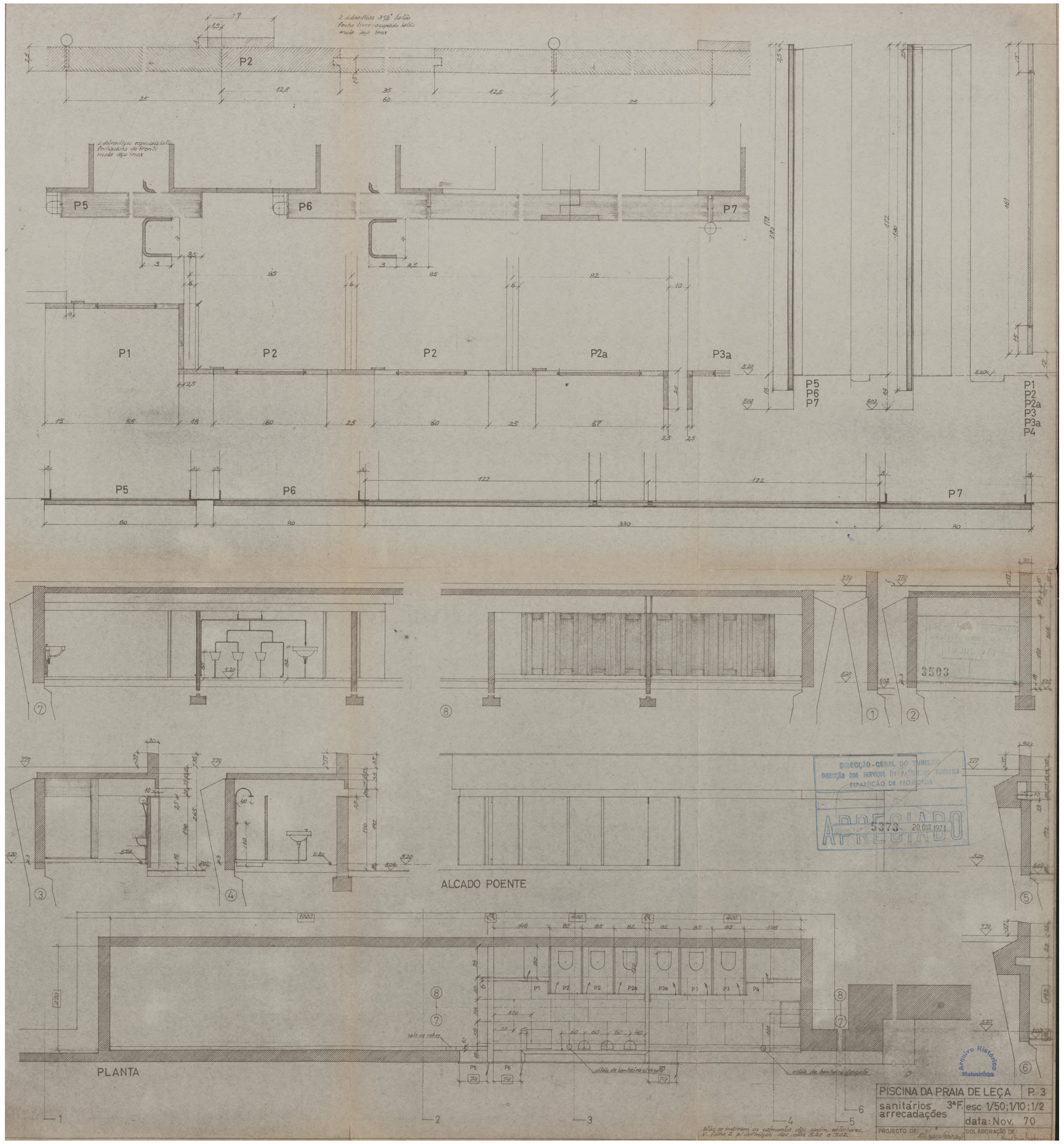


A.32

A.30 Plan and elevation, 1966.
A.31 Retaining walls and reinforced concrete details, 1966.
A.32 Bar plan, elevation, sections and details, 1966.
A.33 North bathrooms plan, elevation, sections and details, 1966.



A.33

Leça da Palmeira Ocean Swimming Pool - Intercalary draft of the 3rd and 4th phases

Design report, 1973

1 – The attached preliminary draft, prepared in accordance with the instructions of the Matosinhos Municipality, defines the works to be carried out for the conclusion of the 3rd phase, in order to satisfy the opinions formulated in the meantime, and also to introduce improvements advised by the experience of the enclosure operation.

2 - Works resulting from the opinions formulated

a) Connection of sewers to the general network

A diagram (drawing 4) of the referred connection is presented, which is made from a septic tank, since the municipal pipeline is mixed.

b) Separation of shoed and barefoot areas

A foot wash will be built which, together with the existing one on the south side, ensures the separation of the two enclosures (drawing 1).

c) Expansion of sanitary facilities

The number of 500 people was fixed as the maximum attendance of the enclosure. For the expansion of barefoot users' toilets, the numbers referred to in the "General Instructions on Swimming Pool Constructions", prepared by the Sanitary Engineer of the General Directorate of Health, were considered, assuming that there are 500 visitors, 50% of each gender.

With regard to shoed users, the same "Instructions" were respected, assuming the hypothesis of a maximum frequency of 20% of total entries, and equally 50% of each gender. The shoed users' restrooms will be built in a more sheltered location, adapting the existing ones for staff use (changing rooms and restrooms for men and women).

d) Protection on the sea side of the pool.

A drawing (sheet 5) of the removable railing to be placed on the pool sidewalks is attached. This railing prevents access to the rocks, on the west side, making it inevitable to go through the foot wash, slightly extended on the north and south ends. A removable railing was chosen considering the violence of the sea to which the pool is subject, which would make a permanent solution extremely expensive.

e) Bar

Drawing 6 defines the constitution of the bar and the service area corresponding to the preparation area and pantry, as well as refrigeration and other equipment. The staff facilities and storage area and container deposit, shown at 1/50 scale on page 2, are located under the retaining wall and to the east of the bar.

3 – It is clarified that, with regard to other objections made, the points of view presented have in the meantime been taken into account:

a) The edge of the tank profile was altered, in order to present a 2% slant to the outside (drawing 5).

b) The shallowest area of the tank currently has a depth of 0.90 m, with 3.80 m being the minimum height of the jumps area. The edge for the footrest, with a 0.15m protrusion, consists of a reinforced concrete console at a depth of 1.30m and covers the entire length of the pool walls beyond that depth. The plan and 1/250 scale sections of the swimming pool is attached (sheet 5).

c) The situation of the access stairs to the swimming pool, and the respective details are also presented on sheet 5.

4 – Works for the completion of the 3rd phase and improvements to the construction already carried out.

a) Completion of the north platform. This platform, accessible only to shoed users, will be extended to the place where the restaurant is planned to be built, which will constitute the definitive limit to the north (4th phase). At the northern end of the platform there is a ramp connecting to the avenue level.

b) Raising the flowerbeds to the level of the avenue, in the extension surrounding the site, in order to avoid trespassing and to facilitate entrance control. This control will be established at two points, respectively at the north and south ends of the access platform that is now intended to be completed.

c) Construction of a storage room at the northern end of the access platform, taking advantage of the height difference between this construction and the raised flower beds.

d) Completion of the south side ramp along the avenue retaining wall. This ramp, which will be covered with vegetation, will complete the alignment of the reinforced concrete wall, where it meets the plastered supporting wall, and will end against the rocks indicated in drawing 1.

e) Access to the north beach adjacent to the swimming pool area. An access ramp to the beach will be built to the north, interrupted by a foot wash that limits the bar's terrace.

f) Site illumination

The site will be equipped with artificial lighting, with particular attention to the entrance, bar and annexes, since only in this area is night-time operation foreseen.

g) Sound installation

The much needed audio speaker device will be installed.

h) Improvements to the existing changing rooms

A slight modification is foreseen in order to improve the natural lighting of the changing rooms (top lighting) and the remodelling of the chlorine cabin in order to clear division 3.

All wooden frames will be scraped and receive appropriate treatment.

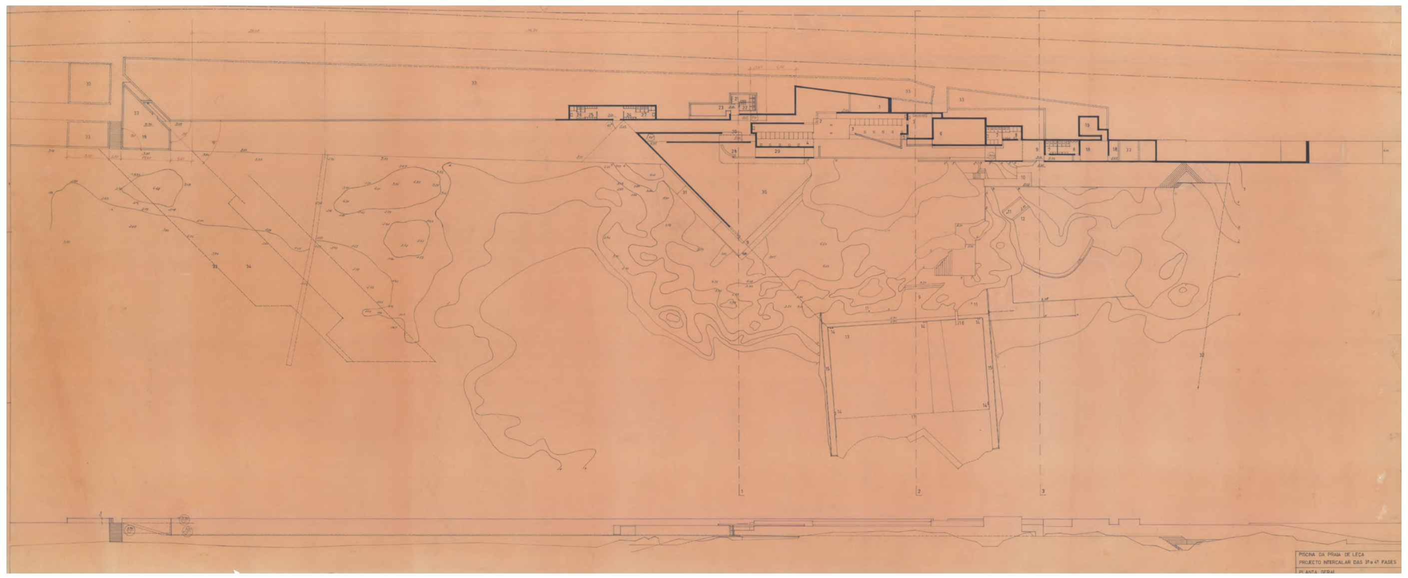
5 – Construction

The construction processes and materials used are similar to those adopted in the previous phases, given the strict conditions imposed by the location of the pool. That is, bare concrete is used in partition walls and slabs, Baltic pine wood is used in frames, and concrete slabs are used for interior floors. According to the opinions formulated, the partitions between sanitary facilities of different genders will not be interrupted at the top, as was done in the past to facilitate ventilation and the passage of pipes, but entirely closed. The interior spaces to be built, whose location within reach of the sea during spring tides does not allow, without the damage already verified, to provide for openings, unless the ones strictly indispensable and equipped with iron doors, will be mechanically ventilated. All the equipment in the bar, preparation area and pantry will be in stainless steel and removable, so that during the winter it can be moved to the protected storage room. The plumbing will be in copper piping.

The terrace equipment (tables and chairs) will be made of Baltic pine wood.

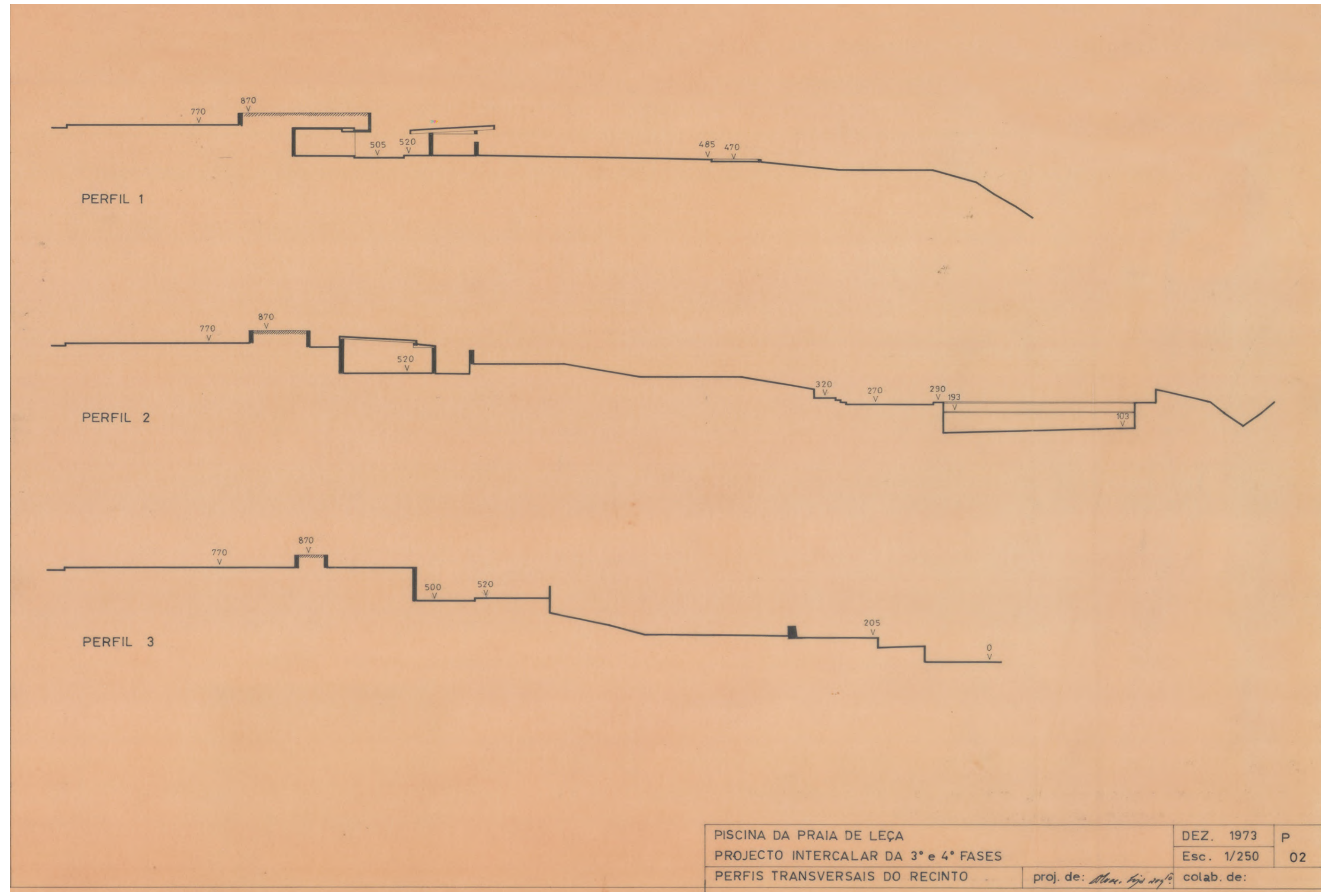
Porto, April 2, 1973

Álvaro Siza Vieira



A.34

A.34 Plan and elevation, 1973.
A.35 Site cross sections, 1973.
A.36 South platform ending plan and elevation, 1973.
A.37 Bar plan and equipment layout, 1973.
A.38 Adults swimming pool access ladder, 1973.
A.39 Terrace furniture, 1973.
A.40 Restaurant cross and longitudinal sections, 1995.



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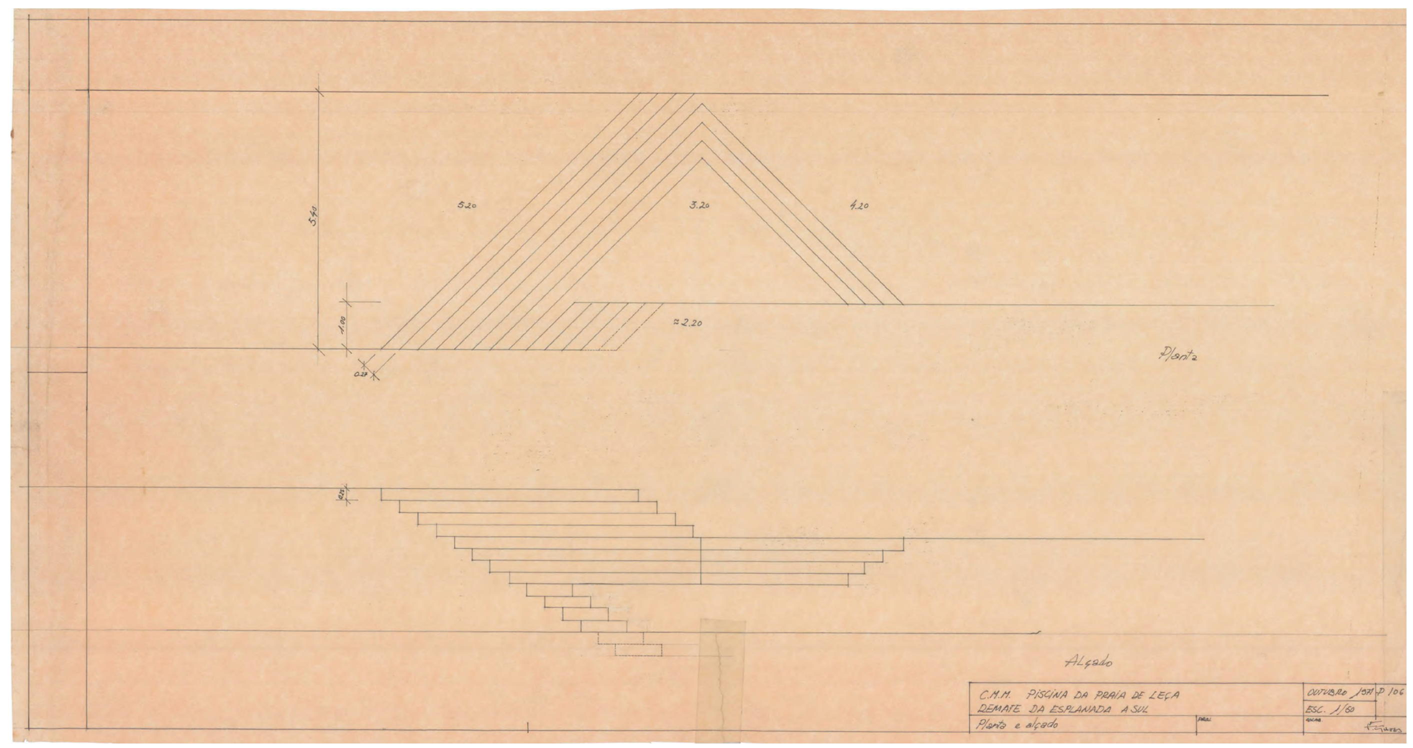

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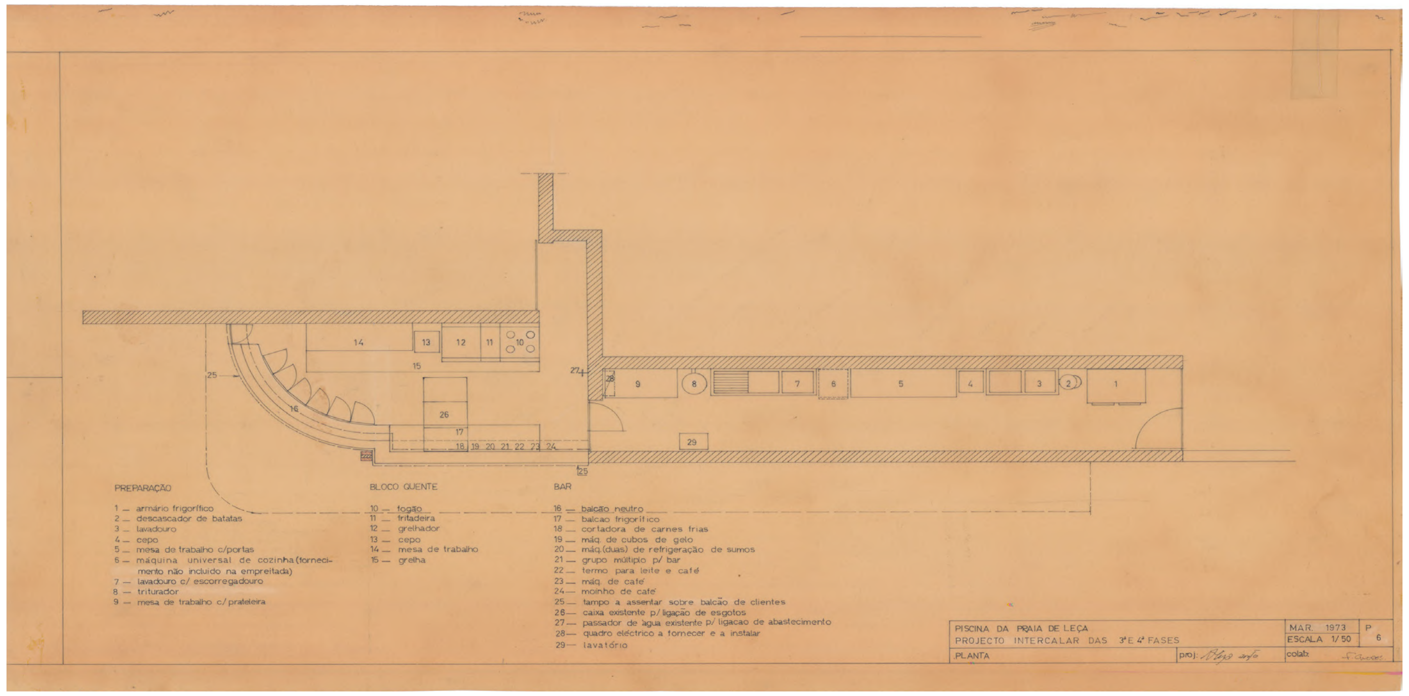

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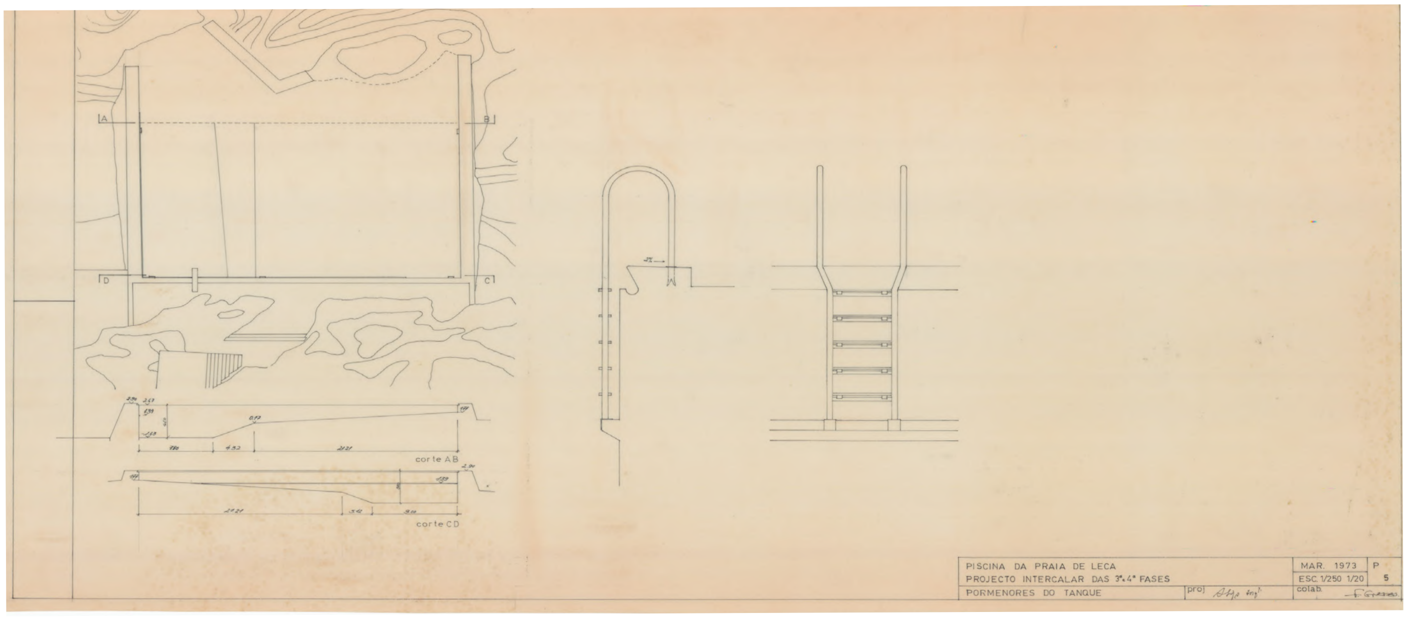

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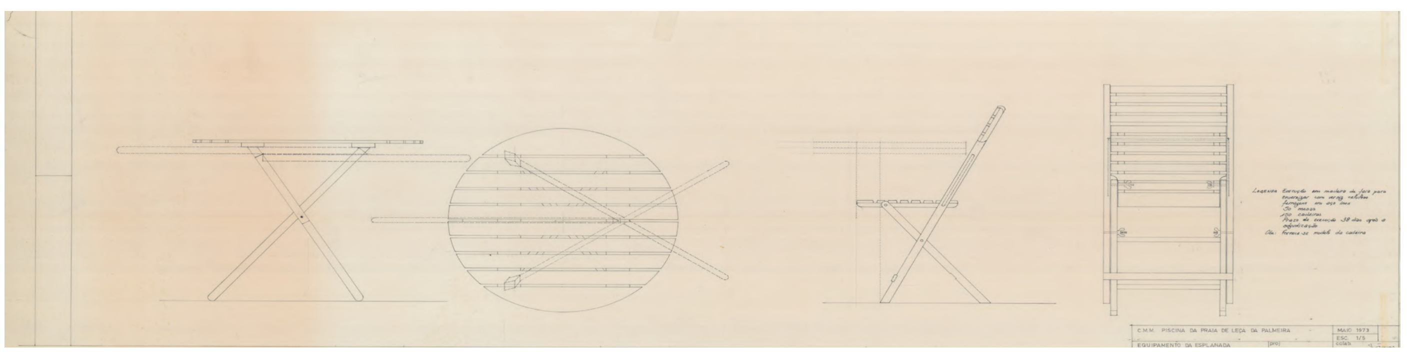


A.39

Ocean Swimming Pool Restaurant - Leça da Palmeira

Restaurant design report, 1995

The Restaurant project is part of the overall study for the Ocean Swimming Pool, started in 1961.

The site includes two pools, partially limited by the rocky outcrops that characterize this area of the Atlantic coast.

The changing rooms, accessed by a ramp, stand parallel to the retaining wall of the seaside avenue, at beach level, so as not to become a visual obstacle.

The solarium is divided by the existing rocky formations, which define communicating spaces of varying dimensions, suitable for different forms of occupation. These natural platforms, supported by small interventions (stairs, ramps, sections of wall) adjust to the slope of the terrain, establishing a natural relationship with the beaches to the north and south of the rock outcrop.

A wall, set at a 45º angle to the seafront, limits the site and a terrace served by a small bar to the north.

This first phase of construction was completed in 1966. The restaurant, whose project has now been prepared, is set on a second rocky outcrop, distancing itself from the avenue wall at an angle of 45º. As in the changing rooms, already built, the roof height exceeds very slightly that of the avenue. The resulting construction height allows for the use of two floors.

The lower floor communicates with a terrace, accessible from the beach, and is occupied by storage rooms and the pantry, which connects to the kitchen by a freight elevator. The restaurant and services of public access are located on the upper floor.

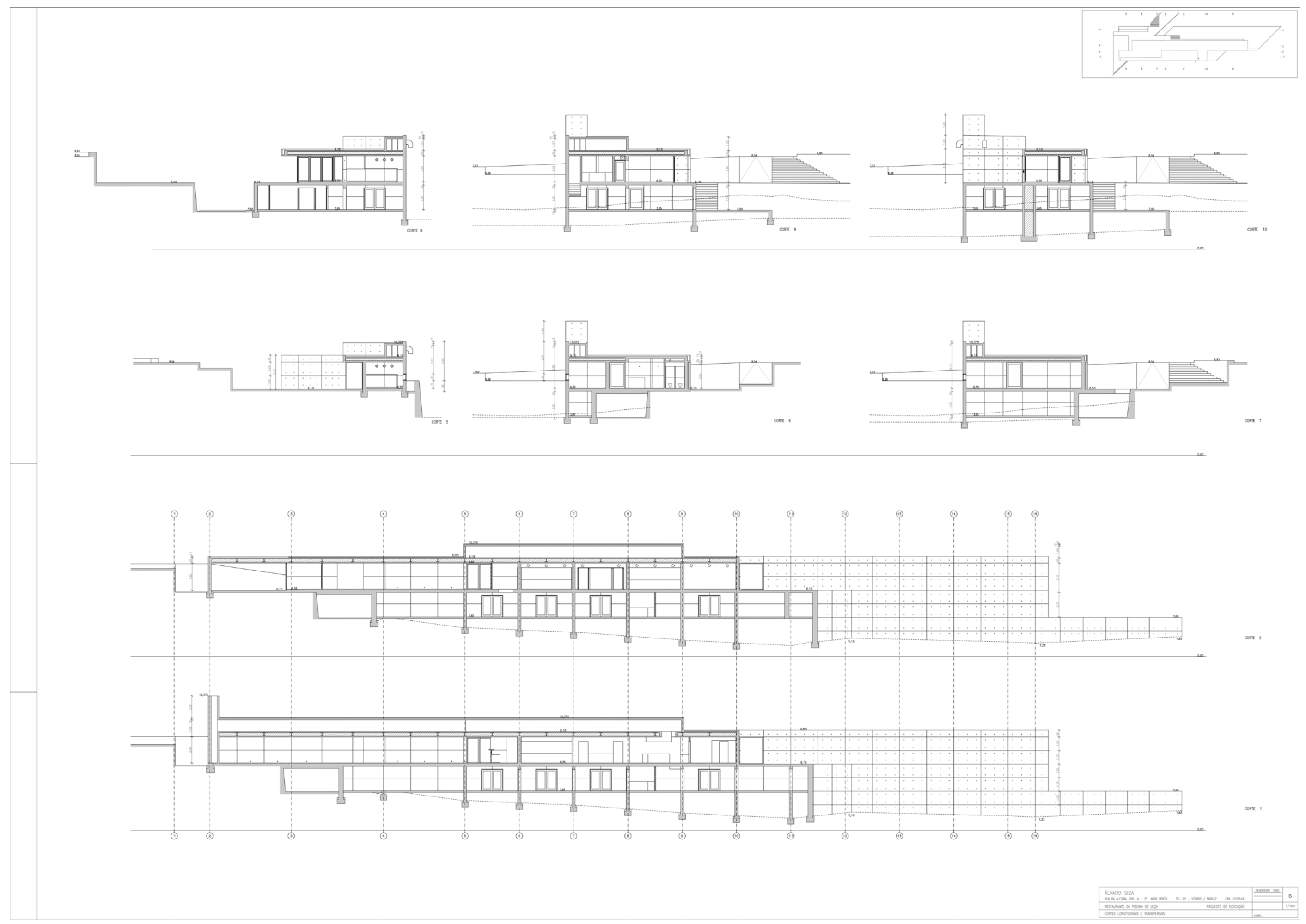
The materials used are, as in the first phase, almost exclusively exposed concrete (floors, walls, and ceilings) and wood.

The roof, also in exposed concrete, is protected by a permanent reflecting pool.

The volume of the restaurant shelters the beach to the north of the central enclosure from the prevailing wind.

December of 1995

Álvaro Siza



A.40

APPENDIX B

Interviews with the Heads of Municipal Council Departments

NAME	POSITION	DESCRIPTION
Clarisse Castro	Head of the Culture Department	Serves in this position since 2019. Has been working for the Municipal Council since 2001 in the area of culture
Isabel Flores	Coordinator of the Architectural and Historic Heritage Commission	Serves in this position since 2015. Has been working for the Municipal Council since 1985 in the area of urban planning
João Quintão	Head of the Planning Department	Serves in this position since 2019. Has been working for the Municipal Council since 1999 in the area of urban planning
Pedro Rocha	Head of the Environment Department	Serves in this position since 2019. Has been working for the Municipal Council since 1991
Susana Gonçalves	Head of the Civil Protection Department	Serves in this position since 2020. Has been working for the Municipal Council since 2006 in the area of civil protection (was lifeguard at the Ocean Swimming Pool)
Pedro Machado	Head of the Municipal Buildings Division	Serves in this position since 2016. Has been working for the Municipal Council since 2005 in the area of supervision

Head of the Culture Department

Name: Clarisse Castro

Address: Vila Nova de Gaia

Education: Degree in History / Post-graduation in Museology

Position: Head of the Culture Department

Serves in this position since 2019. Has been working for the Municipal Council since 2001 in the area of culture

What do you LIKE most about the Ocean Swimming Pool?

"I like the insertion into the landscape, the surprise that awaits us behind every wall and the materials. It is wonderful."

What would you like to CHANGE in the Ocean Swimming Pool?

"I would like people did not see the pool as a mere sports facility but as the national monument it is."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I imagine it shall remain a referential building in the context of world architecture, cherished and protected by all those who live in Matosinhos."

What does your job and work routine consist of?

The management of the cultural services under the responsability of the Municipal Council such as the archive, libraries, museums, galleries, theatre, entertainment and educational activities. All this dynamic and the relationship between services, combined with all the other activities of the Municipal Council, determines a very demanding routine.

What are the main difficulties you encounter in your job?

Having to work on multiple fronts and to deal with the general lack of awareness regarding heritage conservation. Achieve the sometines conflictual and difficult balance between preservation and the significant pressure coming from new developments.

What are the main problems you identify in the (cultural/patrimonial) management of the Ocean Swimming Pool?

The Department of Culture and the Architectural and Historic Heritage Commission were not consulted during the conservation works. In this case in particular no negative consequences arose from this fact as the process was led by the architect responsible for the original design but it would be more enriching for all if there had been an exchange of knowledge between all the actors, such as a non-binding opinion or information issued by the Architectural and Historic Heritage Commission.

Does it seem to you that there is a good understanding of the work and its value by the population?

Yes, I do. The building opened for visits after the conservation works but I think that there is no such thing as too much promotion as it adds value to our collective heritage.

Could the cultural dynamism of/at the Ocean Swimming Pool be further enhanced?

The building already hosted different events off bathing season such as concerts by the Matosinhos Jazz Orchestra, film screening, fashion shows and book launches. Nevertheless, being nearby a residential area, the population is not very receptive to night events. On the other hand, the climate constraints and maritime exposure do not allow for advanced scheduling, as weather conditions are very uncertain in this location.

Would it make sense to have a reception for visitors all year round?

There is a tourism office nearby and the possibility of it ensuring visits to the building has been considered. This something that has to do with management, as the Ocean Swimming Pool is managed by Matosinhos Sport (a municipally owned corporation).

Is there any plan of visits or cultural and school promotion in the scope of the Municipal Council regarding the Ocean Swimming Pool or Álvaro Siza's architecture?

In educational services we work essentially with municipal cultural facilities which do not include the Ocean Swimming Pool, managed together with other sports facilities. In the context of workshops and vacation camps we organize contemporary architecture visits that include the Ocean Swimming Pool.

Does the fact that the Ocean Swimming Pool is a pilgrimage destination for architects from all over the world have any reflection on local cultural policies?

The impact and recognition are always positive. There are tourism offices in Matosinhos and Leça and we are aware that the most popular points of interest, besides the Way of St James, are the works of Siza. This shows us that the building is a point of pilgrimage for many people and we have reports of people getting emotional when they manage to visit the Ocean Swimming Pool.

How do you see the integration of the work in a UNESCO World Heritage listing (and what impact would it have on the territory)?

I think it would very beneficial, raising international awareness about Matosinhos and promoting our heritage.

What suggestions and recommendations would you make in the context of the Ocean Swimming Pool Conservation Management Plan?

Conservation actions should be more regular and assertive so that the building does not reach the state of decay it was in before the works. The management plan has to take into account that it is a National Monument and raise awareness among the public and its users that it is not a swimming pool like any other.

Coordinator of the Architectural and Historic Heritage Commission

Name: Isabel Flores

Address: Porto

Education: Architect

Position: Advisor on Heritage and Urban Regeneration (Office of the President); Coordinator of the Architectural and Historic Heritage Commission

Serves in this position since 2015. Has been working for the Municipal Council since 1985 in the area of urban planning

What do you LIKE most about the Ocean Swimming Pool?

"What I like most, is basically everything. I have never been a user of the pool. I first visited it during these conservation works and I really felt my heart full of joy. When Álvaro Siza designed this pool he made sure that you could see the sea, the Port of Leixões, the Titan, and that from Leça you could not see the pool. So, many people who pass by the Leça waterfront don't realise there is a work of art there."

What would you like to CHANGE in the Ocean Swimming Pool?

"Nothing."

How do you IMAGINE the Ocean Swimming Pool in the future?

"The same."

What does your job and work routine consist of?

It is a privilege to work with great contemporary architects. In Matosinhos we have a great architectural tradition since the presidency of Fernando Pinto de Oliveira. There are great works of architecture and great architects working in the area. I think there is a lack of a modern/contemporary architecture guide in Matosinhos.

What are the main problems you identify in the (cultural/ heritage) management of the Ocean Swimming Pool?

The Municipal Council has many competencies and in the area of heritage we are actually ahead in terms of architecture and urbanism, but it has not had much support from the State.

Are there any other type of instruments for safeguarding and managing the Ocean Swimming Pool (Inventory, Municipal Master Plan, Heritage Safeguarding Map)?

Heritage listing is mostly limited to structures built until 1974 (including palaces, rural heritage, ensembles, etc.) and it is necessary to list what has been built since then to prevent the its destruction. The Architectural and Historic Heritage Commission, however, has a severe shortage of human resources to pursue this objective, having only 3 architects and one archaeologist. It is a small team. On the other hand, there has been significant investments in urban rehabilitation, as is the case of Casa da Arquitectura.

Does the regulation for the intervention in real estate of municipal interest apply to the Ocean Swimming Pool?

Our regulation applies to the Ocean Swimming Pool and other monuments that are on our Heritage Safeguarding Map. Our Municipal Master Plan has a Heritage Safeguarding Map and a Restrictions Map. The Special Protection Zone of the Ocean Swimming Pool and the Boa Nova Tea House is an administrative easement and the rules are clearly defined (Article 43 of 107/2001 - National Law of Cultural Heritage). There are some inconsistencies between national and municipal level regulations that require adaptations. There are still no mechanisms for the protection of views. The Ocean Swimming Pool is a

work of great landscape integration. However, today this idea has been compromised by urban development and the construction of residential buildings.

What suggestions and recommendations would you make in the context of the Ocean Swimming Pool Conservation Management Plan?

I think there should be a year-round visit programme to the pool. The existence of other works by Álvaro Siza and multiple other significant contemporary architecture works in Matosinhos should allow for the creation of a route to visit modern and contemporary architecture. Matosinhos is a fertile territory for architects and we are very proud of that.

Head of the Planning Department

Name: João Quintão

Address: Matosinhos

Education: Architect

Position: Head of the Planning Department

Serves in this position since 2019. Has been working for the Municipal Council since 1999 in the area of urban planning

What do you LIKE most about the Ocean Swimming Pool?

"The way it is present and absent at the same time. The way it merges into the landscape. It is a chameleon and simultaneously has affirmative gestures, establishing harmony between the artificial and natural. I think it is one of Siza's manifesto works without being neutral."

What would you like to CHANGE in the Ocean Swimming Pool?

"No, nothing."

How do you IMAGINE the Ocean Swimming Pool in the future?

"Like it is, but covered with water, because the prospects are not very good."

What does your job and work routine consist of?

Coordination of the Municipal Master Plan, its elaboration, revisions and implementation. Integrated and interdisciplinary work of articulation with the various departments. Definition of planning strategies and spatial planning in the Municipality of Matosinhos.

What are the main problems you identify in the (territorial and urban) management of the Ocean Swimming Pool?

Beach bars. The problem is that despite they pollute the coast, their activity makes a lot of money. It is one of the central themes of the coastal zone revision, as they are given more importance than land use planning. Beach bars and restaurants are now licensed by the port authority. The Municipal Council issues a non-binding opinion, so it cannot have an effective control of the issue. The POC (Coastal Zone Program) establishes that the Portuguese Environmental Agency has jurisdiction along the rest of the coastline that extends to several municipalities. This agency intends to relocate buildings further inland and that raises a lot of questions. This was the Municipal Council's responsibility but it has neither the resources nor the land available for this to take place. Any issue involving the loss of heritage should always include hypotheses on what to do. Restore? Keep photographic records or create virtual reality models to have tactile experiences and leave the work under water? We should put solutions into perspective according to the level of technology available in the future and question whether we want them to disappear or not. If in fact the sea level rises, many things will disappear and there is no plan that will succeed. There are many issues to be verified here, starting with the predictions that are not even consensual. These are things that go beyond any plan, including the Municipal Master Plan. The Ocean Swimming Pool is a work of great landscape integration. However, this idea was compromised by urban development and the construction of residential buildings on the other side of the avenue.

Where can we find the main risks and constraints affecting the Ocean Swimming Pool?

The pool is set on a national ecological reserve and natural area. In front of it there are central areas of public domain where the Municipal Council will certainly not build. The Land Use Map defines the construction and impermeability indexes and areas, the spacing between constructions... In the Zoning Map we have actions that we foresee for the site. Particularly for your case, you will be interested in the Environmental Safeguard Map, but the old POOC (Coastal Zone Management Plan) is still being presented and must be replaced by the new POC (Coastal Zone Programme). It is through the Municipal Master Plan that these special inter-municipal plans will bind the private individual. The Coastal Zone and Forest Management plan will be the one of least interest to you as it was the old PROF (Regional Forest Management Plan). The Heritage Safeguarding Map is the one that indicates the pool and its protection areas. Finally, in the Restriction Map there are several issues such as REN (national ecological reserve), water lines...

Does the Municipal Master Plan have a strategy for the protection of views?

No. The dynamics of the economy are brutal and there has to be some flexibility. The Heritage Safeguarding Map is very confusing and somewhat contradictory because we have listed heritage in central areas where high constructions are allowed. Either we keep the city as it is, with the rules we have, which is a risk from the economic, demographic, social and cultural point of view, or we preserve individual buildings.

What suggestions and recommendations would you make in the context of the Ocean Swimming Pool Conservation Management Plan?

Study the Municipal Master Plan maps and the POC (Coastal Zone Program). Finding out what to do with the buildings that are going to be submerged is something to be studied; it is a subject that invites serious reflection.

Head of the Environment Department

Name: Pedro Rocha

Address: Matosinhos

Education: Environmental Engineering

Position: Head of the Environment Department

Serves in this position since 2019. Has been working for the Municipal Council since 1991

What do you LIKE most about the Ocean Swimming Pool?

"Landscape integration."

What would you like to CHANGE in the Ocean Swimming Pool?

"No, nothing."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I am concerned because of the inherent risk of climate change and the scarce knowledge that we have about it. The Ocean Swimming Pool is in an area susceptible to high risk. I would like to see it as it is for 30 or 40 years, but that is not likely to be the case."

What does your job and work routine consist of?

I coordinate two areas: one more operational, which is the management of contracts, interventions, water, beaches and cemeteries; the other has to do with environmental monitoring and education, interventions in schools, monitoring various indicators such as noise, air quality, and other elements.

What are the main difficulties you encounter in your job?

Unfortunately, the Environment is not yet seen as an integrative tool with a priority overview. There is frequently no time for the important issues, only for the urgent ones.

What are the main problems and risks you identify in the (environmental) management of the Ocean Swimming Pool?

Climate change, floods, rainwater, groundwater, surface water and their effects on the coastline. Matosinhos has a coastline of about 8 km and, therefore, its repercussions will go beyond the maritime component. It is necessary to invest in infrastructures and network knowledge as we do not have precise notions on the future behaviour and impacts of these elements. A project is being developed to address these issues and to sustain the Municipal Council's management and investment policies regarding infrastructure and monitoring.

These are elements on which we have to set a track record in order to have a sustained evaluation. At the Ocean Swimming Pool site, which is a high-risk site, the biggest problem is that we do not have accurate information about what the actual sea level rise will be. The risk is real, but at the moment we do not have that capacity. We are still in the very early stages of trying to materialise and begin to experiment, and then reflect it in the model.

What advice can you give us regarding a mitigation strategy for climate change? Can we find some information in the Coastal Zone Program?

I see the POC (Coastal Zone Program) more as a coastal management instrument in terms of delimitation of uses than as a support in that perspective. The Environment Department assumed the jurisdiction of beach management (something that was previoulsy in the sphere of the Portuguese Environmental Agency) that has to do with the maintenance of the cleanliness, sand management and concessions. The Matosinhos Municipal Council is in a transition phase because the management was previously from APA (Portuguese Environmental Agency) and in the case of Leça (from the lighthouse to the southern limit of the municipality) from APDL (Port Administration of Douro and Leixões), so all this brings a set of needs and adjustments to contracts that were managed by both entities, things that were framed in the old POOC and that are framed in the new POC.

What suggestions and recommendations would you make in the context of the Ocean Swimming Pool Conservation Management Plan?

We can give notes on solid waste, beach cleaning, urban cleaning but the most important thing would be to have a framework or policy on climate change. The area of monitoring also has partnerships on issues that may be relevant.

Head of the Civil Protection Department

Name: Susana Gonçalves

Address: Matosinhos

Education: Environmental Health

Position: Head of the Civil Protection Department

Serves in this position since 2020. Has been working for the Municipal Council since 2006 in the area of civil protection (was lifeguard at the Ocean Swimming Pool)

What do you LIKE most about the Ocean Swimming Pool?

"The Ocean Swimming Pool has a special charm for me because it was where i had my first job. I was a lifeguard. It's a space that is engraved in my memory."

What would you like to CHANGE in the Ocean Swimming Pool?

"No and it has been able to modernise its services while keeping its identity."

How do you IMAGINE the Ocean Swimming Pool in the future?

"The Ocean Swimming Pool will always be one of the landmarks of Matosinhos."

What does your job and work routine consist of?

Management of the Civil Protection Department which consists of several areas: planning, risk analysis, risk management (mitigation and risk identification strategies), emergency service working 24 hours a day, emergency communications centre, articulated management with the Matosinhos fire brigade, technical forestry office, outreach to the population and rescue.

What are the main difficulties you encounter in your job?

Work that presents daily challenges. Try to find the best strategies to solve the problems that come along.

What are the main problems and risks you identify in the Ocean Swimming Pool?

The Ocean Swimming Pool is in a place of great exposure where we can identify different types of risks: on the one hand, risks of natural origin: maritime exposure, extreme weather phenomena (coastal overflow, storm surges); on the other hand, technological risks: proximity of the port of Leixões (navigation routes, maritime accidents), the oil terminal (hazardous materials) and othe oil refinery (there is a pipeline under the coastal avenue that connects the refinery with the oil terminal). The impact of risk factors on the coastline is documented and recorded, fulfilling a preventative function in support of risk prevention through a historical, photographic survey and geo-referencing process (ArcGIS) for damage assessment and reporting.

The Metropolitan Plan of Adaptation to Climate Change is a work coordinated by the Department of Environment and Environmental Monitoring. The Department of Civil Protection contributes by providing information and reporting.

How are those risks mitigated?

Technological risks have an impact analysis and evaluation. We work with companies that are active in the municipality in order to work together in the area of prevention and thus assess and establish mitigating regulations. We work with fire brigades and in awareness programmes for children to raise their consciousness of the risk. The awareness work in schools includes educational movies (safe beaches, dangerous materials, fire safety), a project that has been implemented for 7 years. Drills for children are in place through the pilot project “The house of the little Alert boy” where the main character must confront situations of risk to then create strategies to mitigate them. On the other hand, one of the most frequent phenomena on the coast is the accumulation of sand. We carry out a survey of the phenomenon that allows us to evaluate with the Environment Department to avoid coastal landslides.

How is the security control made?

The engineer Miguel Sousa is a specialist in fire safety, we have already visited the pool after the conservation works, in order to prepare whatever is necessary to implement in the building.

Engineer Miguel Sousa: Our job is to perform a safety and legal compliance diagnosis. We make a first visit and observe the potential vulnerabilities and from that document we outline an action plan of the measures that are missing. Then, in a second phase, we start to implement self-protection measures, which is part of a more wide-ranging strategy in which we develop a simulation plan so that people get to know the plan, prepare the teams and implement self-protection measures.

In swimming pools, the biggest problem is emergency lighting, evacuation routes and signage.

We have the example of working at the Boa Nova Tea House. When it underwent its last conservation intervention we worked very directly with the architectural team and managed to find solutions and strategies to be comply with the regulations. Although there were occasional difficulties in combining the two languages of security and the artistic dimension of architecture, we managed to overcome these difficulties by working together and achieving a joint result.

What are the adopted measures in an emergency situation?

The intervention is divided into two phases: internal interventions are seen case by case, with specific interventions for each building and the external interventions depend on the type of accident that we are talking about (in case of fire there is a specific type of approach, etc...).

What suggestions and recommendations would you make in the context of the Ocean Swimming Pool Conservation Management Plan?

Integrate the aspects of risk, especially those associated with climate change. We find it difficult to control them. A building with this kind of value is installed in a municipality with high technological risks that should not be ignored in the plan. Do the maintenance of the security equipment, detection centre, inspect the equipment when implemented, train the security teams to detect anomalies and instruct them to make the necessary interventions. Make a record of anomalous situations and report them to be integrated into the protection plan, georeferencing for later integration, and make a record of interventions made by lifeguards in the pool.

Head of the Municipal Buildings Division

Name: Pedro Machado

Address: Matosinhos

Education: Civil Engineering, Master in Construction Project Management.

Position: Head of municipal buildings division.

Serves in this position since 2016. Has been working for the Municipal Council since 2005 in the area of supervision

What do you LIKE most about the Ocean Swimming Pool?

“The fluidity that the building has with the sea. The connection that makes the pool perfectly integrated into the landscape.”

What would you like to CHANGE in the Ocean Swimming Pool?

“From a technical perspective, the water collection system. From a user perspective, the construction of the restaurant would be an asset.”

How do you IMAGINE the Ocean Swimming Pool in the future?

“The same.”

What does your job and work routine consist of?

The Department is divided into three divisions: mine deals with buildings, then the others deal with public roads and equipment. We have several operational work teams and the technical staff who follow up on contracts and other maintenance actions such as external maintenance contracts. My function is to coordinate the management and maintenance of buildings in order to work with preventive maintenance logistics. Previously this information was all on paper, dispersed, and now we are building a data-base alongside the field response.

What are the main difficulties you encounter in your job?

In the operational part the biggest difficulty is to have qualified labour. At this moment we have almost no qualified employees and we have difficulty in attracting workers for a salary that is equivalent to the minimum wage. We are trying to find ways to attract people at the end of their career and even the beginning of their career. On the technical side it is difficult to find the necessary information to move forward (registration phase). On the other hand, we also have difficulty in generating information that allows us to draft a maintenance contract that solves these problems that we have day by day, because the legislation is very restrictive and we have to specify much more of what has to be done. It is difficult to draft contracts that can solve the problems of repair maintenance without basic information, in addition to the legislation restrictions.

How is building maintenance carried out in Matosinhos Municipal Council?

We have a set of preventive maintenance contracts defined by law (fire extinguishers, HVAC), repair maintenance contracts, hardware and glass repair maintenance and then we have internal teams that solve the problems that do not fit into these contracts. The communications of these preventive needs are loaded into Infraespeak and there is a routine that schedules these preventive and repair needs.

What about the Ocean Swimming Pool in particular, how is the management and maintenance of this building carried out?

The Ocean Swimming Pool has always been a shared building between the Matosinhos Municipal Council and Matosinhos Sport, they do the operation during the bathing season and then the Municipal Council has the responsibility for the rest of the year. Normally we would do an intensive repair at the beginning of the year as in the winter it is difficult because of the rough seas. There is a team of specialised operators who do preventive maintenance of equipment (pump operation) to monitor and guarantee continuity of service (weekly work). They fill the pool and deliver the equipment in operating condition to Matosinhos Sport. In terms of routine, the following works are performed from January to May: the cleaning of the tank, revision of painting, painting wooden structure, repairs, revision of hydraulic installations.

What are the main problems you identify in the management and maintenance of this building?

It is unpredictable, during the visit in January we never know how the building like and the necessary works. It is very exposed to vandalism, since there are no boundaries, and also to the action of high tides. We never wanted to change the building, we don’t want to take decisions like integrating video surveillance systems because they change the original design. For example, when the building was taken over by SUMA (a company in the environmental field of action) they altered the wood by applying burnt oil. The water collection system was not changed. There was a remodelling intervention in 1990 but it was not completed so it works in a rather critical way. It affects the functioning because when the bathing season starts it takes 3 to 4 days to fill the main tank, so there ends up being some difficulty in controlling that part of the process. Today it is already possible to provide an alternative solution that does not interfere with the architecture and that allows the filling in to occur in a more controlled way. Regarding anomalies: tank cleaning, submerged pipes, vandalism (theft of fixtures), in recent years the hydraulic system has had several valve issues, 3 filters last season were no longer working. Funding difficulty: we have to make a study to see which costs we should allocate to the maintenance of buildings. We don't have the necessary funding. No one has an idea of the cost that this maintenance implies. The goal is to have a notion of the operating cost of the building, which is important to understand the constructive solutions that will best satisfy the client.

Is there a maintenance plan for the Ocean Swimming Pool?

There is a plan, but not yet a physical plan, there is a periodicity of tasks that, based on previous experience, are being implemented.

If it is done, what are the perspectives, methodologies and tools for its elaboration and implementation?

Our goal is to make a database with digital information, work the information in order to standardize and load it in the Infraspeak platform (Management and Maintenance software) with all the buildings typified according to the COBIE standard (typifies all the typologies of use that is poured in the BIM system,) survey point cloud plan.

What suggestions and recommendations would you make in the context of the Ocean Swimming Pool Conservation Management Plan?

Be aware of the costs. The cost of no maintenance is 3 to 5 times higher than the cost of preventive maintenance.

APPENDIX C

Interviews with the Site Managers and Staff

NAME	POSITION	DESCRIPTION
João Regufe	Head of Division	Serves in this position since 2016, being responsible for the management of the 9 swimming pools of Matosinhos. Has been working for Matosinhos Sport since 2004
João Galvão	Technical Coordinator of municipal swimming pools	Serves in this position since 2010. Has been working in the Ocean Swimming Pool since 2015
Catarina Teixeira	Technical Director	Serves in this position since 2018. Has been working for Matosinhos Sport since 2006
Eduardo Silva	Bar concessionaire	Has been the concessionaire of the bar since 2012
Nuno Silva	Maintenance foreman	Serves in this position since 2008. Had previously worked at the Ocean Swimming Pool as a pool operator
Paula Santos	Receptionist	Serves in this position since 2016. Has been working for Matosinhos Sport since 2007
Tiago Macedo	Lifeguard	Serves in this position since 2021. Has worked at the marina for seven years and works as a lifeguard for ISN since 2017
Manuel Jesus	Security guard	Serves in this position since 2019. Had already worked at the Ocean Swimming Pool before and has been a security guard since 1993
Maria da Conceição	Cleaning assistant	Serves in this position since 2021

Head of Division (Matosinhos Sport)

Name: João Regufe

Birth date: 1981

Address: Matosinhos

Education: Physical Education Teacher

Position: Head of Division

Serves in this position since 2016, being responsible for the management of the 9 swimming pools of Matosinhos. Has been working for Matosinhos Sport since 2004.

What do you LIKE most about the Ocean Swimming Pool?

"I like the architecture of the space."

What would you like to CHANGE in the Ocean Swimming Pool?

"Although I understand that the original design should be respected, I think some changes could be made. For example, the situation of people with mobility impairments. The access signage could also be improved, as this is an important monument, very sought after by national and international visitors that may find it hard to find the building."

How do you IMAGINE the Ocean Swimming Pool in the future?

"Seen as a monument. A monument that is simultaneously a swimming pool, used by locals and marketed internationally, with a differentiated price for people that comes from abroad. This building allows us to make Matosinhos known to the world."

What does your job and work routine consist of?

Technically coordinate everything related to municipal swimming pools (that are nine, seven of which are indoor and two outdoor), from teachers to security, water treatment, cleaning, reception, maintenance and operators. Besides that, I attend Matosinhos Sport administration meetings. Matosinhos Sport has 165 employees besides service providers.

What are the main difficulties you encounter in your job?

The main problems are in dealing with and managing people as they are all different, with different functions. Managing the budget. We always want to do more but we have to achieve our goals with the few financial resources we have. Also the logistics of the space such as restocking as there are several procedures that must be followed.

What are the main problems you identify in this building?

Most of the problems have to do with maintenance. It is a building in contact with the sea and we have to pay close attention to it. There are always problems with the equipment (a sink that breaks or a dispenser) which is normal because the facility has a very intensive use during summer months (more than 50,000 people).

What would you propose as prohibitions, alerts and recommendations for users?

There are two types of users in swimming pools, the bathers and the architects. The architects come and want to know about the behaviour of the concrete, the resistance of the materials, take measurements of the building... All users are different and it is up to us to understand what the user expects from the space and provide the best experience. On the other hand, we have groups of people who come for birthdays, bachelor parties, and it is normal that we have difficulties enforcing rules with these groups.

What behaviours are adopted in emergency situations?

The emergency must be reported to the technical director who contacts the head of division. In the meantime, if there is a high degree of emergency it is necessary to contact directly the emergency services.

What recommendations would you make/suggest? to improve the use of the Ocean Swimming Pool's spaces?

Improve signage on the access roads to the property and improve the conditions for users with mobility impairments to fully enjoy the building.

Technical Coordinator of Municipal Swimming Pools (Matosinhos Sport)

Name: João Galvão

Birth date: 1981

Address: Matosinhos

Education: Sports Management/Political Sciences

Position: Technical Coordinator of municipal swimming pools

Serves in this position since 2010. Has been working in the Ocean Swimming Pool since 2015.

What do you LIKE most about the Ocean Swimming Pool?

"Working in sports related with a monument that is integrated into nature. The fact that we work with a variety of publics, there is a lot of cultural richness."

What would you like to CHANGE in the Ocean Swimming Pool?

"Not in the building itself, I think it's very important to maintain it. It would be important to complement the security aspect that was not contemplated in the original design."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I honestly hope that with more users and if possible to return to the capacity we had before the covid-19 pandemic."

What does your job and work routine consist of?

Coordinating the company's human resources, articulating the pool's operation with the technical aspects of maintenance, defining the regulations, creating the price list, coordinating group visits, articulating and managing reservations. Occasionally I also perform the functions of technical coordinator and identify the needs of the site.

What are the main difficulties you encounter in your job?

The articulation between stakeholders: we have two security teams, we have the concessionaire, our team from Matosinhos Sport and the Matosinhos Municipal Council.

The relationship with the public when there are longer waiting times to enter the premises or the capacity is sold out. This creates a lot of anxiety at the entrance and we have to know how to manage that.

What are the main problems you identify in this building?

Plumbing problems in the toilets, clogging, damaged washbasins, providing restocking when there is heavy use. On the other hand, to reduce the risk of vandalism, security has been reinforced. When these problems are detected by the employees, they are reported to the technical directors that are in charge of presenting solutions to the identified issues.

What recommendations would you make to improve the use of the Ocean Swimming Pool's spaces?

A clear transmission the site's regulation. We have the mandatory signs, like the dangerous area signs, but we also have to look very closely at where to put them so as not to much visual noise.

Technical Director of Municipal Swimming Pools (Matosinhos Sport)

Name: Catarina Teixeira

Birth date: 1982

Address: Matosinhos

Education: Degree in Physical Education

Position: Technical Director

Serves in this position since 2018. Has been working for Matosinhos Sport since 2006.

What do you LIKE most about the Ocean Swimming Pool?

"The space itself. It's a different pool, it has salt water."

What would you like to CHANGE in the Ocean Swimming Pool?

" I wish the changing rooms had more light, but I understand what the architect's intention was."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I think it will remain as it is."

What does your job and work routine consist of?

The technical directors of the municipal swimming pools in Matosinhos work as technical directors at the Ocean Swimming Pool and at Quinta da Conceição during summer months. There are eight in total and there are two per day in each one, one during the morning and another during the afternoon. Our job is to coordinate all the staff: receptionist, security guards, lifeguards and cleaning staff. We also have two security guards from the Municipal Council who help to control the beach limits to prevent trespssing. We have the task of checking and communicating all anomalies to be repaired. We are responsible for communicating any complaints or relevant information.

What are the main difficulties you encounter in your job?

The most difficult thing today is dealing with people at the reception on days with very good the weather conditions. There is a lot of affluence and the maximum occupation is quickly reached. The public does not understand when the capacity is sold out. Inside the venue, the most difficult is managing the correct distance between people. It is also hard to establish communication with external companies working in the pool such as the security company, for example.

What are the main problems you identify in this building?

The most common are clogged toilets.

What recommendations would you make to improve the use of the Ocean Swimming Pool's spaces?

One of the most important actions is cleaning the space. I would recommend to inform users to keep the spaces clean and dispose of rubbish where it is supposed to be. Use the space as if they were at home.

For users, what would you define as prohibitions, alerts and recommendations?

The prohibitions of use are already defined, the prohibitions relating to pandemics are also set out.

Is there a procedure to report problems detected in the building?

Any member of the team can report a problem to us (technical directors) and we report it to Matosinhos Sport as soon as possible to try to solve the problem immediately.

When it comes to the building maintenance, what actions would you recommend to be done on a daily, weekly, monthly, yearly routine, among others?

I would recommend to check the equipment. From year to year we try to improve the measures.

Bar concessionaire

Name: Eduardo Silva

Birth date: 1971

Address: Matosinhos

Education: Degree in Civil Protection Engineering

Position: Bar concessionaire

Has been the concessionaire of the bar since 2012.

What do you LIKE most about the Ocean Swimming Pool?

"I live this pool intensely. I used it when I was a child and I am very grateful for the opportunity I have been given to work here. I feel like a caretaker of this space. Even when it was closed I have been here everyday. Because of all my childhood memories, the relationship I have with the sea and the space is above all of gratitude."

What would you like to CHANGE in the Ocean Swimming Pool?

"As I see things there is no reason for it to be open for just three months every year."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I fight for it to be open off the bathing season."

What does your job and work routine consist of?

I manage the bar during the bathing season.

What are the main difficulties you encounter in your job?

In 2014 storm Hercules affected the entire north coast with flooding. The sea destroyed everything but there was no one to come here, it was one of the most dramatic moments of my life. I felt the space was being abandoned, only remembered during the summer period. I do not forget that this is in fact a pool with a bar and not a bar with a pool, but I have always seen the existence of a bar as an attractive point. There was a great lack of articulation. I already tried to tell the Municipal Council how many people come here during the winter without passing by the tourism office or the Casa da Arquitectura.

What are the main problems you identify in this building?

When talking about the conservation works, I asked the architect if he had already studied the possibility of equipping it with sunshades. I find it concerning that the pool is working in this type of conditions. It is not at all abiding hygiene and food safety standards. We are talking about functionality problems, food safety and space. The lighting is not up to standard. There are many visits that happen without appointment. I consider this as a monument and I think it has to be welcoming to tourists. The space has to be open for visits or at least have staff that can guide a visit. These are opportunities that are lost due to poor promotion of the space. One problem is the lack of security in winter. During bathing season there is a security company that is here for 24 hours. There are two more elements in the north and south, hired by the Municipal Council for the security of the space. Then it comes September and there is no one here.

For users, what would you define as prohibitions, alerts and recommendations?

It is a permeable space, a dangerous space. There is a concern for people's physical safety. Sometimes people pass by the beach and climb down the rocks.

What recommendations would you make to improve the use of the the Ocean Swimming Pool spaces?

In the past there was no preventive maintenance plan, only a corrective one. Maintenance work was always done thinking about the summer, but I think that the whole year has to be revised and the space has to be taken care of. If it functioned as a thermal space, with a warm water pool, the use of the space would be much broader. I hope that this abandonment does not happen in the future.

Maintenance foreman

Name: Nuno Silva

Birth date: 1981

Address: Matosinhos

Education: Secondary school

Position: Maintenance foreman

Serves in this position since 2008. Had previously worked at the Ocean Swimming Pool as a pool operator.

What do you LIKE most about the Ocean Swimming Pool?

"Working in a national heritage site is a source of pride. I like the context where it is inserted, a natural pool on a beach."

What would you like to CHANGE in the Ocean Swimming Pool?

"Nothing, you have to preserve heritage."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I hope it continues to have the receptivity it has. I hope that I and all the people of Matosinhos will continue to enjoy the pool."

What does your job and work routine consist of?

Management of maintenance operations (water treatment, tank cleaning and disinfection, filter washing, tank vacuuming, stock reposition) and coordination of the team of operators consisting of two daily service attendants and one vacuum cleaner.

What are the main difficulties you encounter in your job?

Sometimes the weather conditions do not allow us to carry out our operations.

What are the main problems you identify in this building?

Mainly problems with pipes and clogging.

What behaviours are adopted when emergency situations arise?

In the event of an emergency we have two options: either own team is able to solve it or we resort to an external specialized company (Omninstal company that has a maintenance contract with Matosinhos Sport).

How is the maintenance of the building's machinery carried out?

First of all the filters are washed by means of a pressure filtering process that purifies the water, where impurities are retained on the surface. This process is done at least twice a day depending on the usage. The water is then disinfected, which is a constant process throughout the day, using a dosing pump with sodium hypochlorite (the quantity must be between 1 and 2 ppm). A coagulant is added for greater absorption of particles, improving the filtration process, and a product is administered to prevent the formation of algae. The tanks are sucked up by a pump every morning from 7 am for a period of between one and three hours. Through aspiration all impurities are removed from the water (sand, algae, pieces of wood, plastics, etc.). These processes are carried out in each separate tank with different treatments by the technical operators, all trained to carry out the maintenance operations. Besides the daily maintenance at the beginning and end of the bathing season, a general maintenance of the equipment is done by Matosinhos Municipal Council, which is in charge of the management of the swimming pools off the bathing season.

Is there a timetable for these actions?

The daily routine, which is the washing of filters, disinfection of water, vacuuming of tanks and the sanitary log (sanitary wash log, control and logistics of chlorine, pH level, temperatures, control of water, light and number of users).

What recommendations would you make to improve the use of the the Ocean Swimming Pool spaces?

Improve the conditions of the reception, it is a very windy area. The engine room is also very noisy.

Receptionist

Name: Paula Santos

Birth date: 1977

Address: Matosinhos

Education: Secondary school (project design. Had photography classes with Teresa Siza).

Position: Receptionist

Serves in this position since 2016. Has been working for Matosinhos Sport since 2007.

What do you LIKE most about the Ocean Swimming Pool?

"The features, the integration of the natural with the urban."

What would you like to CHANGE in the Ocean Swimming Pool?

"Some details could be updated. The accessibility of the pool for people with mobility impairments (this community is becoming more active and nowadays they have to enter the pool with the help of the staff). More safety for children (stairs without handrails). More protection in the reception area (exposed to north wind)".

How do you IMAGINE the Ocean Swimming Pool in the future?

"I can't imagine it any differently."

What does your job and work routine consist of?

Logistics of setting up and dismantling the counter with the computers, cash register and ATM. Customer service: providing information on prices, water temperature, information on capacity and handing out wristbands, differentiated by colour for full day or half day.

What are the main difficulties you encounter in your job?

The reception area has little protection. It is exposed to the weather conditions.

What are the main problems you identify in this building?

Mainly the maintenance of the toilets.

Is there any control on the number of people frequenting the spaces?

A counting system is carried out by a controller. Currently, with the pandemic, the maximum capacity is 618 people. According to the number of people, we place signs in public view indicating the occupation level (low, medium and high/ full capacity).

What behaviours are adopted when emergency situations arise?

In an emergency situation we call 112. If it is a covid emergency there is an isolation room with a testing kit.

What recommendations would you make to improve the use of the the Ocean Swimming Pool spaces?

I would recommend users to respect the signs in the toilets, such as putting waste in the appropriate bin and have more civility.

Lifeguard

Name: Tiago Macedo

Birth date: 1992

Address: Porto

Education: Degree in Sport

Position: Lifeguard

Serves in this position since 2021. Has worked at the marina for seven years and works as a lifeguard for ISN since 2017.

What do you LIKE most about the Ocean Swimming Pool?

"The view. It's like the pool merges with the sea."

What would you like to CHANGE in the Ocean Swimming Pool?

"Improve the sand quality in the main part, with less dust."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I don't think it will change much, I think it will remain as it is."

What does your job and work routine consist of?

Raising the flags on the north and south beach before the opening and setting up the lifeguard station (with the life-saving instruments, surfboard, life stick, torpedo buoy, belt, and first aid kit). In our work, prevention is very important, warning children not to run, jump, or dive.

What are the main difficulties you encounter in your job?

Being exposed to the sun for extended periods (about 10 hours), despite the sunshade, is very tiresome. Dealing with people that do not comply with safety recomendations.

What are the main problems you identify in this building?

Sometimes people do not respect the rules and it is normal for children to get hurt.

For users, what would you define as prohibitions, alerts and recommendations?

No climbing on rocks, no diving, no apnea without the supervision of a lifeguard, no buoys inside the pool, no balls, no animals.

What behaviours are adopted when emergency situations arise?

In an emergency situation you should call 112. If the emergency is at sea, we call the ISN that is responsible for the search and rescue vessels and part of the national maritime authority.

Security guard

Name: Manuel Jesus

Birth date: 1959

Address: Porto

Education: 9th grade

Position: Security guard

Serves in this position since 2019. Had already worked at the Ocean Swimming Pool before and has been a security guard since 1993.

Has the support of two security guards from a different private company and 4 Municipal Council employees that control the site boundaries.

What do you LIKE most about the Ocean Swimming Pool?

"I like its structure."

What would you like to CHANGE in the Ocean Swimming Pool?

"Nothing."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I can't imagine it any other way."

What does your job and work routine consist of?

During the day we control the entrances and exits, support the reception and measure the temperature of users upon entrance. During the night we patrol the entire premises, from one end to the other. The walking patrols take place at an hourly basis and take about 20 minutes to complete. During patrols we must detect intruders and check for water leaks or other malfunctions. If there are any occurrences during the rounds we need to fill in a report.

What are the main difficulties you encounter in your job?

The arrival of groups (mainly foreigners), off the bathing season, who want to visit the building. We are not authorized to give access because these visits are coordinated by the Municipal Council, and we can only open the facilities in specific situations with authorization from the Municipal Council.

What are the main problems you identify in this building?

The reception is not sheltered from the weather conditions. In terms of operation there are no problems. In the winter an inspection is made so that in the summer the equipment is in good condition.

What behaviours are adopted when emergency situations arise?

If we detect a water leak or an electrical failure during the night we have to call the security company, report it to the central office and they take measures. Although we have several fire extinguishers and we are qualified to use them if there is an emergency situation, we always have to report to the company, even if it is an emergency that we can solve ourselves.

For users, what would you define as prohibitions, alerts and recommendations?

It is forbidden to bring parasols, animals, taking photographs. We have a sign with the forbidden activities.

When the building is closed, do other problems usually arise, such as theft, vandalism or unauthorised entry?

It can happen. For example, graffiti is easy because it's a very quick process, and, therefore, difficult to prevent. It would be interesting to have video surveillance. I do not know if it would be possible because of the aesthetic component, but I would be able to control a larger area. We also don't have an alarm system. Since I've been here, they've never removed the copper plates, but it can happen.

What recommendations would you make to improve the use of the the Ocean Swimming Pool spaces?

That the users don't go beyond the site boundaries. The tapes are placed so people know it is a limited space, although many people do not respect this and go underneath. Sport fishermen are the only ones that have access from outside as they have a licence to enter the area. Handle the equipment and facilities with care. For example, there is a shower that some user has damaged, but otherwise I think it is working well.

Cleaning assistant

Name: Maria da Conceição

Birth date: 1974

Address: Matosinhos

Education: 6th grade

Position: Cleaning assistant

Serves in this position since 2021. Has the support of two other cleaning assistants after the building's closure.

What do you LIKE most about the Ocean Swimming Pool?

"Everything."

What would you like to CHANGE in the Ocean Swimming Pool?

"Nothing."

How do you IMAGINE the Ocean Swimming Pool in the future?

"I think it looks well as it is."

What does your job and work routine consist of?

Cleaning the pool area and the bathrooms, replenishing toilet paper, washing the foot washes and the floor around the pool. All the process is carried out with bleach supplied by the company Euromex.

What are the main difficulties you encounter in your job?

None. People are very approachable and always willing to help.

What problems do you identify regarding the users of this building?

None.

Is there a procedure to report problems detected in the building?

Report to Matosinhos Sport.

Is there a schedule of cleaning routines for the building?

In the morning check the bathrooms and report any missing materials. Then during the day repeatedly do the cleaning and disinfection routine between pools, foot washes and toilets.

What recommendations would you make to improve the use of the the Ocean Swimming Pool spaces?

Dispose of the waste in the rubbish bins and respect the space.

APPENDIX D

Inspection and diagnosis report

1.1 Damage survey

The building remains in a reasonable state of conservation, without any interventions that have substantially altered its original physiognomy. However, the building is at risk because of its maritime location and the nearby oil refinery, which together have aggravated the decay of the concrete to moderate extent, by triggering cracking, corrosion and spalling of its steel reinforcement. While the carbon dioxide from the refinery accelerates the carbonation process, the chlorides of the salt water and salt fog penetrate into the concrete and cause localized corrosion and spalling. Furthermore, interventions conducted by the Matosinhos Municipal Council since the 1980s have led to problems such as delamination, pattern cracking and staining.

The building and pools are mainly constructed in good quality concrete, with a small amount of reinforced steel, according to the structural project of the Engineer Bernardo Ferrão (dated c. 1960). The building walls have a thickness of 30 cm and have a steel mesh of 5mm, with a grid of 15 × 15 cm. In contrast, the beams and slabs have thicker reinforced steel bars, and it is here that the main problems of reinforced steel corrosion and spalling have been detected (Fig. 34). Spalling also occasionally occurs at the top of the walls or in the swimming pool tanks, which exhibit some alterations, namely at the points where the tanks connect with the rocks.

The most evident signs of alterations and degradation in the concrete walls come in the form of cracks, creating visible discontinuities in the surface of the material. Most of these cracks are not apparently related with steel corrosion and the vertical cracks in the longitudinal walls seem to be caused by the absence of movements joints, which corresponds to an evolutionary damage process possibly due to shrinkage and / or thermal movements. These were aggravated by interventions performed by the Municipal Council, filling the cracks with incompatible mortar. However, in some cases (Fig. 35), steel corrosion is starting to appear and this will require conservation actions and future maintenance. Moreover, some concrete surfaces have small red/brown stains created by the oxidation of rusted metal inside the concrete, which have deposited on the surface. In some cases, namely in the beams, there are signs of a loss of material (spalling) (Fig. 34), caused by the corrosion of reinforced steel. There are situations (Fig. 36) where the corrosion of the reinforced steel spread across a large portion of a concrete slab which, in result, affected the structure stability, even though there was an attempt to fix one of these locations by applying repair mortar to cover the unprotected reinforced steel.

There is also damage associated to distributed cracking (taking the form of a polygonal net, similar to a spider's web) caused by the addition, in the 1980s, of a 4 cm concrete layer (with light mesh) over some walls, because of incompatibility with the preexisting concrete walls or shrinkage. (Fig. 37).

Some of the walls show signs of efflorescence in the form of a textured white stain (Fig. 38), which is caused by the infiltration of water in the concrete. The building also suffers from localized spots displaying a chromatic change that has a "dragged" appearance (Fig. 39). This is the result of the rainwater running off the surface and leaving a deposit. There are also the effects of biological colonization (Fig. 40) growing on the concrete surface, which, again, changes its texture and color.

Moreover, the copper surface of the building's roofs has a green color due to oxidation (Fig. 41) and leakage has been identified in the assembly of the copper elements, resulting from the exposure and lack of maintenance. In addition, the timber structure of the roof and of the changing rooms' partition walls presents localized detachment of the coating, and an oily texture (Fig. 41) that results from the excessive amounts of linseed oil used in its maintenance. The screws used for the timber structure show signs of oxidation, with brown textured spots on their surface. Finally, the adults' tank presents spots and biological colonization.

Despite the reported condition, the problem that has most seriously affected the building's integrity and authenticity is the series of interventions performed by the Municipal Council over the years, such as the introduction of incompatible repair mortars, as well as unauthorized electrical installations (Fig. 43), which have a distinctive light grey color and smooth texture, in comparison with the preexisting concrete. Also, the bar concession holder has performed unauthorized alterations to the interior of the building and the original design was not preserved. Thus, the Conservation Management Plan will also be an important tool for providing guidelines as to the correct use of the building in the future.

The most notable deficiency in the building's use is related to the hydraulic infrastructure, as many of the pipes of the water system have either been destroyed by the corrosion or are clogged with sand (Fig. 44), which means that they were compromising the pools' functionality (the pools were closed to the public in 2018 and have reopened in 2021). Finally, Fig. 45 presents the damage mapping of the building.

Fig. 34 – Examples of spalling caused by reinforced steel corrosion in beams.

Fig. 35 – Details of vertical cracks.

Fig. 36 – Concrete slabs severely affected by the corrosion of the reinforced steel.

Fig. 37 – Distributed crack pattern.

Fig. 38 – Crack in the concrete wall and efflorescence on the north wall of the reception area.

Fig. 39 – Stains created by rainwater run-off.

Fig. 40 – Biological colonization.

Fig. 41 – Oxidized copper roofs, corroded screws and an oily texture of the wood.

Fig. 42 – Spots and biological colonization in the adults' tank .

Fig. 43 – Incorrect interventions.

Fig. 44 – Corroded pipes of the water system.

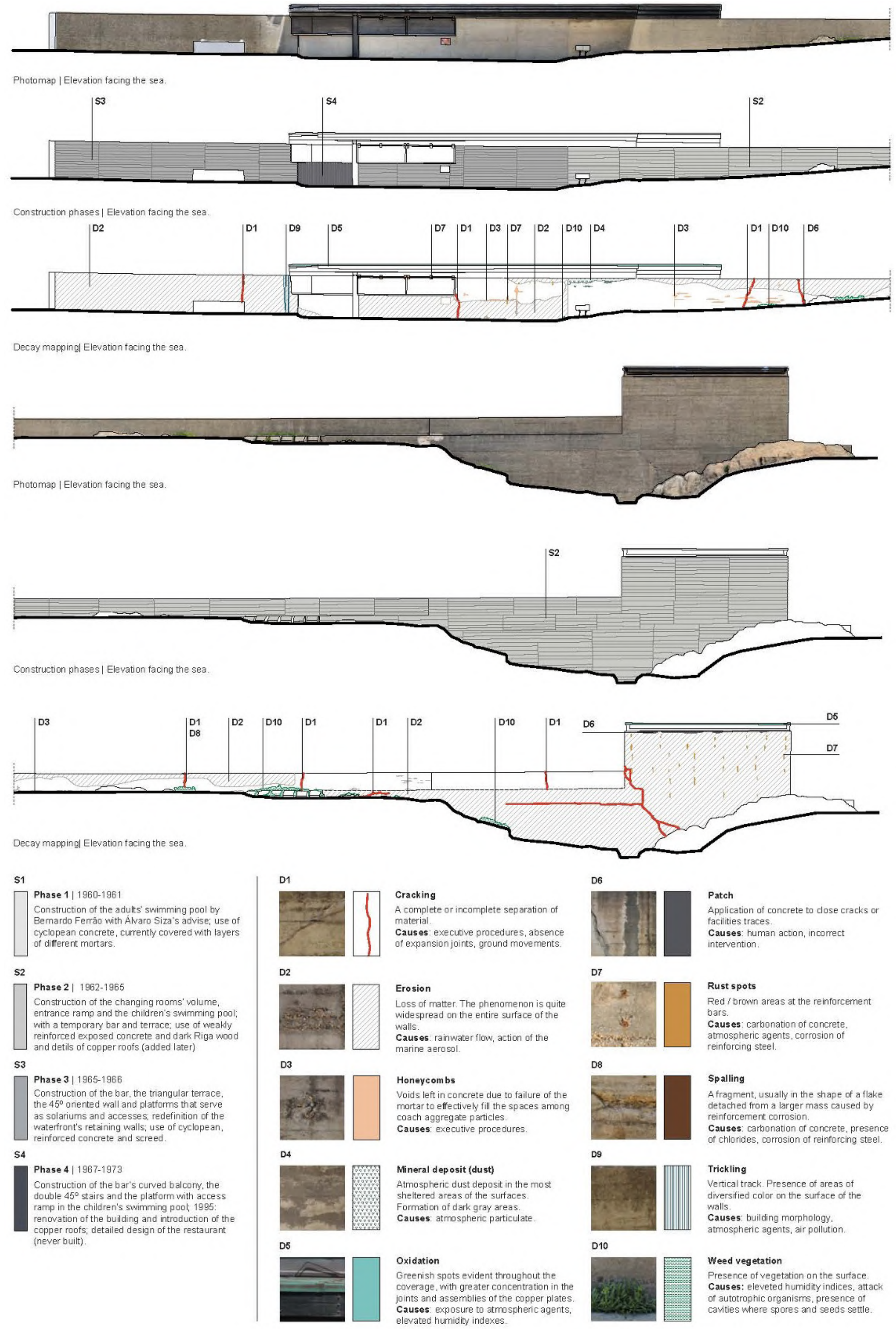


Fig. 45 - Elevations of the Swimming Pool in Leça (photomap, phases and damage mapping).

1.2 Evaluation of the Out-the-plane Deformations

The diagnosis of the building included a laser scanner survey, which was used to evaluate the out-of-plane deformation of the concrete walls. In this first analysis, the out-of-plane deformations of the retaining wall and the main façade's North were evaluated (Fig. 46). It is noted that the deformations were evaluated with respect to a theoretical vertical plane passing through the base of the wall, using colormaps and 2D cross-sections (Fig. 47-50).

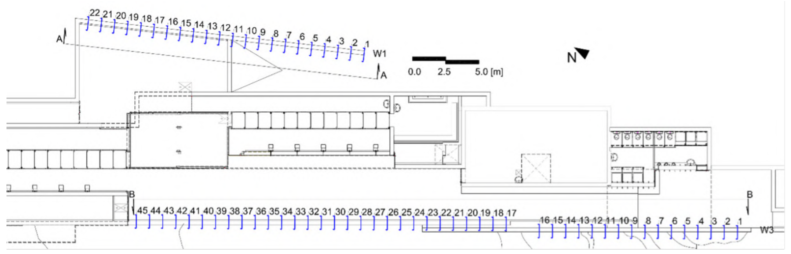


Fig. 46 – Location of the walls and cross-sections adopted in the evaluation of the out-of-plane deformation.

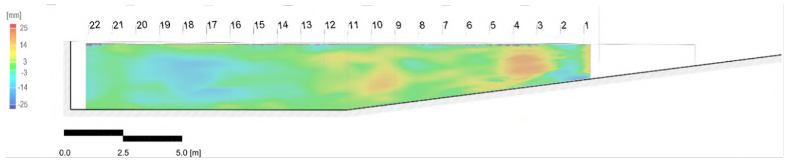


Fig. 47 – Colormap of the out-of-plane deformation of the retaining wall (Section AA).

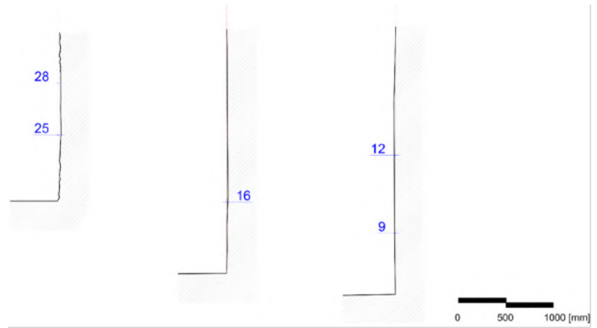


Fig. 48 – Cross-sections of the retaining wall (Section AA) with the highest out-of-plane deformation.

The results of this first analysis allow to verify that the maximum out-of-plane deformation of the retaining wall is equal to 28 mm and occurs at the cross-section W1-4 in the east direction (inwards) (Fig. 47 and 48). The maximum out-of-plane deformation in the west direction (outwards) is equal to 12 mm (cross-section W1_18). In the main façade's North, the maximum out-of-plane deformation is equal to 34 mm and occurs at the cross-section W3_18 in the west direction (Fig. 49 and 50). In the opposite direction, the maximum deformation of this wall is equal to 27 mm (cross-section W3_6). Although these deformations are low, the out-of-plane deformation of the other walls may be also evaluated in the future for further documentation.

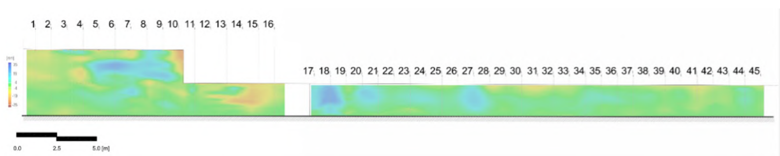


Fig. 49 – Colormap of the out-of-plane deformation of the main façade's North (Section BB).

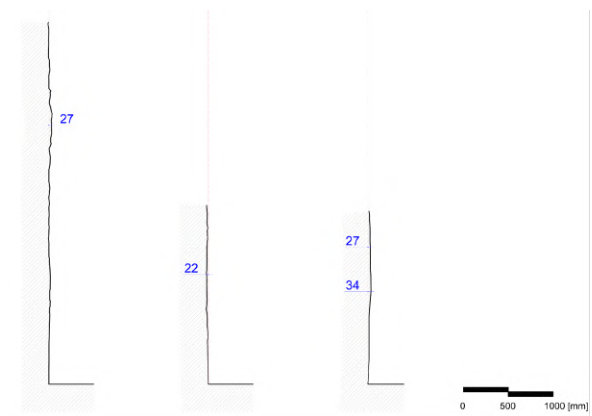


Fig. 50 – Cross-sections of the main façade's North (Section BB) with the highest out-of-plane deformation.

1.3 Non-destructive and Minor-destructive Testing

1.3.1 Concrete Carbonation Testing

Carbonation is a chemical process that causes a reduction in the alkalinity of the concrete and, consequently, corrosion in the steel rebars and damage in the concrete. This chemical process occurs when atmospheric carbon dioxide reacts with calcium hydroxide of the cement paste, producing calcium carbonate and reducing the pH. Typically, the cement paste no longer provides a passive environment, which protects the steel rebars, when the pH of the concrete reduces to about 9. In general, for very dry or saturated concrete, the carbonation process is slow. It is noted that young concrete is a high alkaline material with pH values around 12-13, protecting the steel rebars against corrosion.

In the diagnosis, three zones of the building were selected to carry out in-situ concrete carbonation tests: (1) adults' tank (Phase 1 - exterior); (2) children's tank (Phase 2.1 - exterior); (c) water collection area (Phase 2.1 - interior) (Fig. 33). The tests involved the extraction of three concrete cores and the application of a phenolphthalein solution on the core's surface, aiming at determining the carbonation depth into the concrete. The carbonation depth is determined based on the reaction of the phenolphthalein solution with the concrete (color of the surface), i.e. pink means non-carbonated concrete and grey means carbonated concrete. The concrete cores were extracted using a drilling machine with 110 mm of diameter (Fig. 51). The phenolphthalein solution was prepared according to the EN 12390-12:2020 (CEN, 2020).

(a) (b) (c)

Fig. 51 – Concrete cores extraction: (a) adults' tank; (b) children's tank; (c) water collection area.

Fig. 52 presents the concrete cores sprayed with the phenolphthalein solution, and it is possible to observe that the entire surface of all the concrete cores is pink, meaning the concrete in these zones of the building is not carbonated. However, the concrete elements are located in an environment with high relative humidity and the carbonation testing with the phenolphthalein solution (simplified method) includes uncertainties. Thus, cement paste samples were collected and tested at the laboratory to conclude on the carbonation of the concrete. (Section 3.3.10.1).

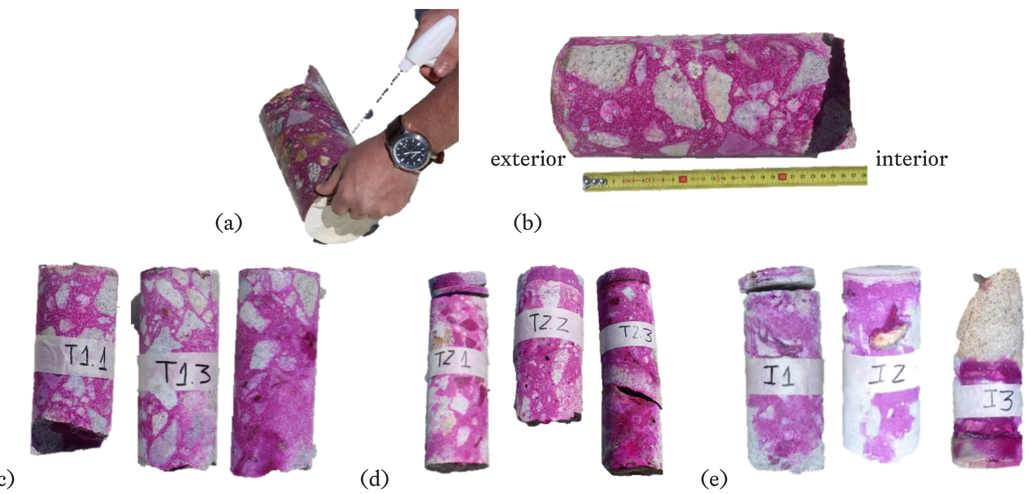


Fig. 52 – Carbonation concrete tests: (a) application of the phenolphthalein solution; (b) detailed view of a concrete core of the adults´ tank; (c) general view of the concrete cores of the adults´ tank; (d) general view of the concrete of the children's tank; (e) general view of the concrete of the water collection area.

1.3.2 Laboratory Tests to Determine the Concrete and Steel Mechanical Properties

The concrete cores extracted for the carbonation tests were used in the laboratory tests to determine the mechanical properties of the concrete. Ten cylindrical concrete specimens were prepared based on the EN 12390-1:2012 (CEN, 2012) (Fig. 53a), namely three specimens of the adults´ tank (T1.1; T1.2; T1.3), four specimens of the children's tank (T2.1; T2.2; T2.3; T2.4) and three specimens of the water collection area (I1; I2, I3). The area and density of the concrete specimens are presented in the Table 2. Two types of tests were carried out: (1) tests to determine the Young's modulus based on the LNEC E397:1993 (LNEC, 1993)(Fig. 53b); (2) tests to determine the compressive strength based on the EN 12390-3:2019 (CEN, 2019) (Fig. 53c). In the test planning, one concrete specimen of each zone was firstly tested in compression (destructive test) to estimate the compressive strength needed to perform the tests to determine the Young's modulus. Then, these tests were performed for the remaining specimens, with exception of the specimen T2.3_1, due to its low length. Finally, the specimens were tested in compression.

Table 2 presents the results of the laboratory tests carried out in the concrete specimens. The mean compressive strength is equal to 36 MPa, 24 MPa and 23 MPa for the concrete of the adults' tank, children's tank and water collection area, respectively. The compressive strength of the specimens with l/d ratio (length/diameter) lower than 2 was corrected based on the correction factors presented in the ASMT C 42/C 42M (ASMT, 2013). The mean Young´s modulus is equal to 39 GPa, 27 GPa and 38 MPa for the concrete of the adults' tank, children's tank and water collection area, respectively. It is noted that high values for the mechanical properties of the concrete specimens are expected since the concrete of these parts of the building corresponds to cyclopean concrete, with large stone aggregates. The external concrete walls present another type of concrete. However, no concrete cores could be extracted in the external walls, in order to affect the original materials in visible areas.

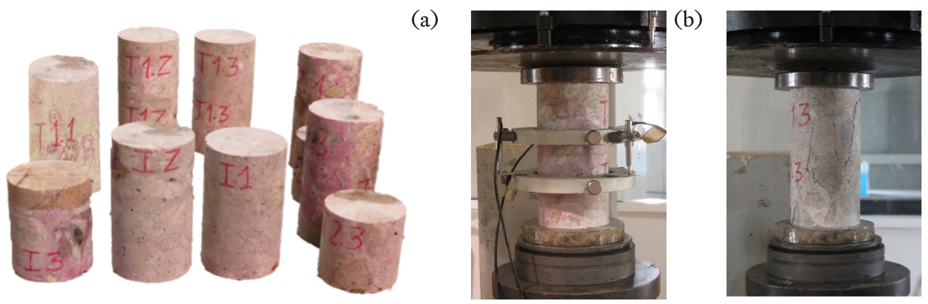


Fig. 53 – Laboratory tests to determine the mechanical properties of the concrete: (a) general view of the specimens; (b) test to determine the Young's modulus; (c) test to determine the compressive strength.

Location	Specimen	Area [cm²]	Density [kg/m³]	Average density [kg/m³]	F_{max} [kN]	f_c [MPa]	f_m [MPa]	E [GPa]	E_m [GPa]
Adults tank	T1.1	86.39	2345	2365	325.90	37.72	36.09	-	39.36
	T1.2	86.61	2361		326.30	37.67		39.80	
	T1.3	86.41	2390		284.10	32.88		38.92	
Children tank	T2.1	104.88	2298	2209	268.70	25.62	23.83	27.18	26.69
	T2.2	104.92	2127		331.10	27.25		-	
	T2.3_1	104.93	2131		273.30	22.22		-	
	T2.3_2	104.99	2281		212.50	20.24		26.19	
Water collection room	I1	104.81	2271	2298	250.30	23.20	23.03	34.18	38.28
	I2	105.03	2292		250.20	23.29		42.33	
	I3	104.86	2331		257.20	22.60		-	

(F_{max}: maximum force; f_c: compressive strength; f_m: mean compressive strength; **E**: Young's modulus; E_m: mean Young's modulus)

Table 2 – Résumé of the properties of the concrete specimens.

Samples of steel rebars were also collected, namely at the top of the retaining wall, the adults' tank and in the slab of the South's storage room. In the laboratory, one steel specimen of the rebar of the retaining wall (P1.1), three steel specimens of the rebars of the adults' tank (T1.1; T1.2; T1.3) and two steel specimens of the slab of the South's storage room (A1; A2) were prepared and tested, aiming at determining the tensile strength of the steel (Fig. 54a). The tensile tests were carried out based on the EN 10002-1:2001 (CEN, 2001). The P1.1 specimen presents corrosion (minimum diameter equal to 5.72 mm) and a tensile strength significantly lower (ultimate strength equal to 253 MPa) than the other specimens (Fig. 54b and Table 3). The steel specimens of the adults' tank have a mean diameter equal to 6.30 mm (smooth rebars without significant corrosion) and ultimate strength equal to 397 MPa. The mean yield strength (fy,0.6fu) of these steel specimens is equal to 238 MPa (Table 3), which allows to conclude that this steel corresponds to the class A235 (Portuguese steel class for smooth rebars of normal ductility and yield strength equal or higher than 200 MPa). Finally, two rebars of the slab of the South's storage room present corrosion and have a mean diameter of 9.44 mm. The mean yield strength (fy,0.6fu) of these two steel specimens is equal to 294 MPa.

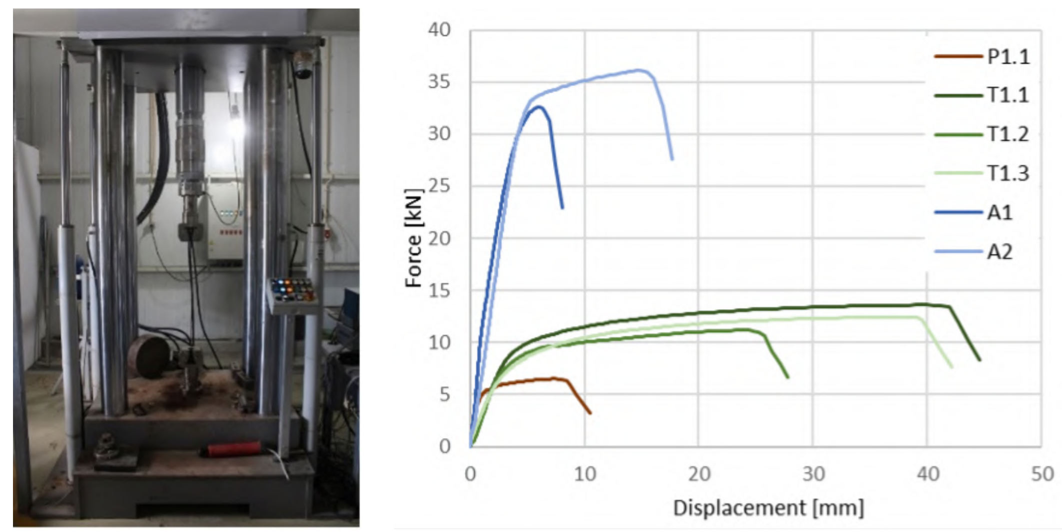


Fig. 54 – Laboratory tests to determine the mechanical properties of the steel rebars: (a) tests to determine the tensile strength; (b) results of the tests.

Specimen	Diameter [mm]	Area [cm²]	F_{max} [kN]	f_u [MPa]	$f_{y,0.6fu}$ [MPa]	$f_{y,0.2\%}$ [MPa]
P1.1	5.72	0.26	6.49	252.56	151.54	143.52
T1.1	6.40	0.32	13.59	422.77	253.66	301.69
T1.2	6.16	0.30	11.16	375.00	225.00	294.75
T1.3	6.34	0.32	12.47	394.65	236.79	276.90
Average	6.30	0.31	12.41	397.48	238.49	291.11
A1	9.16	0.66	32.60	493.94	296.36	465.31
A2	9.71	0.74	36.09	487.70	292.62	487.47
Average	9.44	0.70	34.35	490.82	294.49	476.39

(F_{max}: maximum force; f_u: ultimate tensile strength; $f_{y,0.6fu}$: yield tensile strength assuming the proof stress equal to 0.6 of the ultimate strength; $f_{y,0.2\%}$: yield tensile strength assuming the proof stress associated to the strain equal to 0.2%)

Table 3 – Résumé of the properties of the steel rebar specimens.

1.3.3 Chloride Content Testing

Under normal conditions, concrete provides protection that prevents the corrosion of the steel, mainly associated with the high pH of concrete and low electrical conductivity. However, during the lifetime of the reinforced concrete structure, external actions, such as the penetration of chlorides, can promote the electromechanical corrosion of the rebars, causing reduction of the effective cross-section of the steel rebars and damage in the concrete. The penetration of chlorides is associated with environmental factors, such as the exposure of the building.

Since the building is located very close to the sea (sea water, salt fog, winds and high relative humidity), samples of the concrete paste were collected and the chloride content was estimated based on chemical tests performed at the laboratory. The samples were collected at the adults' tank (T1.10; T1.20; T1.30), the children's tank (T2.10; T2.20; T2.10.B; T2.20.B), the water collection area (C10; C20; C30) and the bar (B10; B20; B30) (Fig. 55 and Table 4). The cement paste samples were collected using a drilling machine at different depths (from 10 cm to 30 cm, from the external surface), without contamination of the samples (Fig. 55). In general, three samples of each zone were collected, with exception of the children's tank where four samples were extracted (two at the external mortar layer, namely T2.10 and T2.20, and two at the original concrete, namely T2.10.B and T2.20.B). The collection of samples causes minor damage and, consequently, no concrete paste samples were collected at other parts of the building, such as at the external walls. It is noted that, during the collection of samples, the wall of the bar (external wall) was cut, due to the intervention that was being carried out, and the cement paste samples were collected orthogonally to the cross-section of the wall without causing damage in the external surface, but not according to the typical procedure (from the external surface to the interior of the wall).

Table 4 presents the results of the chemical tests with the estimation of chloride content in the cement paste. In general, the results present a significant chloride content (higher than 1% - upper limit definied by the EN 206-1 (CEN, 2000)), which decreases in depth. In contrast, the samples of the adults' tank present an increase of the chloride content in depth. It is noted that it corresponds to a cyclopean concrete with large stones aggregates and, consequently, the samples can also include stone, influencing the percentage of chlorides in the sample. The samples of the bar also present an unexpected evolution of the chloride content in depth. However, and it was previously referred, the collection of these samples did not follow the typical procedure. It is also noted that the concrete of the water collection area (interior wall) presents a significant reduction of the chloride content in the cement paste at the 30 cm depth (0.18%).

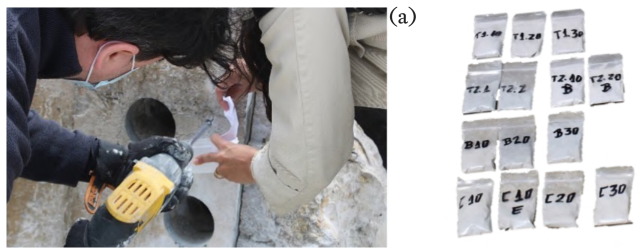

(a) (b)

Fig. 55 – Collection of concrete samples for the chemical tests to estimate the chloride content in the cement paste: (a) procedure; (b) samples.

Location	Sample	Depth [mm]	Chloride content in the cement paste [%]
Adults tank	T1.10	10	1.32
	T1.20	20	1.68
	T1.30	30	1.86
Children tank (external mortar layer)	T2.10	10	2.96
	T2.20	20	2.00
Children tank (concrete)	T2.10_B	10	1.84
	T2.20_B	20	1.36
Water collection room	C10	10	0.78
	C20	20	0.40
	C30	30	0.18
Bar[1]	B10	10*	2.16
	B20	20*	2.11
	B30	30*	3.35

Table 4 – Results of the chemical tests to estimate the chloride content in the cement paste.

1.3.4 Water Penetration Testing

The in-situ water penetration tests with a Karsten's tube aim to estimate the amount of water that penetrates into the concrete over time, which is also an indirect measure of the superficial porosity or permeability. In this test, the Karsten's tube (glass tube with a graduated scale) is glued to the concrete surface, without causing damage, and filled with water. The water exerts a pressure on the surface, simulating wind-driven rain speeds up to 98 mph (pressure equal to 1140 Pa).

In the diagnosis of the building, four water penetration tests were carried, namely at the interior surface of the wall of the water treatment area (Q1), external surface of the wall of the water treatment area (Q2), external surface of the wall the South's corridor (CA) and external surface of the wall of the changing rooms (PV) (Fig. 33 and Fig. 56). The penetration of the water into the concrete was measured every 5 min for 20 min.

Table 5 presents the results of the water penetration tests, in which it is observed that the surfaces of the tested walls present significant different performances. The highest water absorption (permeability of the concrete) occurs at the wall of the water treatment area (1.6 ml and 1.1 ml at the interior and external surface, respectively, after 20 min), which corresponds to a water absorption coefficient of 1.00 kg/m².min0.5 after 20 min (for example, the expected range for traditional cement-based renders is 0.2-1.5 kg/m².min0.5). The tested surface of the wall of the South's corridor showed low permeability and no water absorption was observed at the tested wall of the changing rooms, during 20 min of the test. The results are according to the expected, since the external surfaces of the concrete walls present a significantly different appearance.


(a) (b)

Fig. 56 – Examples of water penetration tests at the: (a) external surface of the wall of the water treatment area (Q2); (b) external surface of the wall of the changing rooms (PV).

Time [min]	Decrease of the water level in the Karsten's tube [ml]			
	Q1	Q2	CA	PV
5	0.3	0.3	0.1	0
10	0.7	0.6	0.2	0
15	1.1	0.8	0.3	0
20	1.6	1.1	0.3	0

Table 5 – Results of the water penetration tests.

1.3.4 Concrete Testing with Schmidt Hammer

Non-destructive tests were also carried out at the external concrete walls (where it was not possible to extract concrete cores) and the tanks, such as tests with Schmidt hammer. This type of non-destructive test is based on the surface hardness, in which the rebound number provided by the Schmidt hammer is correlated with the compressive strength. Thus, this type of test is only representative of a layer of about 5 cm depth and the results can be affected by steel rebars, large aggregates, carbonation and moisture.

The concrete tests with Schmidt hammer were performed according to the EN 12504-2 (CEN, 2013), in several areas of the building (Fig. 33), with ten test repetitions in each location, aiming at evaluation the dispersion of the results (Fig. 57).

(a) (b)

Fig. 57 – Examples of concrete testing with Schmidt hammer: (a) wall of the South's corridor; (b) main façade's North.

Table 6 presents the resume of results, namely the mean compressive strength (fcm) and the coefficient of variation (CoV). The original concrete of the adults' tank presents an average compressive strength equal to 42 MPa (15% higher the value obtained from the laboratory tests). On the other hand, the original external mortar of the children's tank presents an average compressive strength equal to 54 MPa. The average compressive strength of the new concrete applied in the tanks during the intervention is equal to 25 MPa. The compressive strength estimated by the tests with Schmidt hammer of the original concrete of the external walls ranges from 38 MPa to 77 MPa, in which the high values can be related with the hardening of the concrete over time, and the presence of aggregates and rebars at the testing points. Finally, the tests showed that the compressive strength of the concrete of the retaining wall ranges from 30 MPa (new concrete) to 54 MPa (Phase 3). Again, the high values can be affected by the presence of steel rebars close to the testing points.

Location	Point	f_{cm} [MPa]	CoV [%]
Adults tank	T1_P1	48	18
	T1_P2	37	25
	T1_P3[1]	30	18
Children tank	T2.P1[2]	54	11
	T2.P2[1]	25	12
Changing rooms	PV.P1	79	7
	PV.P2	70	8
Main façade south	PS.P1	68	15
	PS.P2	68	17
Main façade north	PN.P1	68	11
	PN.P2	38	26
South corridor	CA.P1	77	10
Bar	B.P1	57	31
Retaining wall	P.P1	54	13
	P.P2[1]	30	14

Table 6 – Résumé of the results of the tests with Schmidt hammer.

1.3.6 Sonic Testing

Sonic testing is a non-destructive technique that allows to determine the velocity of the wave propagation (V) from a transmitting transducer to a receiving transducer:

$$V = \frac{s}{\Delta t}$$

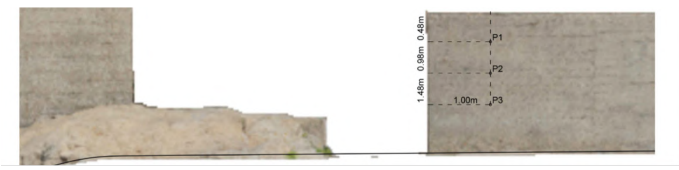
where s is the distance between the transmitting and the receiving transducers, and Δt is the time that the wave takes from the transmitting transducer to the receiving transducer. The velocity of the wave is associated with the elastic material properties and can be used to evaluate the material homogeneity in the structure.

In this experimental campaign, direct tests were carried based on the ASTM C597-02 (ASTM, 2002), using a piezoelectric accelerometer with a sensitivity of 10 V/g (receiving transducer), an instrumented hammer (transmitting transducer), an acquisition board with 24 bits resolution, coaxial cables, and software developed by the University of Minho (Fig. 58). The sonic tests were performed in five concrete walls: (1) three points of the wall of the South's corridor (CA); (2) three points of the wall of the South's bathrooms (CS); (3) four points of the main's façade South (PS, two points above and below the horizontal crack, Fig. 58b); (4) three points of the wall of the changing rooms (PV); (5) three points of the wall of the water treatment area (Q) (Fig. 59). The distance between the transducers is equal to the thickness of the walls (0.298-0.300 m) and the Δt was determined from the P waves of the direct sonic tests. At each point, six repetitions of the direct test were performed.

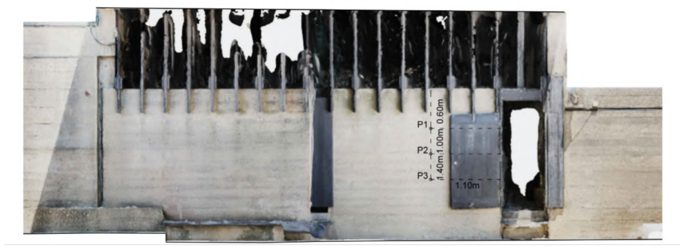
The results of the direct sonic tests (Table 7) show that the average velocity of the waves ranges from 2326 m/s (main's façade South) to 2898 m/s (changing rooms), in which the coefficient of variation is equal to 8%. The tested walls of the South's corridor, South's bathrooms and Water treatment area present similar results (velocity about 2580 ms/s; coefficient of variation of 1%), leading to the conclusion that the concrete of these walls does not present significant differences in the elastic properties.

(a) (b)

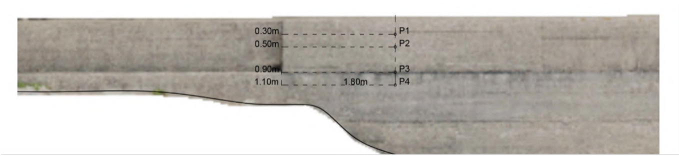
Fig. 58 – Sonic testing: (a) equipment; (b) test.



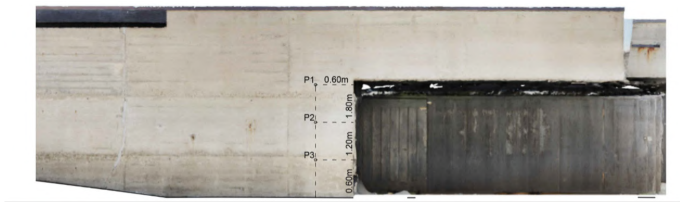
(a)



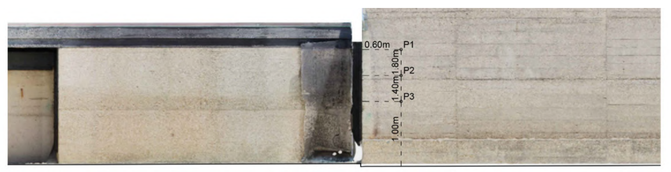
(b)



(c)



(d)



(e)

Fig. 59 – Location of the sonic tests: (a) South's corridor (CA); (b) South's bathrooms (CS); (c) main's façade South (PS); (d) changing rooms (PV); (e) water treatment area (Q).

Location	Point	Mean velocity [m/s]	Average velocity [m/s]
South corridor (CA)	P1	2195	2598
	P2	2737	
	P3	2862	
South bathrooms (CS)	P1	2231	2560
	P2	2728	
	P3	2720	
Main façade south (PS)	P1	2524	2326
	P2	2317	
	P3	2078	
	P4	2387	
Changing rooms (PV)	P1	2760	2898
	P2	3052	
	P3	2881	
Water treatment room (Q)	P1	2474	2582
	P2	2797	
	P3	2474	

Table 7 – Resume of the results of the direct sonic tests.

1.3.7 Color Analysis Based on Spectrophotometry

The color analysis of the concrete was performed using a spectrophotometer Konica Minolta CM-2600d (Fig. 60a). The spectrophotometer provides the parameters L (lightness), a (redness-greyness of the color) and b (yellow-blueness of the color) (CIELAB color space) for a testing point, which allow to evaluate the color difference between testing points, based on the ΔE distance (Eq. 2). In general, it is considered that the color difference is perceivable by the human eye when ΔE is higher than 2.0. ΔE higher than 5.0 and 6.0 mean significant color difference and different colors, respectively.

The tests with spectrophotometer were carried out at ten locations of the building, including original concrete and new concrete applied in the intervention (Fig. 33 and Fig. 60). Moreover, ten test repetitions were considered in each location. The results were evaluated in terms of ΔE (see Appendix C) and represented using the Adobe RGB 1998 and sRGB color spaces (Fig. 61). As expected, the results present a high dispersion, with the color ranging from beige to dark gray. The lighter colors were detected in the children's tank (T2_e1, original concrete) and the main façade South's (PN_e1). The new concrete (T1_e3; T2_e2; P_e2) presents also different color with respect to original concrete (T1_e1, T1_e2; T2_e1; P_e1).

(a)

(b)

(c)

(d)

Fig. 60 – Color analysis testing: (a) spectrophotometer; (b) test at the adults' tank (original concrete); (c) test at the wall of the changing rooms (east surface); (d) test at the wall of the bar (west surface).

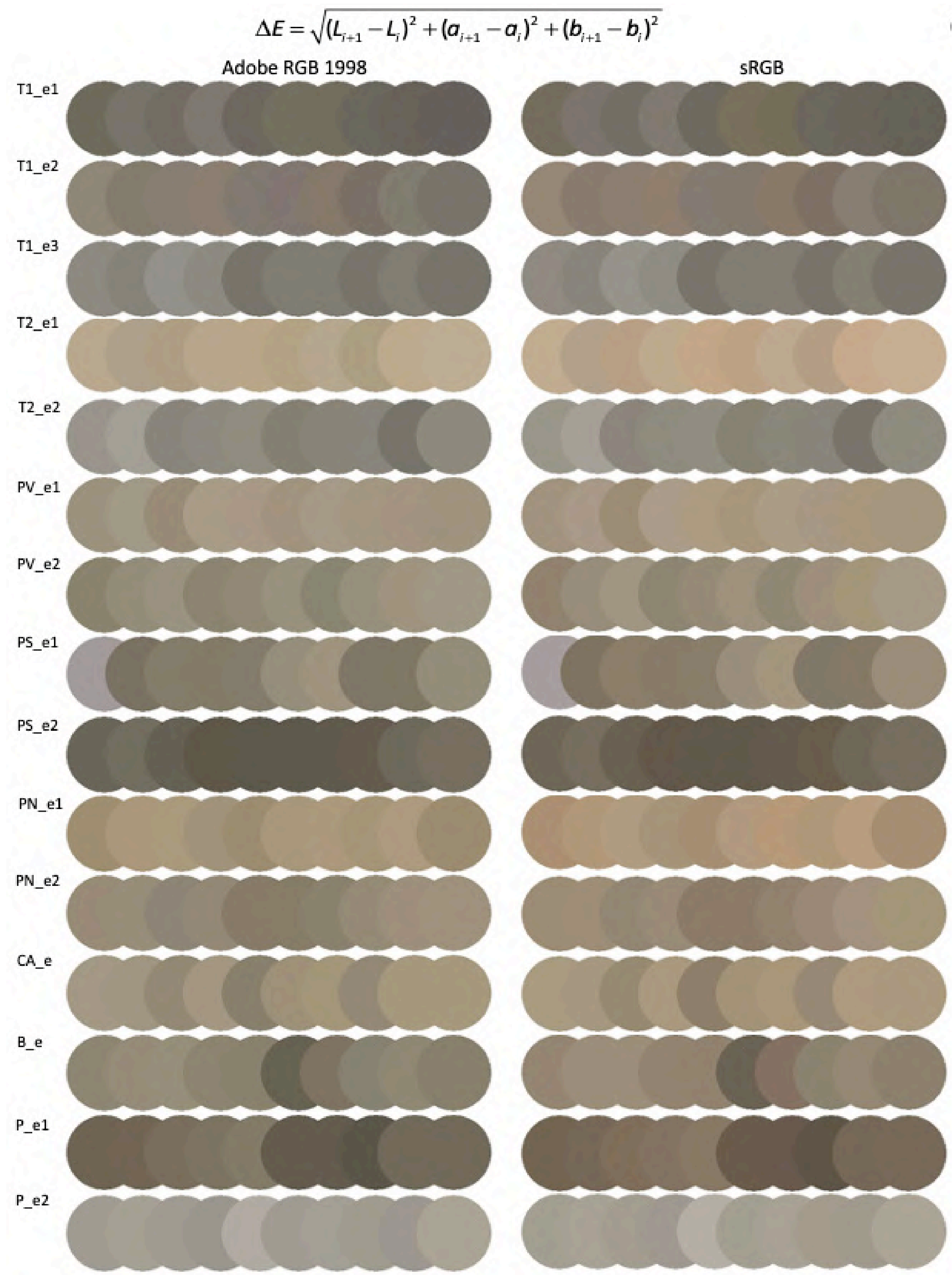


Fig. 61 – Results of the color analysis.

1.3.8 Ground Penetrating Radar Testing

Ground Penetrating Radar (GPR) tests were carried out in several locations of the building. The main objective of the GPR tests was to determine the type of connection existing between the cantilever beams located over the changing rooms. GPR tests were also carried out at other reinforced concrete walls, aiming to verify the spacing of the vertical and horizontal reinforcement.

The tests were carried out using the RAMAC/GPR system from MALA (Guideline Geo). Given the objective of the works and the estimated thickness of the structural elements under analysis (around 30 cm), the tests were carried out using a 1600 MHz antenna. The GPR method is based on the emission of high-frequency electromagnetic waves (radar waves) into a building element using a dipole antenna. The waves are generated by a transmission antenna placed on the surface of the analyzed object. The wave propagates through the material and part of it is reflected back to the testing surface (where the reception antenna is also located) when discontinuities are observed. Discontinuities correspond to a change in the dielectric properties of the medium, which happen when they reach an interface between different materials, namely the end of an element (backside of a wall), a metallic element (reinforcement bars), voids, etc.

The time between the emission and reception of the reflection can be measured, which allows the determination of the location and depth of the anomaly observed. The transmission and reception antennas are within the same device, which is also a cart (Fig. 62). Thus, the antennas can be moved along the surface of the element under investigation, producing radargrams. Radargrams are charts that show the position of the antenna against the travel time of the wave. If the velocity of propagation of the radar waves within the media is known, the location and depth of the different obstacles (interfaces, rebars, the backside of elements, etc.) can be estimated. For reference, it is noted that the average radar-wave velocity in concrete is 10 cm/ns, according to the literature (Daniels, 2014).

(a)

(b)

Fig. 62 – GPR testing: (a) equipment used in the GPR tests; (b) test carried out at the cantilever beam over the changing rooms.

Assessing the Connection Between the Cantilever Beams at the Changing Rooms

A series of GPR profiles were carried out in the three beams that compose the entrance of the changing rooms. The main objective was to understand the connection between the beam with no evident supports (beam B in Fig. 63) and the two perpendicular cantilever beams (beams A and C in Fig. 63). Assuming the likely presence of dowels connecting the beams, vertical GPR profiles were carried out each 10 cm (close to the connection) and each 20 cm (around the center of beam B). The test aimed to determine two specific construction details: (1) the number of dowels connecting the beams; (2) the length of the dowels. Fig. 63 shows schematically the number and location of the profiles carried out.

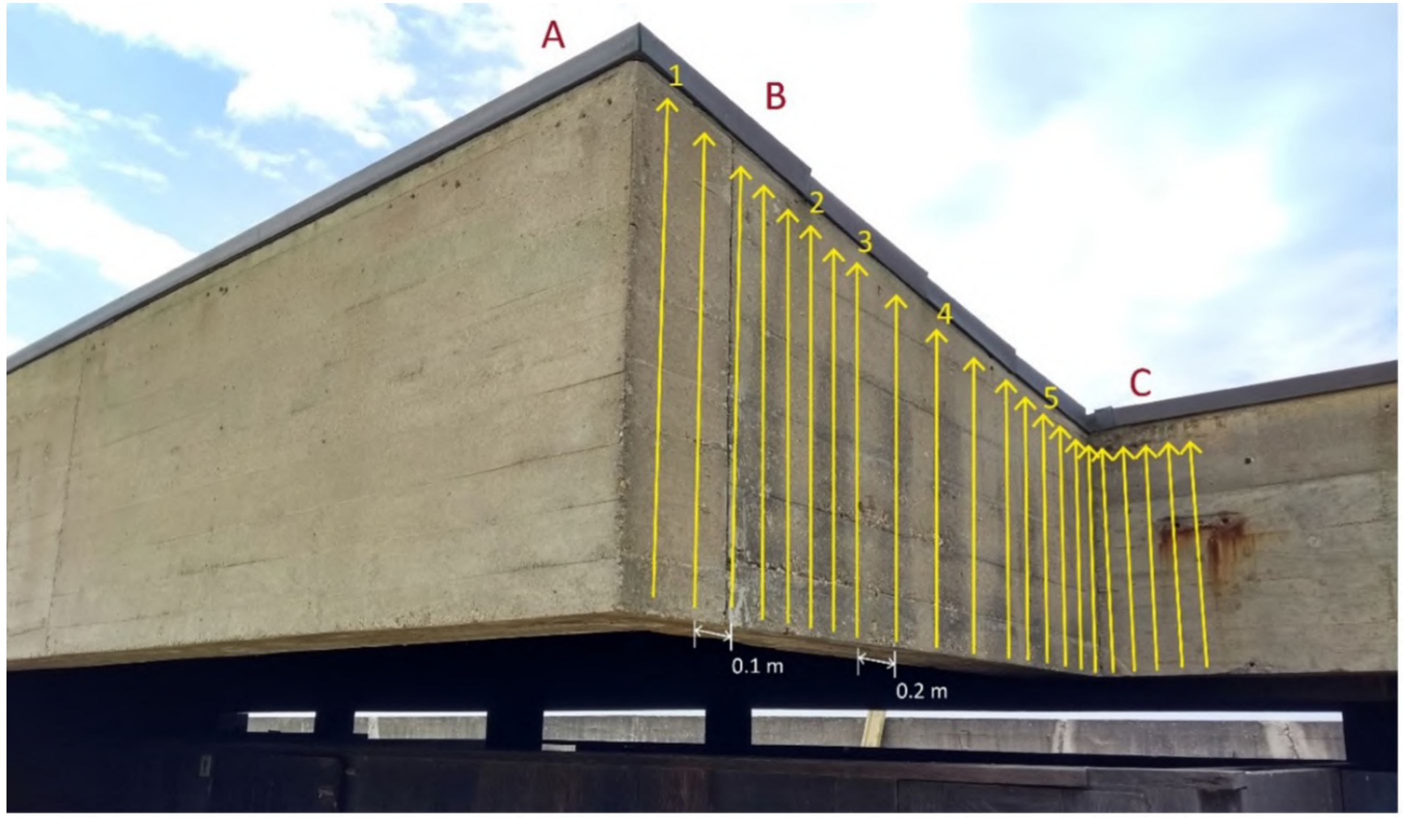


Fig. 63 – Location of the GPR profiles carried out on the tree cantilever beams over the changing rooms.

The thickness of the beam is known (30 cm). Thus, the velocity of the waves in the concrete could be defined for this specific case. A velocity of 11 cm/ns was found, which is within the common range recommended in the literature (ASTM, 2002). Once the velocity was calibrated, the depth of the steel reinforcement bars and ties can be determined from the radargrams.

Fig. 64-68 show five representative radargrams corresponding to locations 1-5 (as indicated in Fig. 63). The first radargram (Fig. 64) was obtained at the head of beam A. The radargram shows parabolas that indicate the presence of steel reinforcement elements, separated approximately 20 cm. These reinforcement elements can be more clearly detected in the second radargram (Fig. 65), carried out on beam B, 30 cm from the joint between beams A and B. Therefore, there seem to be five longitudinal reinforcement elements bars in beam B. Among these five rebars, some of them should go through the joint and penetrate the perpendicular cantilever beam (beam A) to make the connection between the two beams. These five bars are spaced 20 cm in height and are located at a depth of approximately 4-5 cm within the beams. Fig. 65 clearly shows the opposite face of the beam (at 30 cm), indicated as a yellow discontinuous line. Note that this known thickness was used to calibrate the velocity of the radar waves throughout the concrete. Note also that only the bars located close to the inspected surface are clearly observed. The bars from the opposite surface are hidden by the initial reflections. Nevertheless, a symmetric configuration is observed by tests carried out at both surfaces, showing five longitudinal reinforcement elements in both faces.

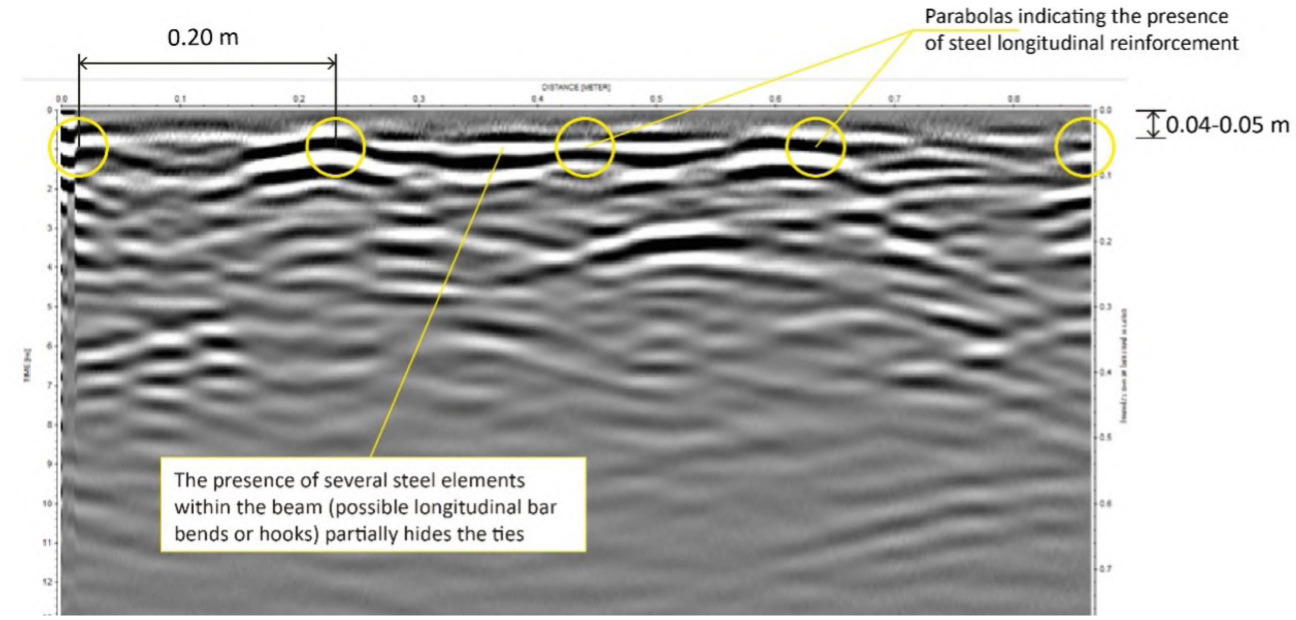


Fig. 64 – Radargram 1 on the head of beam A.

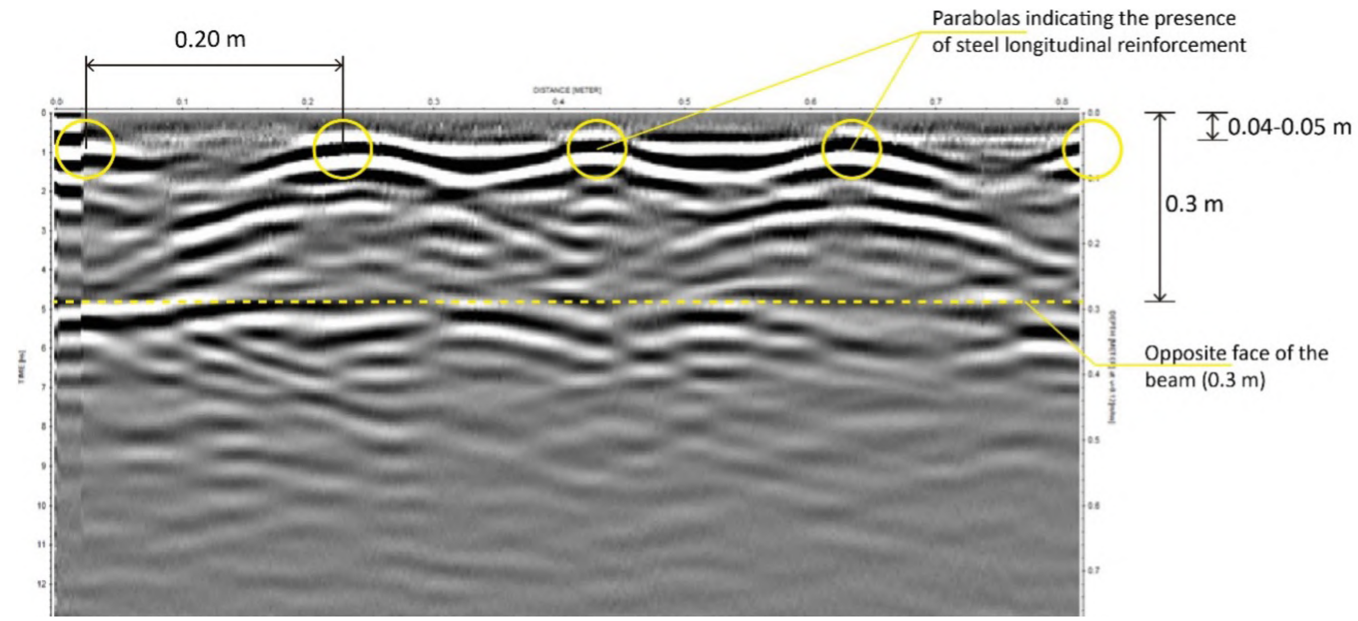


Fig. 65 – Radargram 2 on beam B, 30 cm from the joint between beams A and B.

Radargram 3 (Fig. 66) was carried out 50 cm away from the joint between beams A and B, confirming the presence of the five reinforcement bars) and indicating that their length within beam B is greater than 50 cm. The tests performed at a location further than 50 cm from the joint no longer show the presence of the five bars. As an example, Fig. 67 shows radargram 4, carried out 110 cm away from the joint between beams A and B. Only three steel reinforcement elements can be detected. In conclusion, the dowels that connect beams A and B seem to have a length of 50 cm within beam B and there are two of them (the two longitudinal reinforcement elements that are no longer visible in Fig. 67). The three reinforcement elements located in Fig. 67 seem to be the longitudinal reinforcement of beam B, located at the top, bottom, and middle of the height given the beam large size.

Radargram 5 (Fig. 68) was carried out 180 cm away from the joint between beams A and B and 30 cm away from the joint between beams B and C. The radargram shows again five reinforcements, indicating the presence of dowels in the interior of beam B at this end of the beam to connect with beam C. The reinforcement details thus seems to be similar at both ends of the beam. The tests carried out led to determining that two dowels were used to connect the beams. These dowels are separated 40 cm, located approximately 40 cm from the top and 40 cm from the bottom of the beam. They have a length of approximately 50-60 cm within beam B (beam with no vertical supports).

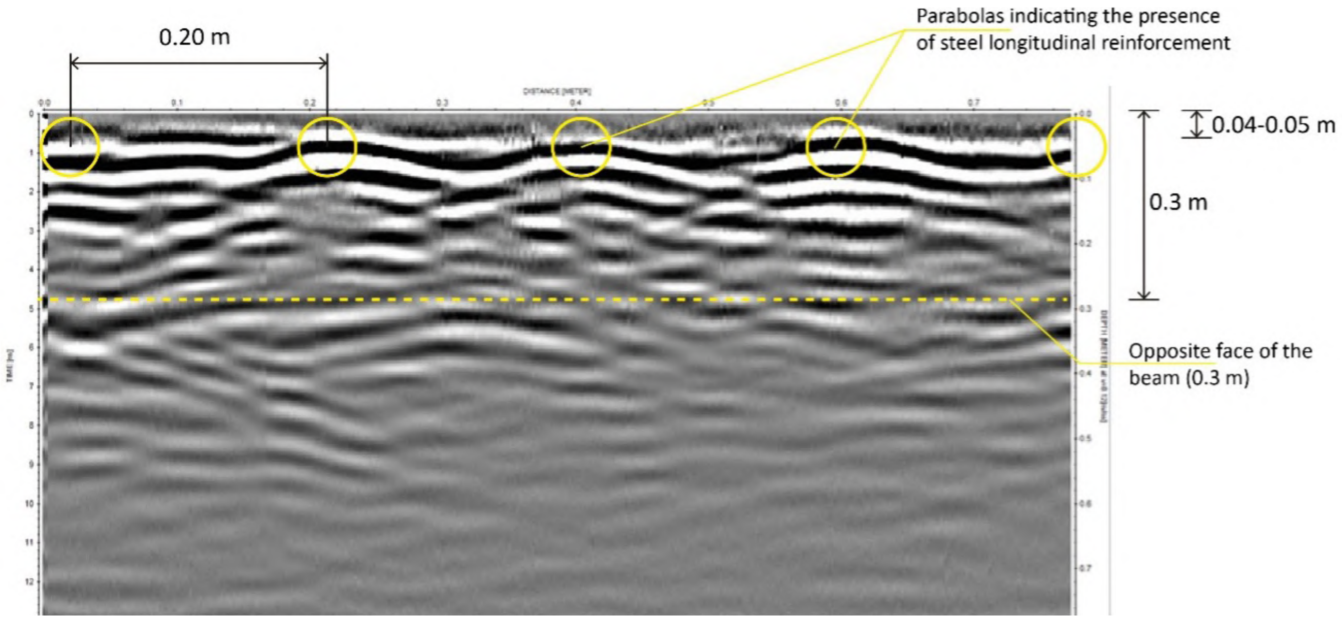


Fig. 66 – Radargram 3 on beam B, 50 cm from the joint between beams A and B.

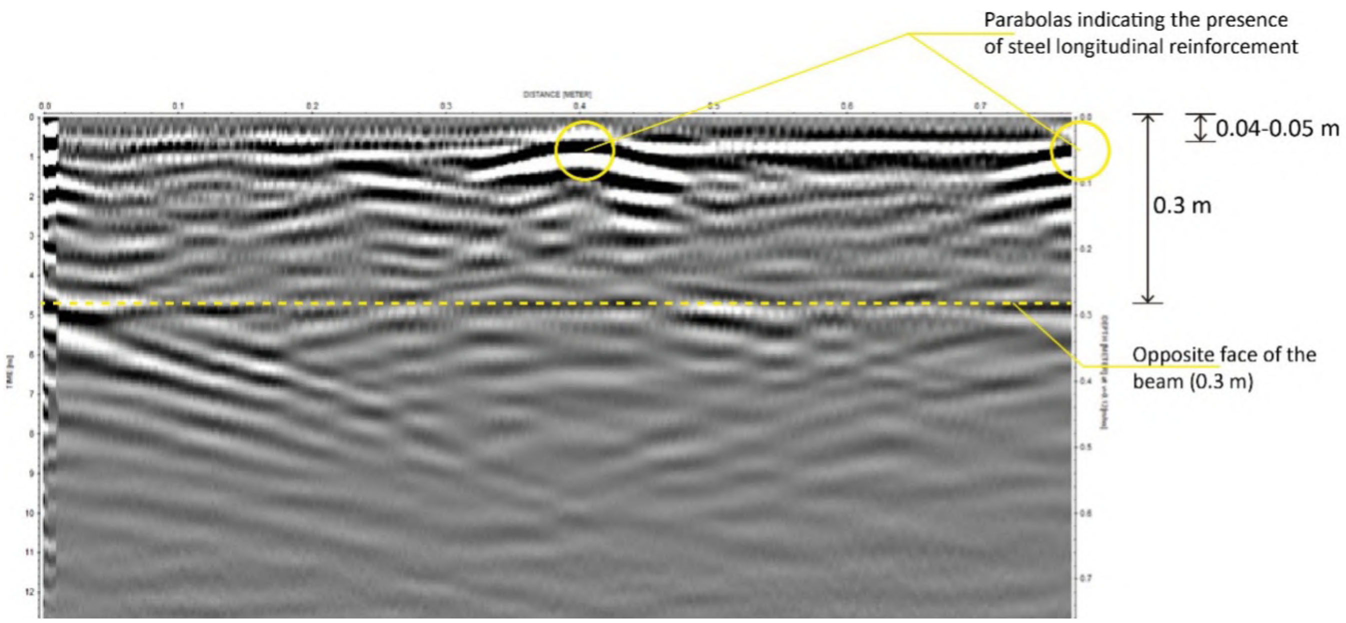


Fig. 67 – Radargram 4 on beam B, 110 cm from the joint between beams A and B.

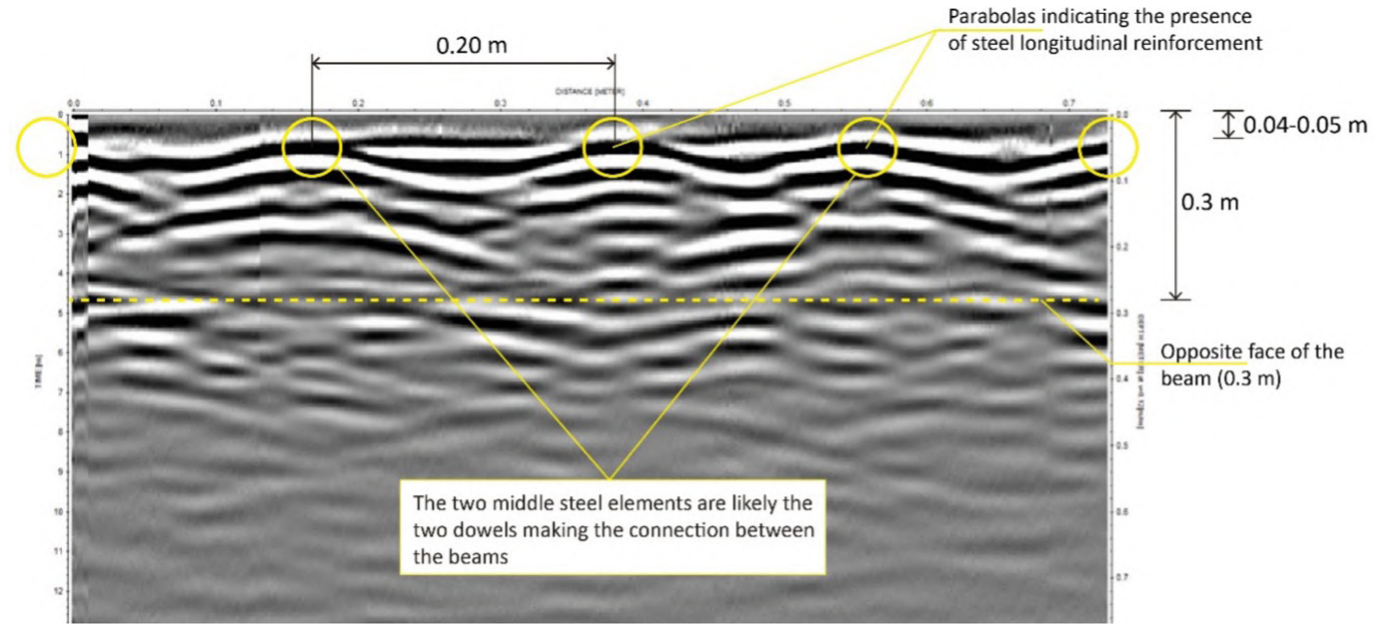


Fig. 68 – Radargram 5 on beam B, 180 cm from the joint between beams A and B.

Several radargrams were carried out on the interior face of the beam, leading to similar conclusions. The results indicate that the same reinforcement detail was used at both faces of the beams. For example, Fig. 69 shows a radargram carried out on the interior face of the beam, 30 cm away from the joint between beams B and C. The radargram shows the longitudinal reinforcement elements spaced 20 cm and located at a depth of 4-5 cm within the concrete. Note that the upper longitudinal reinforcement of the beam is not shown in the radargram because the timber structure prevents carrying out the test along the whole height of the beam.

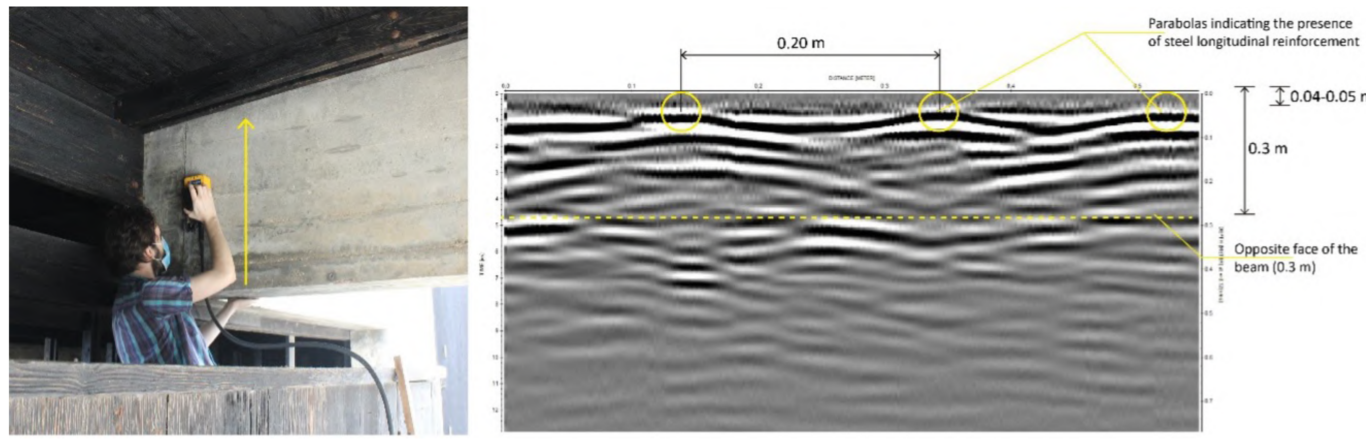


Fig. 69 – Radargram carried out on beam B (interior face), 30 cm from the joint between beams B and C.

Another test was carried out on beam B in the longitudinal horizontal direction, aiming to determine the spacing between the stirrups. Fig. 70 shows that the stirrups have a regular spacing of 25 cm throughout the beam length. However, the spacing is reduced close to the beam ends. The radargram indicates that the spacing of the stirrups at the beam ends is approximately 8-10 cm. Finally, vertical GPR profiles were also carried out on beams A and C. These last set of tests at this location shows that the beams have three longitudinal reinforcement bars in the height. Fig. 71 shows one of the diagrams obtained at beam C, carried out on the exterior face of the beam.

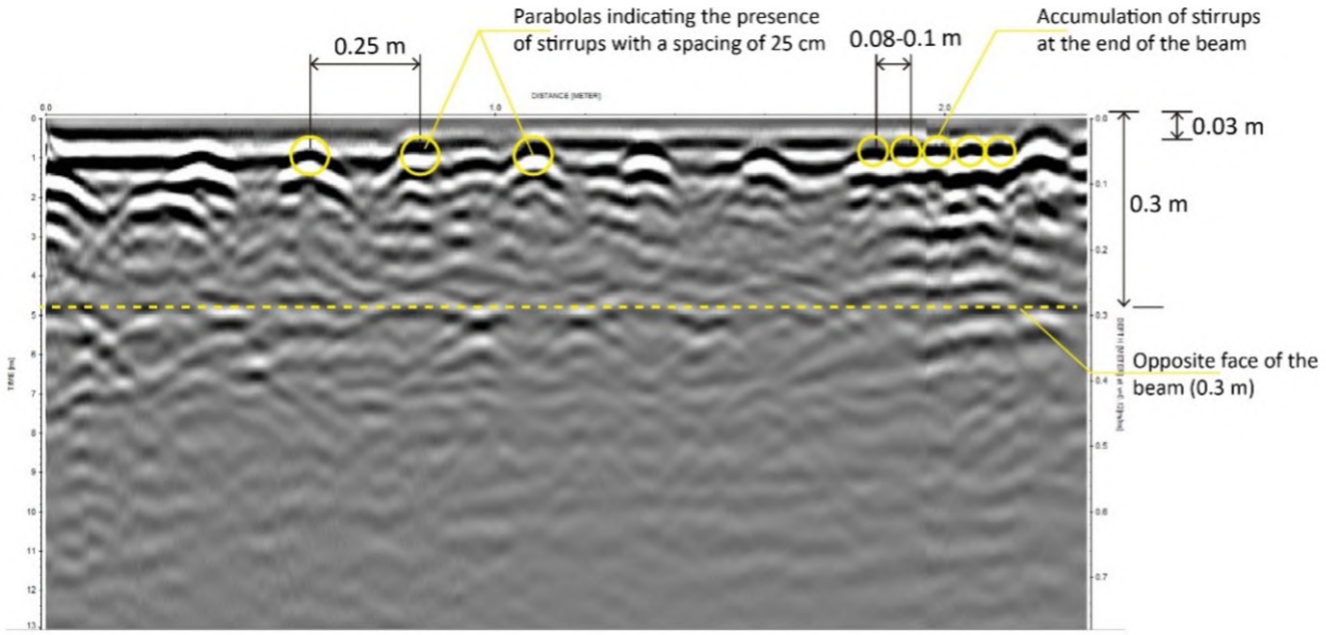


Fig. 70 – Longitudinal radargram carried out on beam B.

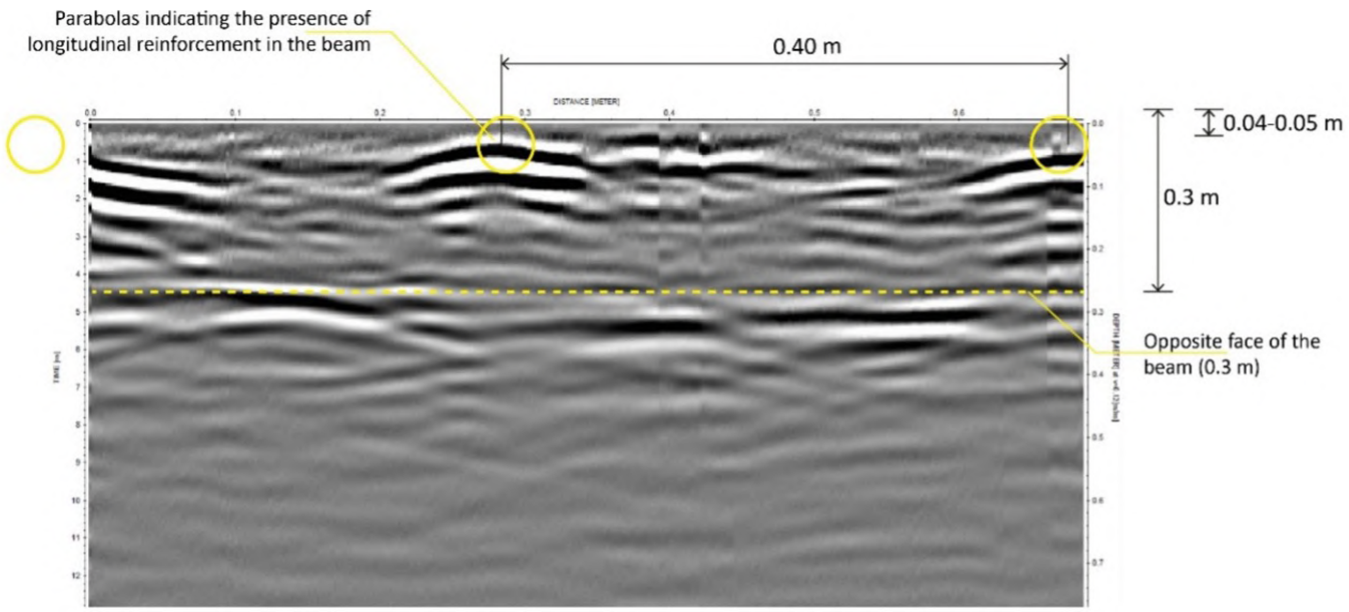


Fig. 71 – Vertical radargram carried out on beam C.

In conclusion, Fig. 72 shows a hypothesis of the connection between the cantilever beams over the changing rooms. The hypothesis that is shown in Fig. 72 indicates the probable presence of two dowels connecting the perpendicular beams in each face (in dark red), making it four it total. It also shows an approximate distribution of the stirrups (in light blue) and the longitudinal reinforcement bars (in orange) of beam B, again in each face. The probable location of the three longitudinal reinforcement bars in beams A and C (in dark blue), and in each face, is also shown. The arrangement is assumed to be symmetric from the vertical axis of the beams.

Fig. 72 – Likely reinforcement details of the connection between the cantilever beams over the changing rooms, and beams main reinforcement.

Verification of the Reinforcement Scheme in Reinforced Concrete Walls

GPR readings were carried out in two reinforced concrete walls to verify the reinforcement scheme (vertical and horizontal spacing). The two walls were located at: (1) the exterior wall of the changing rooms; (2) the exterior wall of the south's corridor. To locate the horizontal and vertical reinforcement elements, tests were carried out in both orthogonal directions on the walls.

Fig. 73 shows the result of one test carried out following a horizontal alignment at the exterior wall of the changing rooms. Variable spacing between vertical reinforcement bars could be estimated. There is a vertical separation between two areas, probably corresponding to two different phases of concrete pouring. At the area closer to the entrance of the changing room (first part of the radargram), the spacing between vertical bars is 20 cm. In the second area, the spacing is 30 cm. The bars are located at a depth of approximately 4 cm. Fig. 74 shows a vertical GPR profile at same wall. In this case, the spacing between horizontal bars is constant (30 cm). The bars are located at a depth of approximately 3 cm. The radargram also shows clearly the horizontal interface between two different phases of concrete pouring.

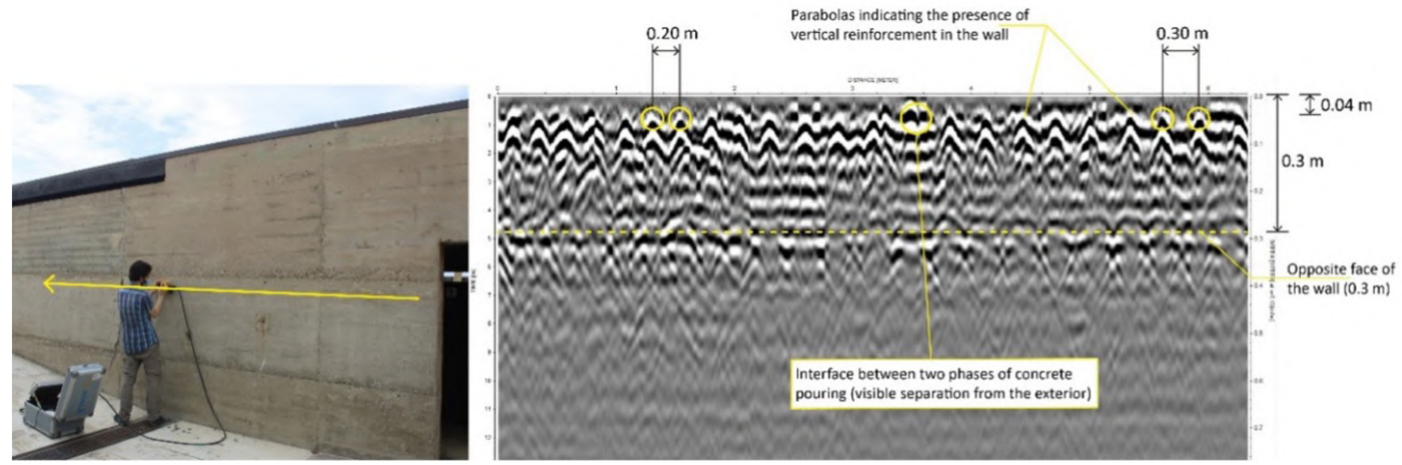


Fig. 73 – Horizontal radargram carried out on the exterior wall of the changing rooms.

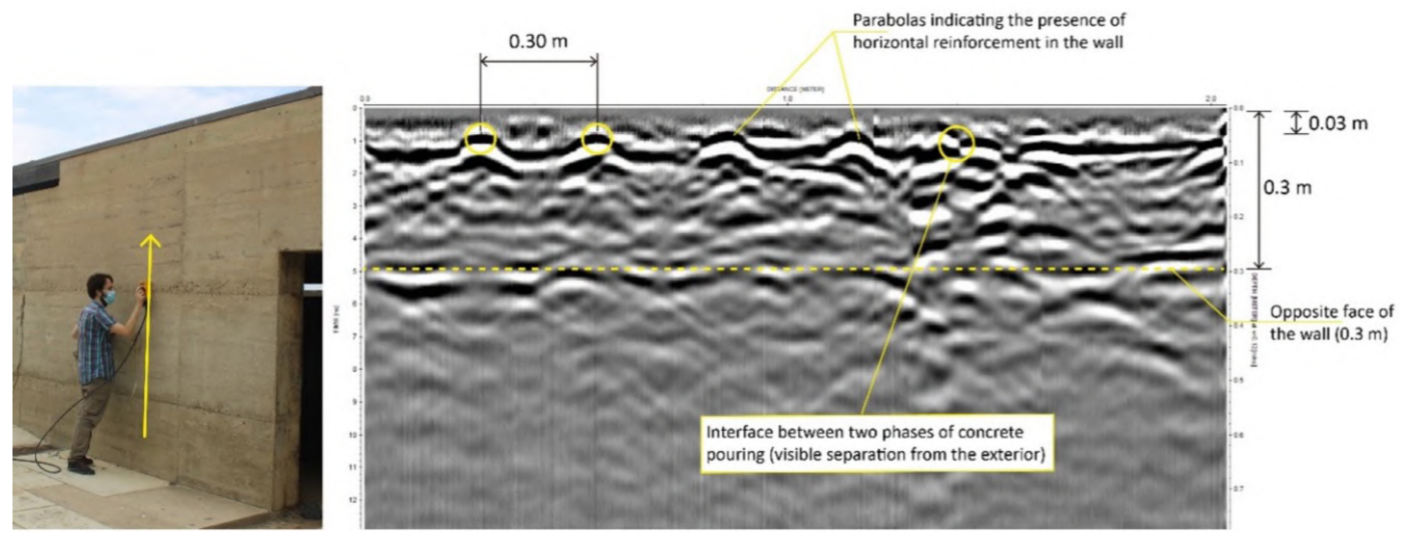


Fig. 74 – Vertical radargram carried out on the exterior wall of the changing rooms.

In the exterior wall of the south's corridor, the tests were carried out in a grid following the orthogonal directions on the walls. A total of 8 parallel scans were carried out in the horizontal and vertical direction (Fig. 75). The separation between scans was 20 cm, covering a total area of 1.4 m x 1.4 m. Fig. 76 shows a representative horizontal radargram carried out on the south's corridor. A spacing of 30 cm between vertical reinforcement bars can be clearly observed. Similarly, Fig. 80 shows a representative vertical radargram carried out on the wall of the south's corridor. In this case, a spacing of 10 cm between horizontal reinforcement bars can be also clearly observed.

The horizontal bars are placed at a depth of approximately 2-3 cm. The vertical reinforcement bars seem to be more deeply located, approximately at 4 cm within the concrete. Note that the velocity of propagation of the radar waves was calibrated based on the known thickness of the wall (30 cm), resulting in a velocity of 12 cm/ns, which is common for concrete materials.

Fig. 75 – Horizontal and vertical scans carried out on the south's corridor.

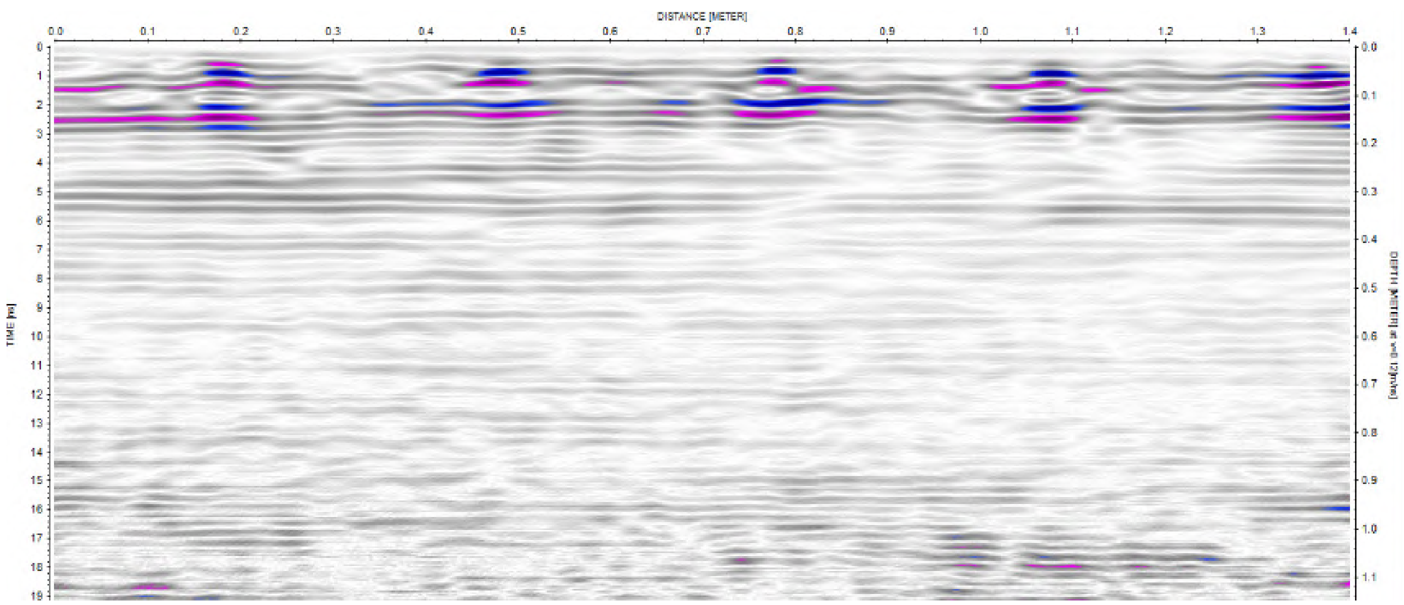


Fig. 76 – Representative example of horizontal radargram carried out on the wall of the south's corridor.

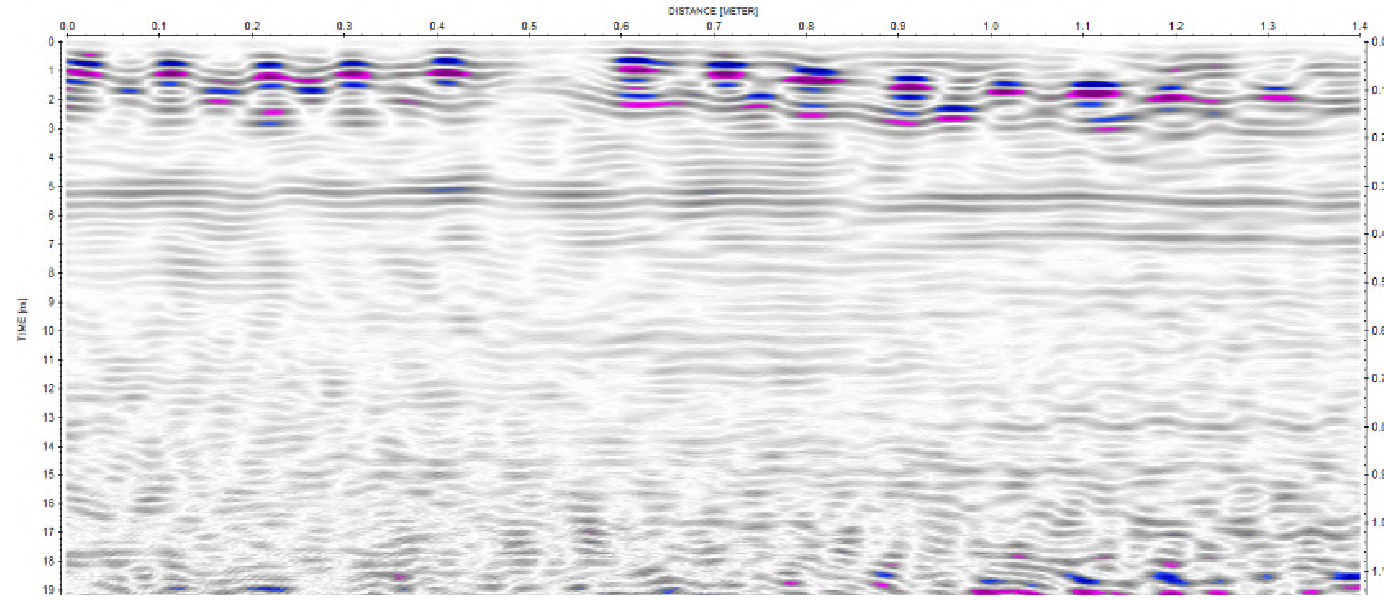
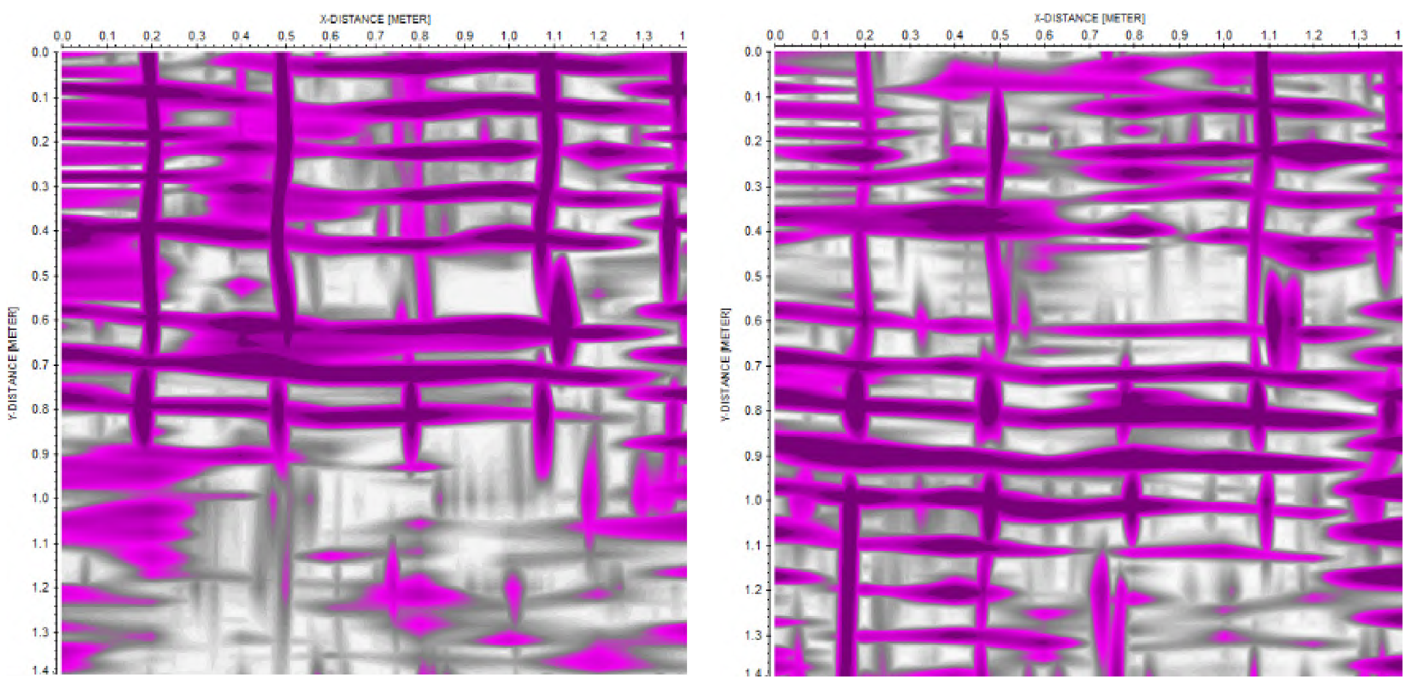


Fig. 77 – Representative example of vertical radargram carried out on the wall of the south's corridor.

The collection of many two-dimensional profiles (radargrams) in a grid allows to derive amplitude maps that illustrate in three dimensions the location of the reflections. The amplitude slice maps show reflected wave amplitudes differences spatially at different depths, which allows for a more direct visualization of the result. Moreover, the process allows the analysis of the spatial distribution of the amplitudes generated by all radargrams simultaneously, instead of the analysis of each scan individually. The maps will show areas with greater amplitudes, corresponding to interfaces between materials with a greater difference in their physical and chemical properties. Areas with low amplitude reflections typically indicate a uniform material. In this case, areas with greater amplitudes should indicate the location of the rebars, which have clearly different physical properties than the surrounding concrete.

Fig. 78 shows amplitude slice maps obtained at different depths (d) within the concrete: at 4.5 cm and 8 cm deep. Note that each amplitude slice should show information of a thicker area and not only at the precise depth. Nevertheless, higher amplitudes are clearly produced by the reinforcements, showing their probable location and configuration. The reinforcements form a grid with 30 cm horizontal spacing and 10 cm vertical spacing for vertical and horizontal reinforcements, respectively, confirming the results previously obtained in the individual profiles.

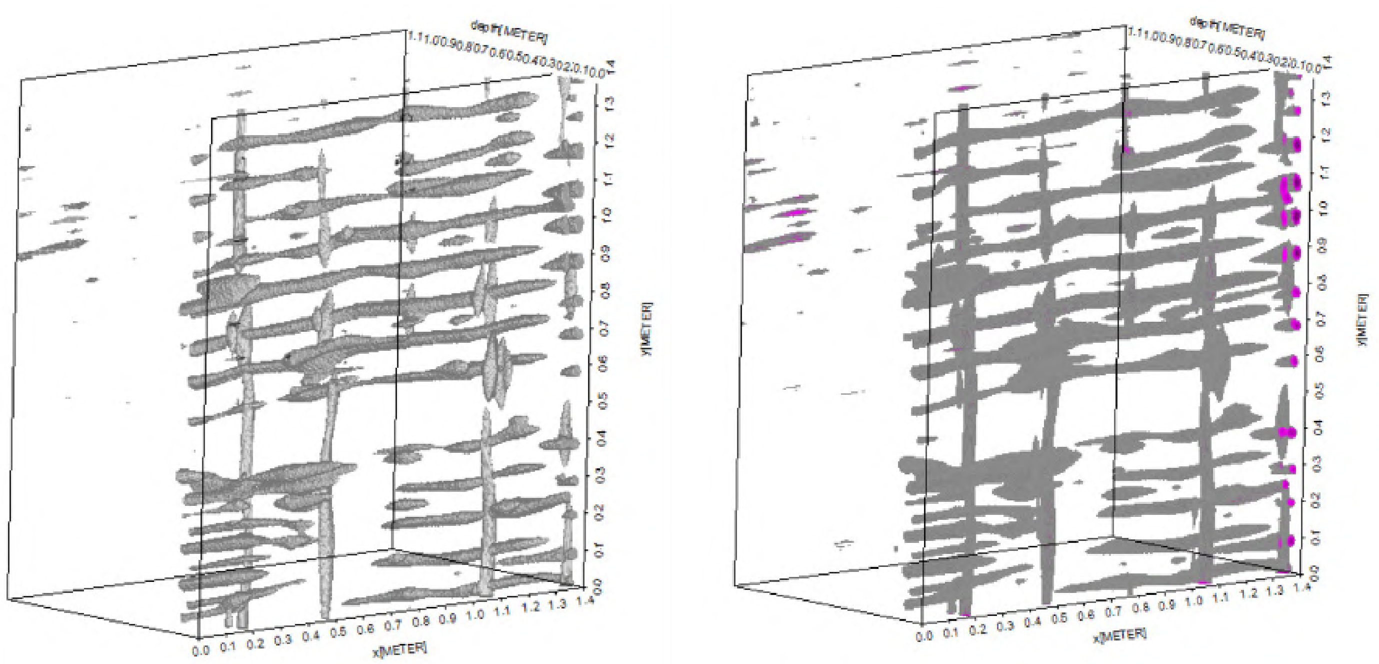
This method of amplitude analysis can also produce three-dimensional images of the reflected waves, which also help in the interpretation of the results. Fig. 79a shows a 3D pseudo-representation of the interior of the reinforced concrete wall, by means of iso-amplitude surfaces representing the threshold enveloped. Fig. 79b shows only the amplitudes exceeding a certain threshold. Both images show well the previously discussed configuration of the reinforcement of the exterior wall of the storage corridor.



(a) d = 0.045 m

(b) d = 0.080 m

Fig. 78 – Amplitude slice maps at different depths (d) within the concrete.



(a)

(b)

Fig. 79 – 3D visualization of the interior of the reinforced concrete wall by means of: (a) iso-amplitude surfaces; and (b) amplitudes exceeding a certain amplitude threshold.

Verification of the Construction Detail of the Wall at the Changing Room

Finally, the last GPR test was carried at the wall of the wash foot's room, aiming to understand the construction detail of the connection between the concrete wall and the timber elements. Fig. 80 shows that the vertical timber element is superficial with a thickness of approximately 1 cm. Thus, the timber element is not a continuation of the timber element that is located on top of the concrete wall. The test also shows the vertical reinforcement bars at the wall, showing a horizontal spacing of 25 cm. Some of the vertical bars are detected behind the timber element, confirming that the element is only superficial. The bars are located at a depth of approximately 4 cm.

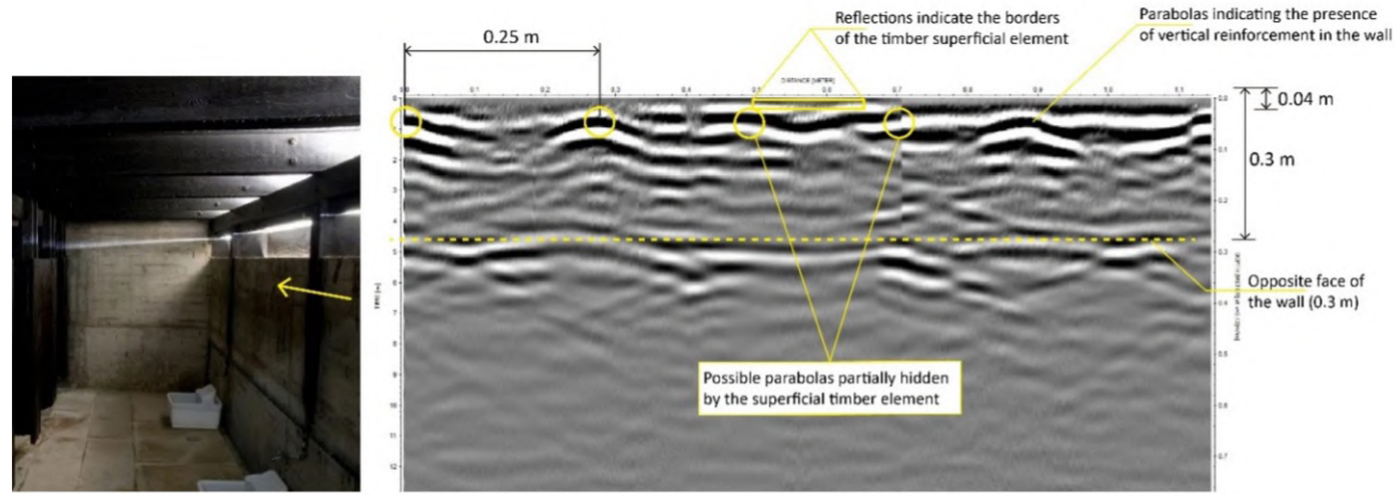


Fig. 80 – Horizontal radargram carried out on the wall of the wash foot's room.

1.3.9 Laboratory Tests on a Timber Specimen

A timber specimen (2×12×3 cm³) was taken from the structure in order to be inspected and tested in laboratory conditions. From an initial visual inspection (Fig. 81), the plank did not present any superficial defects, e.g knots or splits and cracks. There was no slope of grain and the growth rings are regular. From the colour and the dimension of the rings, it is believed that the species of the specimen is riga (pinus sylvestris).

The density of the specimen was obtained according to standard ISO 13061-2 (2014), in which 10 specimens were cut with dimensions of 20×20×25 mm³. The specimens were measured and weighed. A wood density of 635.41 kg/m³ (CoV of 9.8%) was obtained.

Resistograph tests were performed on the timber specimen to determine the quality of the timber, the presence of possible cavities or decayed parts in the timber specimen not detected by a simple visual inspection. The resistograph is an equipment that drills with a 1.5 mm drill into the wood at a speed of 8000 rpm (Fig. 82). The plan was to perform 4 holes in the timber specimen. However, due to the high quality of the specimen and its high density, as well as its low moisture content, only one hole was made, breaking the needle while performing the second hole, due to the high values of resistance. The resistographic measurement (RM), valid for sound and defect-free timber, is given by the ratio between the area underneath the curve and the drilling depth (in this case, 12 cm). A resistographic measurement of 93.27% was found. From the graph (Fig. 83), it is clear that throughout the section, the timber has a good quality, maintaining a uniform resistance. The second hole, which broke the needle, showed even higher values of momentary drill resistance.

There is a direct relationship between RM and the compressive strength of sound timber, i.e. timber without defects (Henrique et al., 2011), showing that the higher the RM the higher the compressive strength of wood.

Fig. 81

Fig. 82

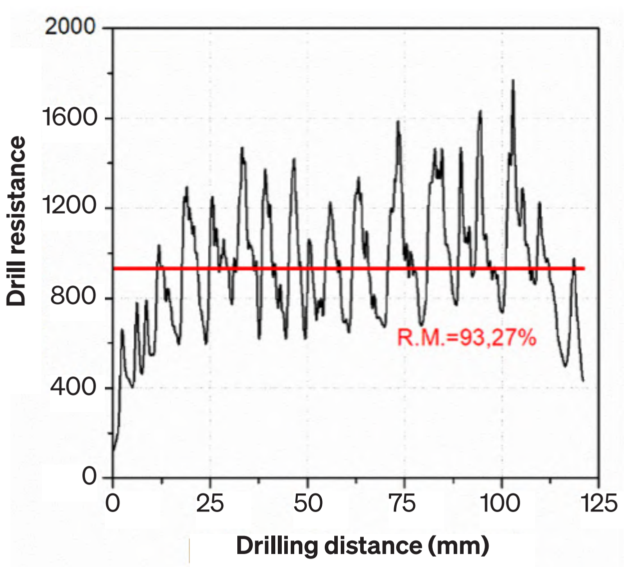


Fig. 83

Fig. 81 – Cross-section of the timber specimen.

Fig. 82 – Performing a test with the resistograph.

Fig. 83 – Resistograph result.

1.3.10 Laboratory Tests on Cement Paste Samples

Paste cement samples were collect from the structure, including the concrete cores, namely at: (1) adult's tank (T1.1); (2) children´s tank (T2.1); (3) water collection area (I1); (4) water treatment area (Q); (5) changing rooms (PV); (6) bar (B1); (7) South's storage room (A). The samples were used to perform the following tests and analyses in the laboratory: (1) thermal gravimetric analysis (TGA); (2) nanoindentation; (3) energy dispersive X-ray analysis (EDS); (4) X-ray diffraction (DRX); (5) scanning electron microscopy (SEM); (6) mercury intrusion porosimetry tests.

Thermal Gravimetric Analysis

The thermal gravimetric analysis (TGA) is a thermal analysis for material characterization, in which the mass loss of the sample is measured over time as function of the temperature increase. The analyses were performed in an SDT Q600 thermal analyzer of the TA Instruments for a temperature range between 0 °C and 1200 °C. Seven cement paste samples were analyzed. The initial mass of the samples ranges from 19.70 mg and 27.65 mg (Fig. 84).

The TGA thermal curves (Fig. 84) shows water release from 0-200 °C. Between 400-450 °C, the samples Q and I1 present calcium hydroxide (portlandite). There is a significant mass drop around 700 °C for all almost samples, which is associated with the presence of calcium carbonate. The TGA results show that these paste cement samples are carbonated, mainly the B1 (exterior wall of the bar), PV (exterior wall of the changing rooms), I1 (interior wall of the water collection area) and A (slab with corroded rebars) samples. It is noted the Q sample, collected from the water treatment area (interior surface of a closed area), presents low carbonation.

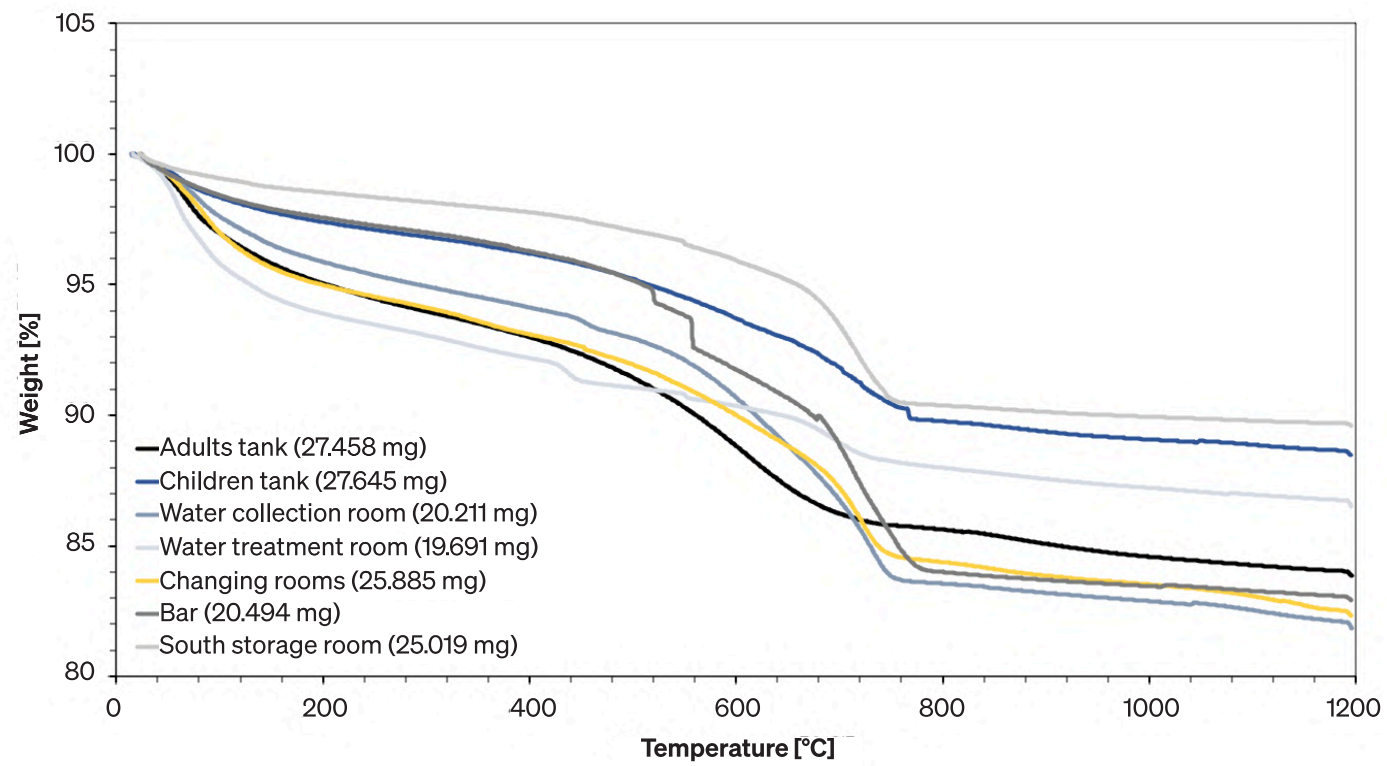


Fig. 84 – TGA thermal curves.

Nanoindentation

The nanoindentation tests were performed with a nanoindenter tester, provided with a vibrating isolating system and constant temperature and humidity. For each sample, 10 tests were carried, using a 2×5 grid (spacing of the horizontal and vertical alignments equal to 75 μm and 250 μm, respectively). All the tests were performed using the same protocol: loading with a constant rate 5 mN/min up to a maximum force, dwell time td=5 [s] at maximum load and unloading with a constant rate 5 mN/min.

The results of the nanoindentation tests are presented in Tables 8 to 14 and Fig. 85, namely the hardness and the reduced (effective) elastic modulus obtained from the unloading stiffness (Er). The sample T1.1 (phase 1) presents a high dispersion on the results, with elastic modulus ranging from 2.98 to 97.16 GPa (mean value equal to 39.95 GPA and CoV of 82%). Although this is a cement paste sample, the concrete core of the adult's tank (T1) present a mean Young´s modulus equal to 39.36 GPa (Table 2). The T2.1 and I1 cement paste samples of phase 2.1 present a similar mean elastic modulus, namely 45.28 GPa and 49.86 GPa, respectively, with exception of the sample Q (interior surface of a closed area), which presents a higher value (74.56 GPa). The sample PV (phase 2.4) presents a mean elastic modulus of 92.75 GPa and the highest value of all tests (177.87 GPa), which can be associated with the many aggregates presented in this sample. The B1 and A samples of the phase present very similar mean elastic modulus, namely 37.14 GPa and 37.53 GPa, respectively. However, tests carried out in sample A presents a high dispersion (CoV equal 145%), with very low and high values, which can be associated with low properties of the gel and the high properties of the aggregates, respectively. It is noted that sample A was collected from a slab with carbonated concrete and corroded rebars.

Indentation	Cycle	Max. Depth (nm)	Plastic Depth (nm)	Max. Load (mN)	Hardness (GPa)	Er (GPa)
1	1	519.42	463.67	5.05	0.64	20.75
2	1	4548.35	4501.07	5.05	0.01	2.98
3	1	143.74	103.01	5.05	6.12	87.75
4	1	118.34	72.09	5.05	9.68	97.16
5	1	459.77	356.78	5.05	0.99	13.94
6	1	450.68	375.12	5.05	0.91	18.24
7	1	329.80	276.94	5.05	1.48	33.21
8	1	259.17	213.23	5.05	2.20	46.67
9	1	273.90	243.70	5.05	1.80	64.19
10	1	494.72	406.13	5.05	0.80	14.58
				Minimum	0.01	2.98
				Maximum	9.68	97.16
				Mean	2.46	39.95
				CoV [%]	123.76	82.45

Table 8 – Results of the nanoindentation tests for the T1.1 sample.

Indentation	Cycle	Max. Depth (nm)	Plastic Depth (nm)	Max. Load (mN)	Hardness (GPa)	Er (GPa)
1	1	205.94	138.94	5.05	4.08	43.56
2	1	388.16	317.49	5.05	1.19	22.31
3	1	319.51	285.98	5.05	1.41	51.07
4	1	186.36	145.11	5.05	3.84	68.65
5	1	160.35	115.09	5.05	5.28	73.35
6	1	351.20	292.79	5.05	1.35	28.78
7	1	430.50	392.89	5.05	0.84	35.29
8	1	150.89	98.12	5.05	6.53	69.93
9	1	368.34	325.49	5.05	1.14	36.08
10	1	383.12	316.75	5.05	1.20	23.80
				Minimum	0.84	22.31
				Maximum	6.53	73.35
				Mean	2.69	45.28
				CoV [%]	76.88	43.07

Table 9 – Results of the nanoindentation tests for the T2.1 sample.

Indentation	Cycle	Max. Depth (nm)	Plastic Depth (nm)	Max. Load (mN)	Hardness (GPa)	Er (GPa)
1	1	143.54	99.84	5.05	6.38	83.48
2	1	99.58	60.26	5.05	12.07	127.62
3	1	381.38	302.97	5.05	1.28	20.87
4	1	163.58	114.17	5.05	5.34	67.53
5	1	434.19	308.60	5.05	1.25	12.84
6	1	122.53	88.69	5.05	7.44	116.44
7	1	294.42	229.67	5.05	1.97	31.31
8	1	787.30	674.30	5.05	0.34	7.42
9	1	273.79	198.57	5.05	2.45	30.05
10	1	6362.81	6264.91	5.05	0.00	1.04
				Minimum	0.00	1.04
				Maximum	12.07	127.62
				Mean	3.85	49.86
				CoV [%]	100.58	92.28

Table 10 – Results of the nanoindentation tests for the I1 sample.

Indentation	Cycle	Max. Depth (nm)	Plastic Depth (nm)	Max. Load (mN)	Hardness (GPa)	Er (GPa)
1	1	787.05	647.66	5.05	0.36	6.23
2	1	160.08	122.40	5.05	4.86	84.49
3	1	137.99	107.60	5.05	5.78	114.26
4	1	155.92	124.92	5.05	4.73	101.28
5	1	121.47	76.51	5.05	8.98	96.29
6	1	631.77	529.38	5.05	0.51	10.10
7	1	152.08	106.87	5.05	5.83	77.15
8	1	137.53	89.62	5.05	7.34	81.69
9	1	112.38	60.53	5.05	12.00	96.52
10	1	136.79	84.35	5.05	7.94	77.60
				Minimum	0.36	6.23
				Maximum	12.00	114.26
				Mean	5.83	74.56
				CoV [%]	61.31	49.45

Table 11 – Results of the nanoindentation tests for the Q sample.

Indentation	Cycle	Max. Depth (nm)	Plastic Depth (nm)	Max. Load (mN)	Hardness (GPa)	Er (GPa)
1	1	114.12	70.59	5.05	9.93	104.59
2	1	296.80	263.95	5.05	1.59	55.49
3	1	231.65	193.36	5.05	2.55	60.19
4	1	206.44	160.47	5.05	3.33	57.38
5	1	205.48	163.91	5.05	3.23	62.49
6	1	226.02	181.85	5.05	2.78	54.58
7	1	83.21	52.57	5.05	14.23	177.87
8	1	92.86	53.63	5.05	13.89	137.26
9	1	80.81	42.18	5.05	18.44	160.58
10	1	205.79	159.39	5.05	3.37	57.11
				Minimum	1.59	54.58
				Maximum	18.44	177.87
				Mean	7.33	92.75
				CoV [%]	84.50	52.46

Table 12 – Results of the nanoindentation tests for the PV sample.

Indentation	Cycle	Max. Depth (nm)	Plastic Depth (nm)	Max. Load (mN)	Hardness (GPa)	Er (GPa)
1	1	591.93	484.39	5.05	0.60	10.36
2	1	162.60	111.76	5.05	5.49	66.59
3	1	270.48	219.46	5.05	2.11	41.12
4	1	247.46	194.56	5.05	2.52	43.37
5	1	170.62	126.73	5.05	4.63	70.86
6	1	439.13	350.06	5.05	1.02	16.37
7	1	358.70	277.40	5.05	1.47	21.57
8	1	199.55	162.18	5.05	3.28	70.05
9	1	355.25	286.46	5.05	1.40	24.86
10	1	892.33	774.59	5.05	0.26	6.30
				Minimum	0.26	6.30
				Maximum	5.49	70.86
				Mean	2.28	37.14
				CoV [%]	75.81	67.36

Table 13 – Results of the nanoindentation tests for the B1 sample.

Indentation	Cycle	Max. Depth (nm)	Plastic Depth (nm)	Max. Load (mN)	Hardness (GPa)	Er (GPa)
1	1	16107.43	15268.51	4.43	0.00	0.04
2	1	18704.86	15095.85	4.41	0.00	0.01
3	1	19914.06	14801.08	3.47	0.00	0.01
4	1	88.54	50.19	5.05	15.03	146.04
5	1	141.43	89.97	5.05	7.30	75.87
6	1	17909.84	13865.70	4.67	0.00	0.01
7	1	19798.12	16280.41	3.70	0.00	0.01
8	1	19904.55	18056.86	3.44	0.00	0.01
9	1	103.92	58.72	5.05	12.46	112.78
10	1	395.36	360.25	5.05	0.97	40.57
				Minimum	0.00	0.01
				Maximum	15.03	146.04
				Mean	3.58	37.53
				CoV [%]	163.41	146.89

Table 14 – Results of the nanoindentation tests for the A sample.

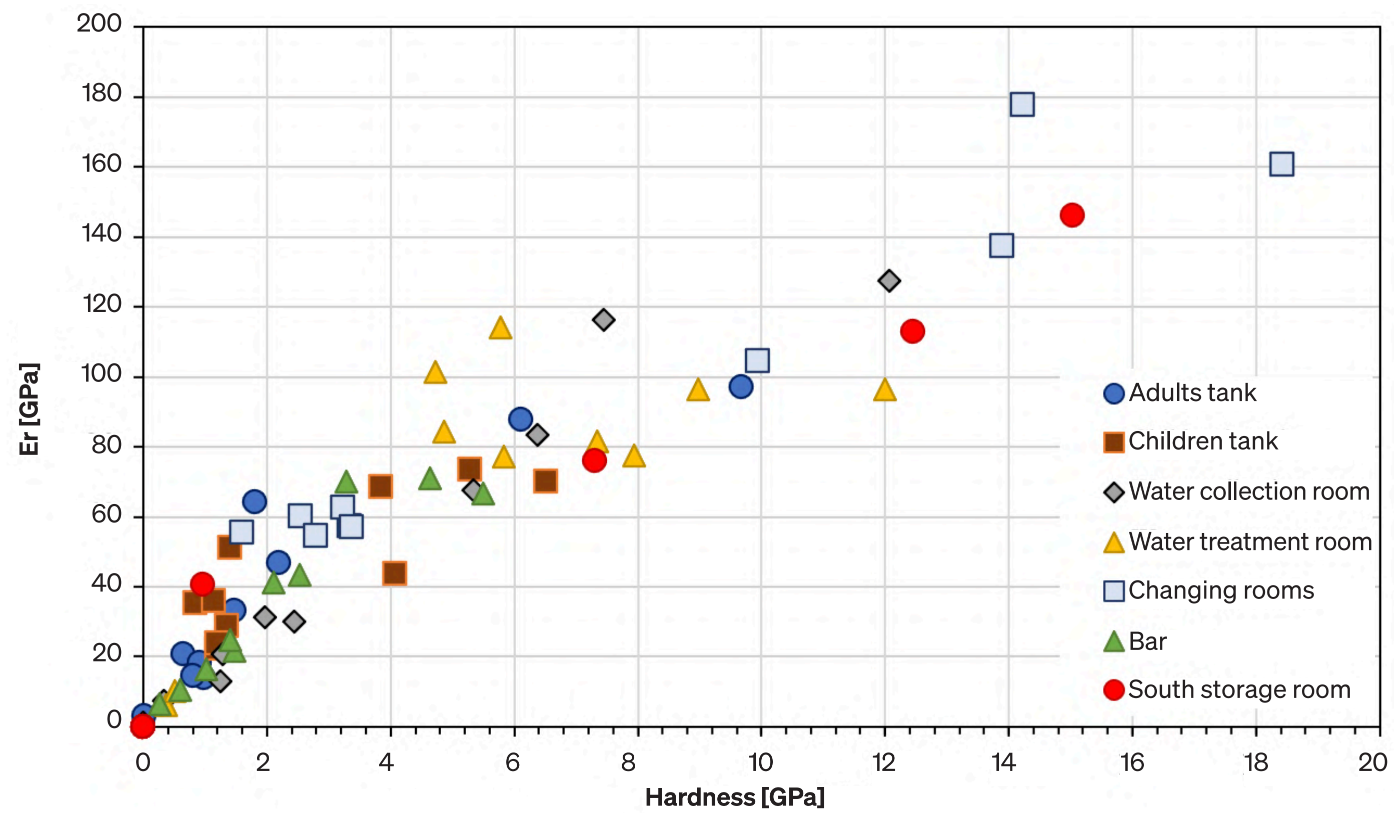
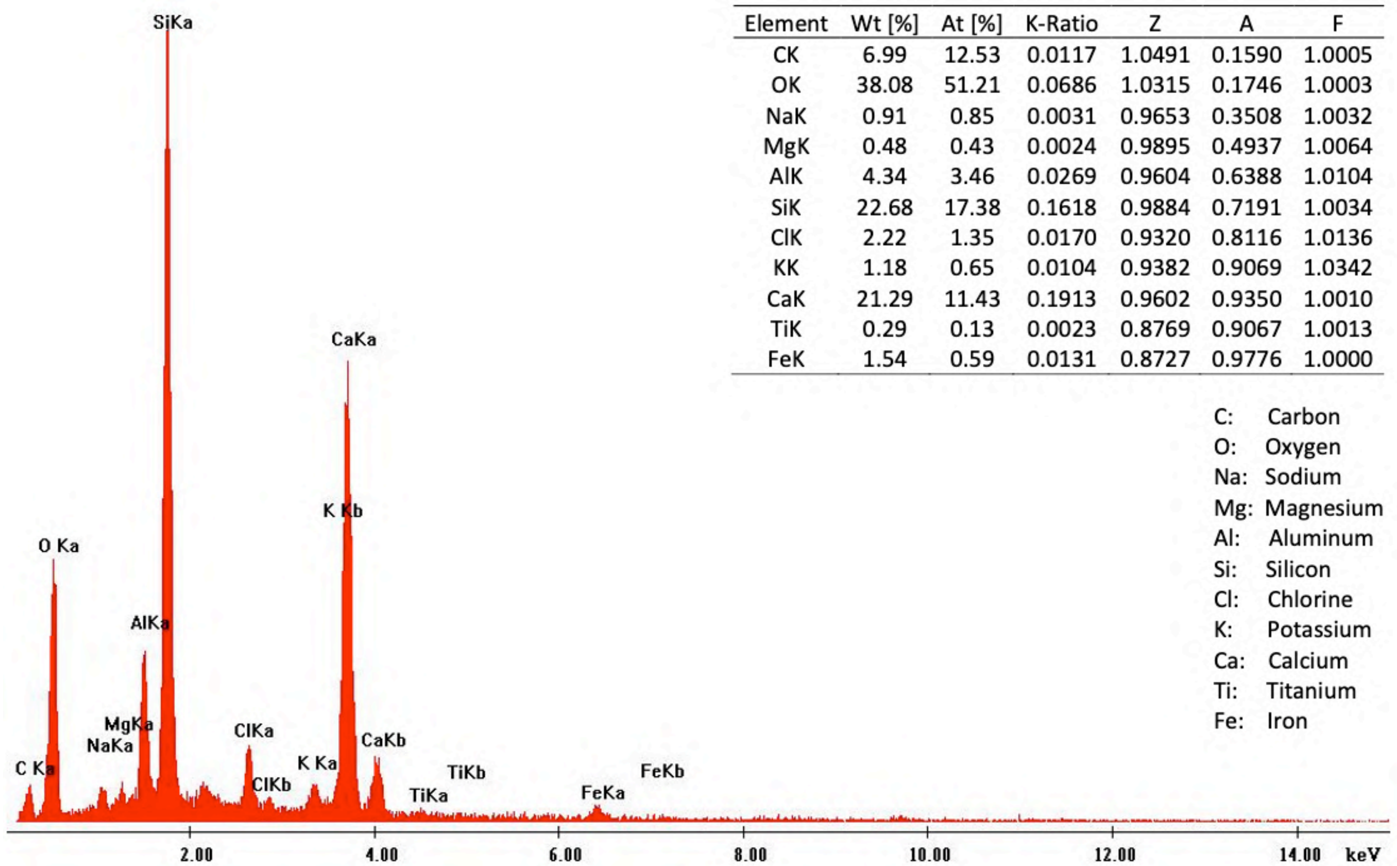


Fig. 85 – Results of the nanoindentation tests for all samples.

Energy Dispersive X-ray Analysis

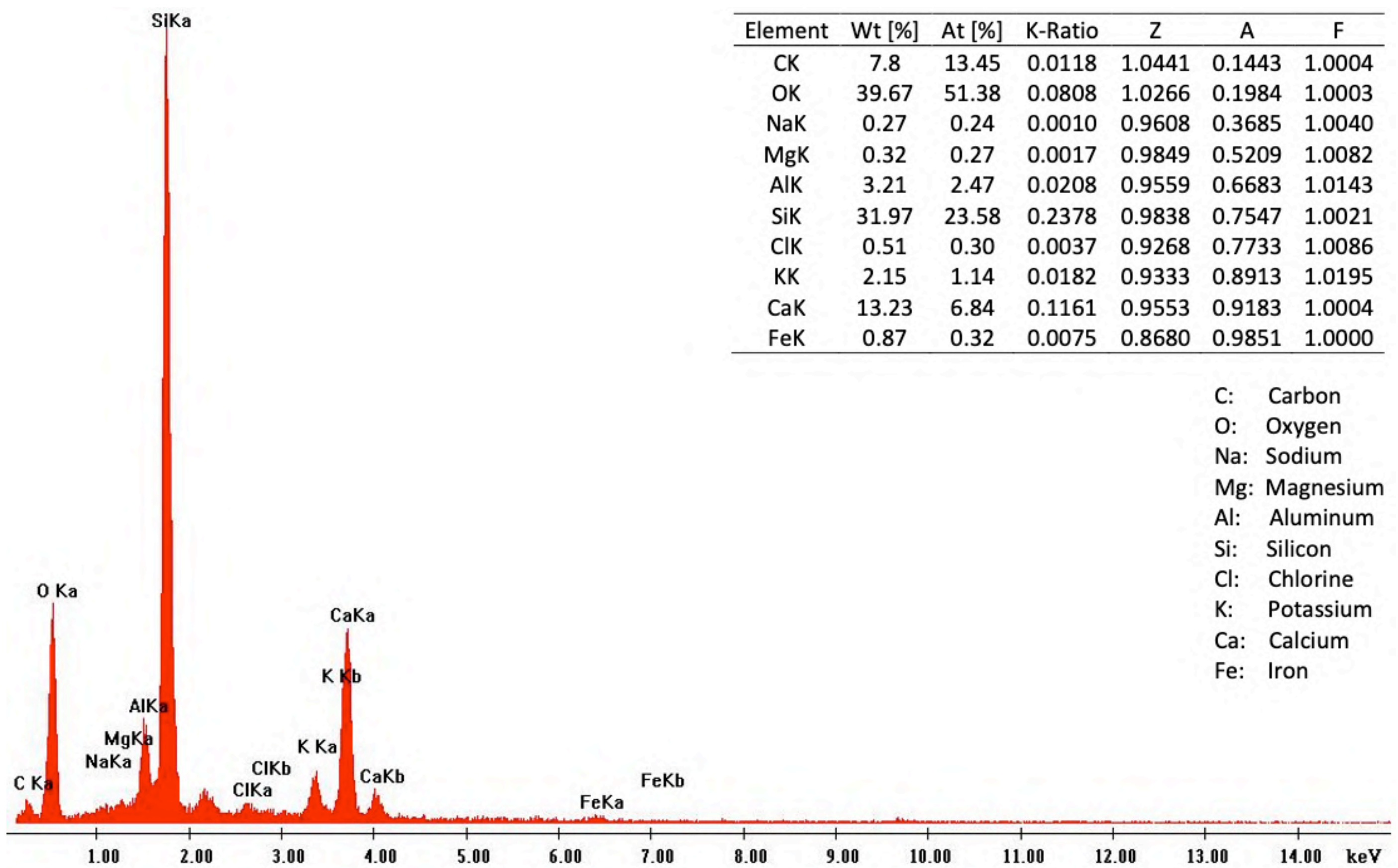
The energy dispersive X-ray analysis (EDS) is a technique that allows to perform the elemental analysis or chemical characterization of surfaces of samples. Several zones of the surfaces of the samples were evaluated. The general results of the EDS (for all the zones of each sample), namely the spectra, shell (k), weight (Wt) and atomic (At) percentages, and K-ratios are presented in Fig. 86 to Fig. 92. The EDS results for each zone are presented in the Annex. The results of these elemental analyses were combined with the results obtained from X-ray diffraction (DRX), for the final chemical characterization and phases identification (see Section 3.3.10.4), and the analysis based on scanning electron microscopy (see Section 3.3.10.5).



Element	Wt [%]	At [%]	K-Ratio	Z	A	F
CK	6.99	12.53	0.0117	1.0491	0.1590	1.0005
OK	38.08	51.21	0.0686	1.0315	0.1746	1.0003
NaK	0.91	0.85	0.0031	0.9653	0.3508	1.0032
MgK	0.48	0.43	0.0024	0.9895	0.4937	1.0064
AlK	4.34	3.46	0.0269	0.9604	0.6388	1.0104
SiK	22.68	17.38	0.1618	0.9884	0.7191	1.0034
ClK	2.22	1.35	0.0170	0.9320	0.8116	1.0136
KK	1.18	0.65	0.0104	0.9382	0.9069	1.0342
CaK	21.29	11.43	0.1913	0.9602	0.9350	1.0010
TiK	0.29	0.13	0.0023	0.8769	0.9067	1.0013
FeK	1.54	0.59	0.0131	0.8727	0.9776	1.0000

C: Carbon
O: Oxygen
Na: Sodium
Mg: Magnesium
Al: Aluminum
Si: Silicon
Cl: Chlorine
K: Potassium
Ca: Calcium
Ti: Titanium
Fe: Iron

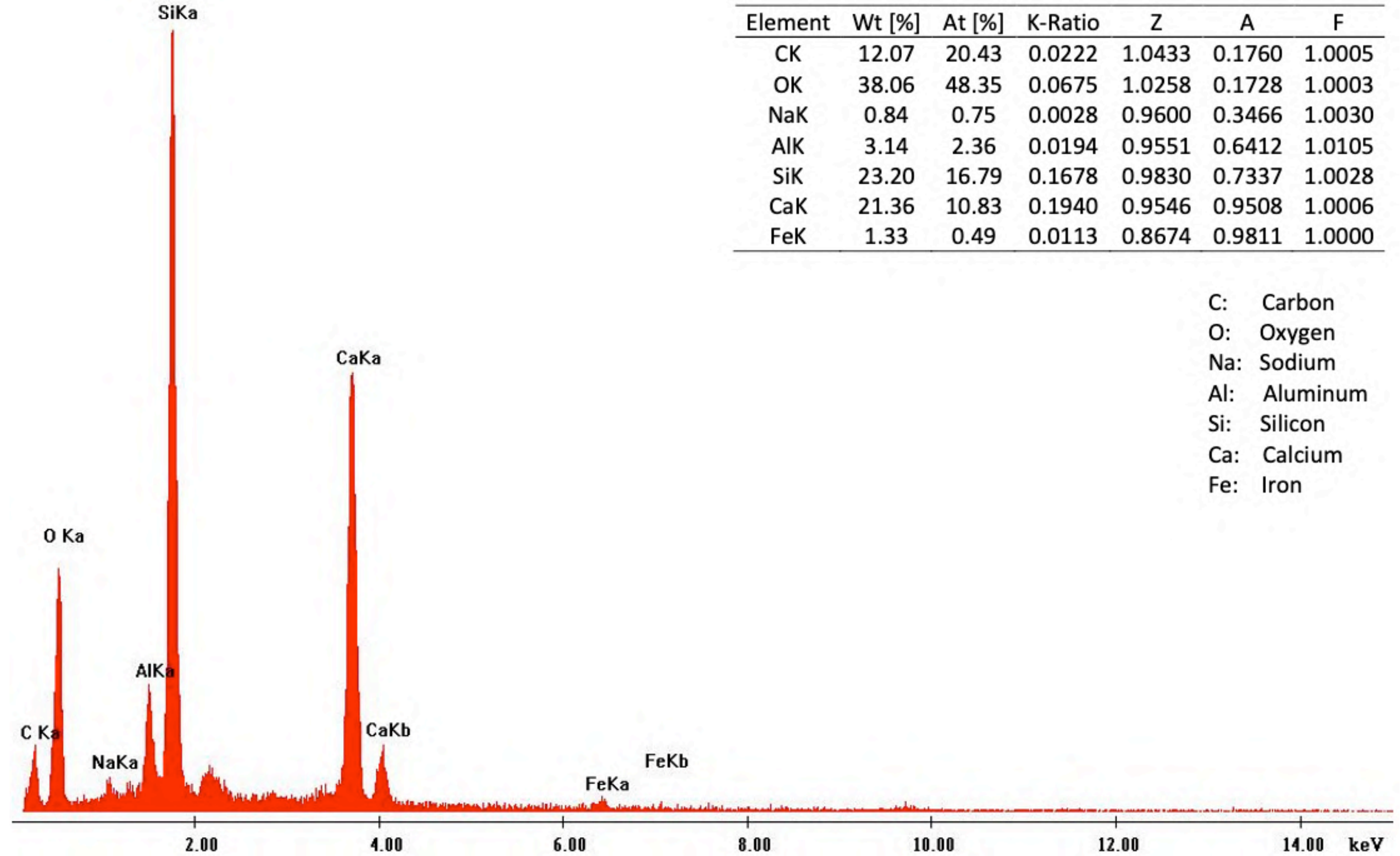
Fig. 86 – Results of the EDS tests for sample T1.1



Element	Wt [%]	At [%]	K-Ratio	Z	A	F
CK	7.8	13.45	0.0118	1.0441	0.1443	1.0004
OK	39.67	51.38	0.0808	1.0266	0.1984	1.0003
NaK	0.27	0.24	0.0010	0.9608	0.3685	1.0040
MgK	0.32	0.27	0.0017	0.9849	0.5209	1.0082
AlK	3.21	2.47	0.0208	0.9559	0.6683	1.0143
SiK	31.97	23.58	0.2378	0.9838	0.7547	1.0021
ClK	0.51	0.30	0.0037	0.9268	0.7733	1.0086
KK	2.15	1.14	0.0182	0.9333	0.8913	1.0195
CaK	13.23	6.84	0.1161	0.9553	0.9183	1.0004
FeK	0.87	0.32	0.0075	0.8680	0.9851	1.0000

C: Carbon
O: Oxygen
Na: Sodium
Mg: Magnesium
Al: Aluminum
Si: Silicon
Cl: Chlorine
K: Potassium
Ca: Calcium
Fe: Iron

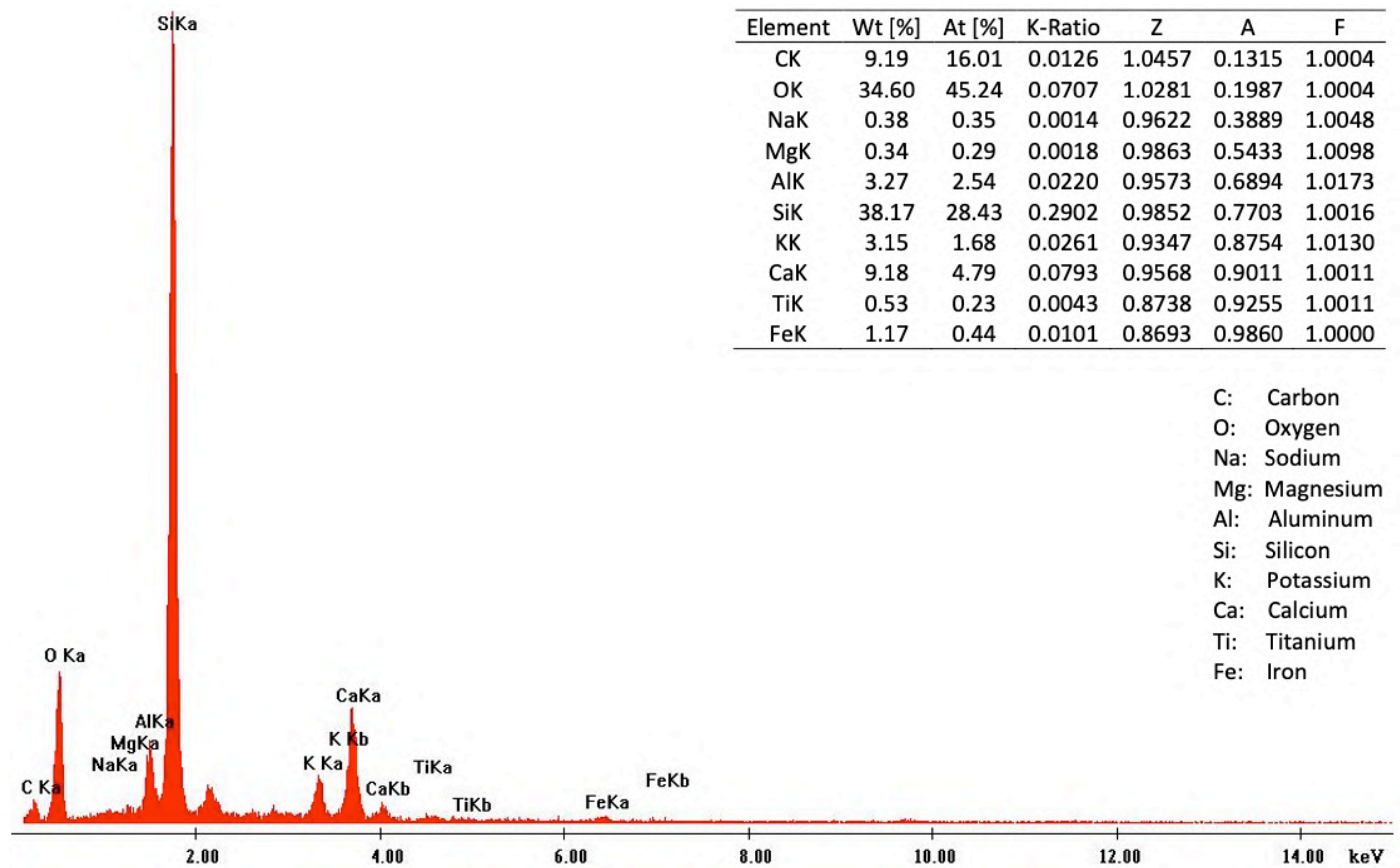
Fig. 87 – Results of the EDS tests for sample T2.1.



Element	Wt [%]	At [%]	K-Ratio	Z	A	F
CK	12.07	20.43	0.0222	1.0433	0.1760	1.0005
OK	38.06	48.35	0.0675	1.0258	0.1728	1.0003
NaK	0.84	0.75	0.0028	0.9600	0.3466	1.0030
AlK	3.14	2.36	0.0194	0.9551	0.6412	1.0105
SiK	23.20	16.79	0.1678	0.9830	0.7337	1.0028
CaK	21.36	10.83	0.1940	0.9546	0.9508	1.0006
FeK	1.33	0.49	0.0113	0.8674	0.9811	1.0000

C: Carbon
O: Oxygen
Na: Sodium
Al: Aluminum
Si: Silicon
Ca: Calcium
Fe: Iron

Fig. 88 – Results of the EDS tests for sample I1



Element	Wt [%]	At [%]	K-Ratio	Z	A	F
CK	9.19	16.01	0.0126	1.0457	0.1315	1.0004
OK	34.60	45.24	0.0707	1.0281	0.1987	1.0004
NaK	0.38	0.35	0.0014	0.9622	0.3889	1.0048
MgK	0.34	0.29	0.0018	0.9863	0.5433	1.0098
AlK	3.27	2.54	0.0220	0.9573	0.6894	1.0173
SiK	38.17	28.43	0.2902	0.9852	0.7703	1.0016
KK	3.15	1.68	0.0261	0.9347	0.8754	1.0130
CaK	9.18	4.79	0.0793	0.9568	0.9011	1.0011
TiK	0.53	0.23	0.0043	0.8738	0.9255	1.0011
FeK	1.17	0.44	0.0101	0.8693	0.9860	1.0000

C: Carbon
O: Oxygen
Na: Sodium
Mg: Magnesium
Al: Aluminum
Si: Silicon
K: Potassium
Ca: Calcium
Ti: Titanium
Fe: Iron

Fig. 88 – Results of the EDS tests for sample I1

Element	Wt [%]	At [%]	K-Ratio	Z	A	F
OK	40.38	57.67	0.0734	1.0339	0.1759	1.0003
MgK	0.69	0.65	0.0034	0.9918	0.4876	1.0075
AlK	3.68	3.11	0.0226	0.9626	0.6311	1.0128
SiK	29.10	23.68	0.2079	0.9906	0.7190	1.0031
ClK	1.18	0.76	0.0087	0.9346	0.7727	1.0132
KK	2.75	1.60	0.0236	0.9406	0.8881	1.0305
CaK	21.29	12.14	0.1872	0.9627	0.9128	1.0004
FeK	0.93	0.38	0.0080	0.8751	0.9728	1.0000

O: Oxygen
Mg: Magnesium
Al: Aluminum
Si: Silicon
Cl: Chlorine
K: Potassium
Ca: Calcium
Fe: Iron

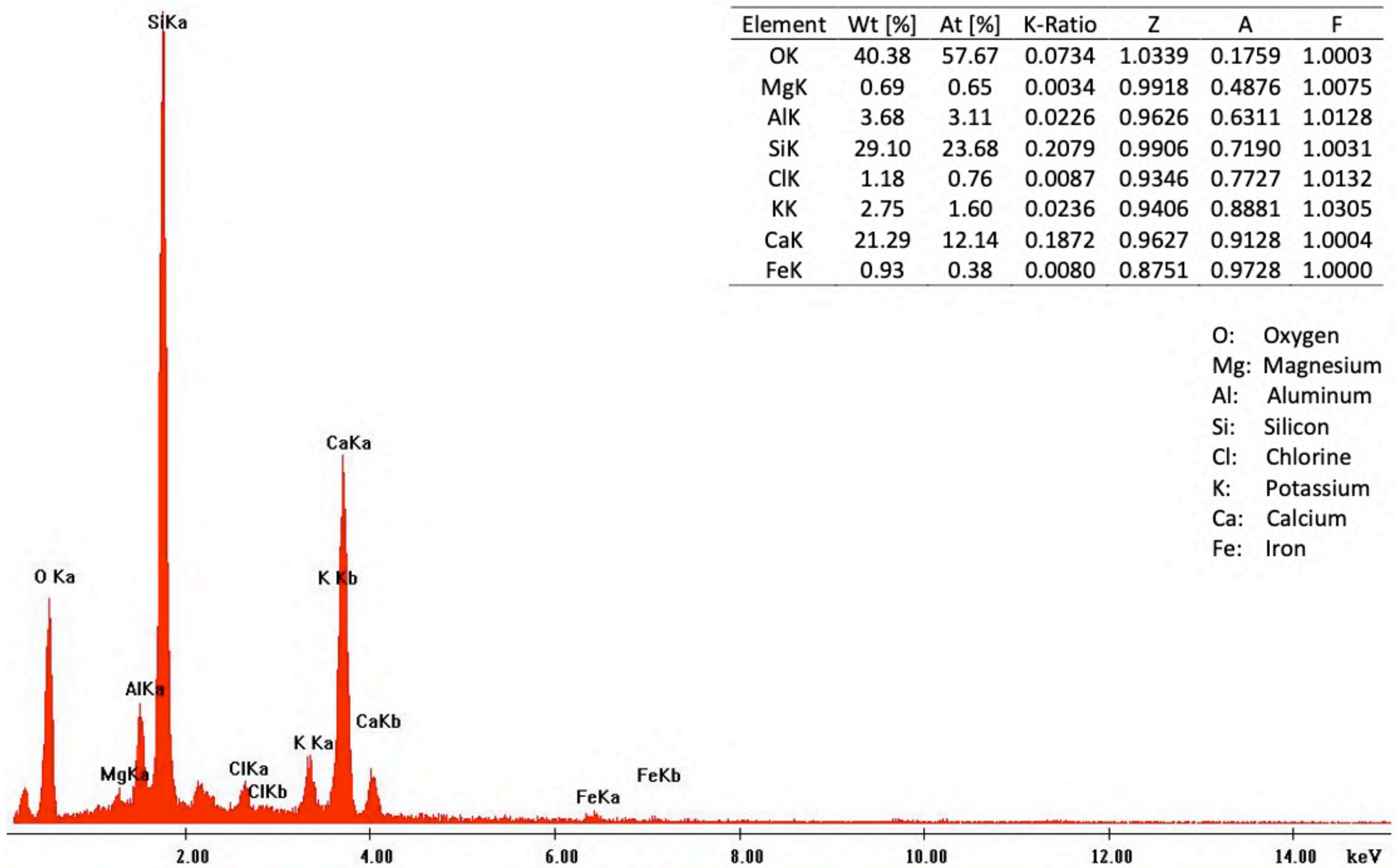


Fig. 90 – Results of the EDS tests for sample PV

Element	Wt [%]	At [%]	K-Ratio	Z	A	F
CK	14.37	23.94	0.0245	1.0449	0.1634	1.0004
OK	35.62	44.57	0.0631	1.0274	0.1724	1.0003
NaK	4.00	3.48	0.0138	0.9615	0.3583	1.0027
MgK	0.87	0.71	0.0041	0.9856	0.4750	1.0052
AlK	2.33	1.73	0.0139	0.9567	0.6165	1.0090
SiK	18.85	13.44	0.1344	0.9846	0.7214	1.0035
ClK	4.02	2.27	0.0314	0.9274	0.8304	1.0119
KK	1.79	0.92	0.0156	0.9339	0.9099	1.0277
CaK	17.23	8.60	0.1539	0.9560	0.9343	1.0004
FeK	0.92	0.33	0.0079	0.8686	0.9829	1.0000

C: Carbon
O: Oxygen
Na: Sodium
Mg: Magnesium
Al: Aluminum
Si: Silicon
Cl: Chlorine
K: Potassium
Ca: Calcium
Fe: Iron

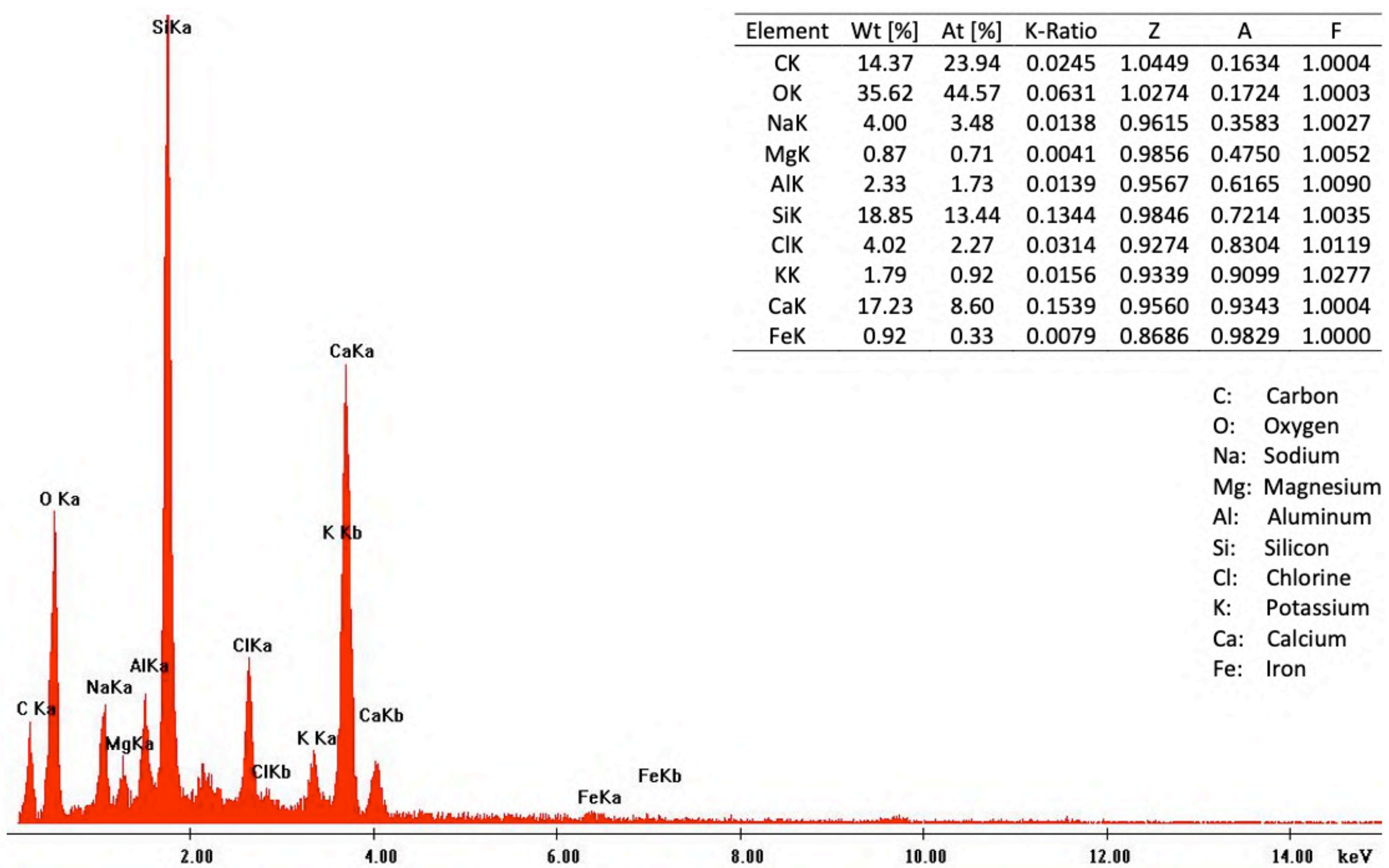


Fig. 91 – Results of the EDS tests for sample B1

Element	Wt [%]	At [%]	K-Ratio	Z	A	F
CK	13.01	21.35	0.0221	1.0408	0.1629	1.0005
OK	39.39	48.52	0.0781	1.0233	0.1937	1.0003
NaK	1.60	1.37	0.0055	0.9577	0.3591	1.0033
MgK	0.30	0.24	0.0015	0.9818	0.4975	1.0067
AlK	2.26	1.65	0.0141	0.9530	0.6459	1.0119
SiK	27.01	18.95	0.1983	0.9808	0.7472	1.0020
KK	1.08	0.54	0.0093	0.9301	0.9084	1.0229
CaK	14.01	6.89	0.1250	0.9521	0.9371	1.0006
FeK	1.34	0.47	0.0114	0.8649	0.9882	1.0000

C: Carbon
O: Oxygen
Na: Sodium
Mg: Magnesium
Al: Aluminum
Si: Silicon
K: Potassium
Ca: Calcium
Fe: Iron

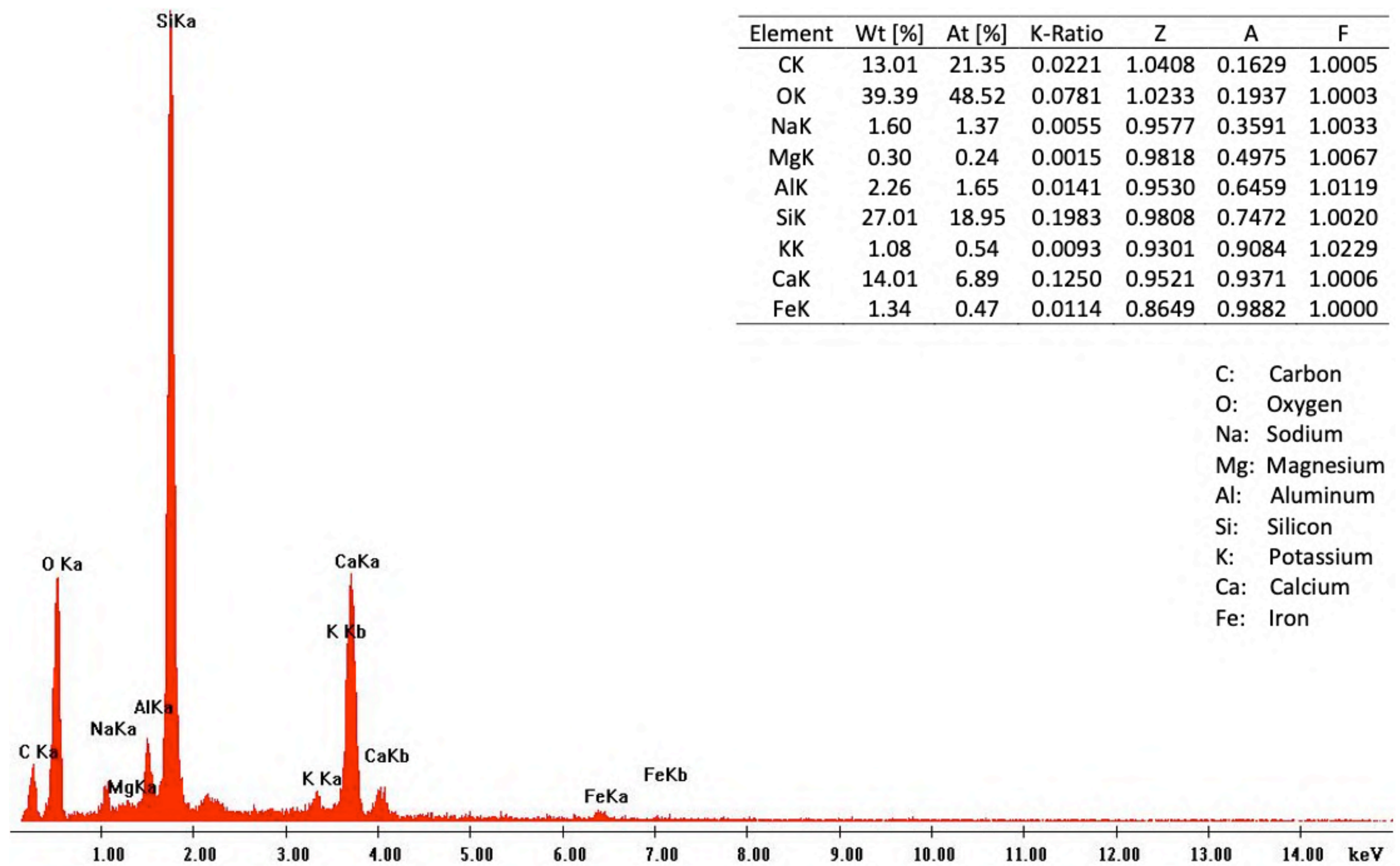


Fig. 92 – Results of the EDS tests for sample A

X-Ray Diffraction

The X-ray diffraction (DRX) was performed aiming at identifying the crystalline structure of the samples, using a D8 DISCOVER X-ray analyzer of the Bruker, with Cu-Kα (λ=1,54060Å) radiation. The analyses were carried out in the $\theta/2\theta$ configuration, at ambient temperature, using a sweep between 5° and 80°, with steps of 0.02°, and integration time of 1 second per step. The crystal structure analysis was done using the EVA software. The identification of the phases was carried out by comparison with the respective experimental pattern from the ICDD (International Center for Diffraction Data) database, using a search matching algorithm. Furthermore, and as previously referred, the DRX results were evaluated together with the EDS results.

The analysis of the sample T1.1 (Fig. 93) allows to determine, with a high degree of certainty, the following phases: hexagonal silicon oxide (quartz), monoclinic muscovite-2M1 and triclinic albite. Furthermore, from the results of the chemical analysis, it was still possible to determine, with less certainty, the presence of the phases of monoclinic gismondine, hexagonal vaterite, triclinic anorthoclase, albite, and triclinic calcian.

Fig. 94 presents the diffractogram of the sample T2.1, in which it is observed, with a high degree of certainty, the presence of the following phases: hexagonal silicon oxide (quartz), muscovite-2M1 monoclinic and microcline triclinic. Furthermore, from the results of the EDS, it was still possible to determine, with less certainty, the presence of the phases of monoclinic rankinite, hexagonal vaterite, monoclinic dickite-2M1, triclinic anorthite, aluminium silicate, tetragonal calcium, oxide of iron and orthorhombic potassium.

The sample I1 presents (Fig. 95), with a high degree of certainty, the following phases: hexagonal silicon oxide (quartz) and hexagonal portlandite and hexagonal vaterite. From the results of the chemical analysis, it was still possible to determine, with less certainty, the presence of the phases of monoclinic beidellite, rhombohedral calcite/hexagonal, monoclinic sodium silicate and calcium and aluminium oxide carbonate hydrate.

The DRX diffractogram of the sample Q shows (Fig. 96), with a high degree of certainty, the following phases: hexagonal silicon oxide (quartz) and hexagonal portlandite. Furthermore, from the results of the chemical analysis, it was still possible to determine, with less certainty, the presence of the phases of triclinic pectolite, monoclinic phlogopite, cubic leucite, monoclinic glauconite, triclinic albite, potassium and titanium oxide hydrate and calcium and aluminium silicate.

The sample PV (Fig. 97) presents, with a high degree of certainty, the following phases: hexagonal silicon oxide (quartz), monoclinic muscovite-2M1 and monoclinic clinochlore. Furthermore, from the results of the chemical analysis, it was still possible to determine, with less certainty, the presence of monoclinic potassium and iron silicate, hexagonal chlorite, triclinic calcium and aluminium silicate and orthorhombic anthophyllite.

The results of sample B1 (Fig. 98) shows, with a high degree of certainty, the following phases: hexagonal silicon oxide (quartz) and monoclinic sanidine. Furthermore, from the results of the chemical analysis, it was still possible to determine, with less certainty, the presence of the phases of monoclinic clintonite-1M, hexagonal nepheline, monoclinic calcium silicate, tetragonal calcium hydride chloride and rhombohedral calcite/ hexagonal.

The DRX diffractogram of sample A (Fig. 99) presents, with a high degree of certainty, the following phases: hexagonal silicon oxide (quartz) and monoclinic illite-2M2. Furthermore, from the results of the chemical analysis, it was still possible to determine, with less certainty, the presence of the phases of triclinic orthoclase, hexagonal calcium carbonate (vaterite), triclinic albite, monoclinic calcium silicate and rhombohedral calcium carbonate /hexagonal.

Finally, it is noted that the DRX results of the samples T1.1, T2.1, I1 and A present vaterite, which is a polymorph of calcium carbonate ($CaCO_3$).

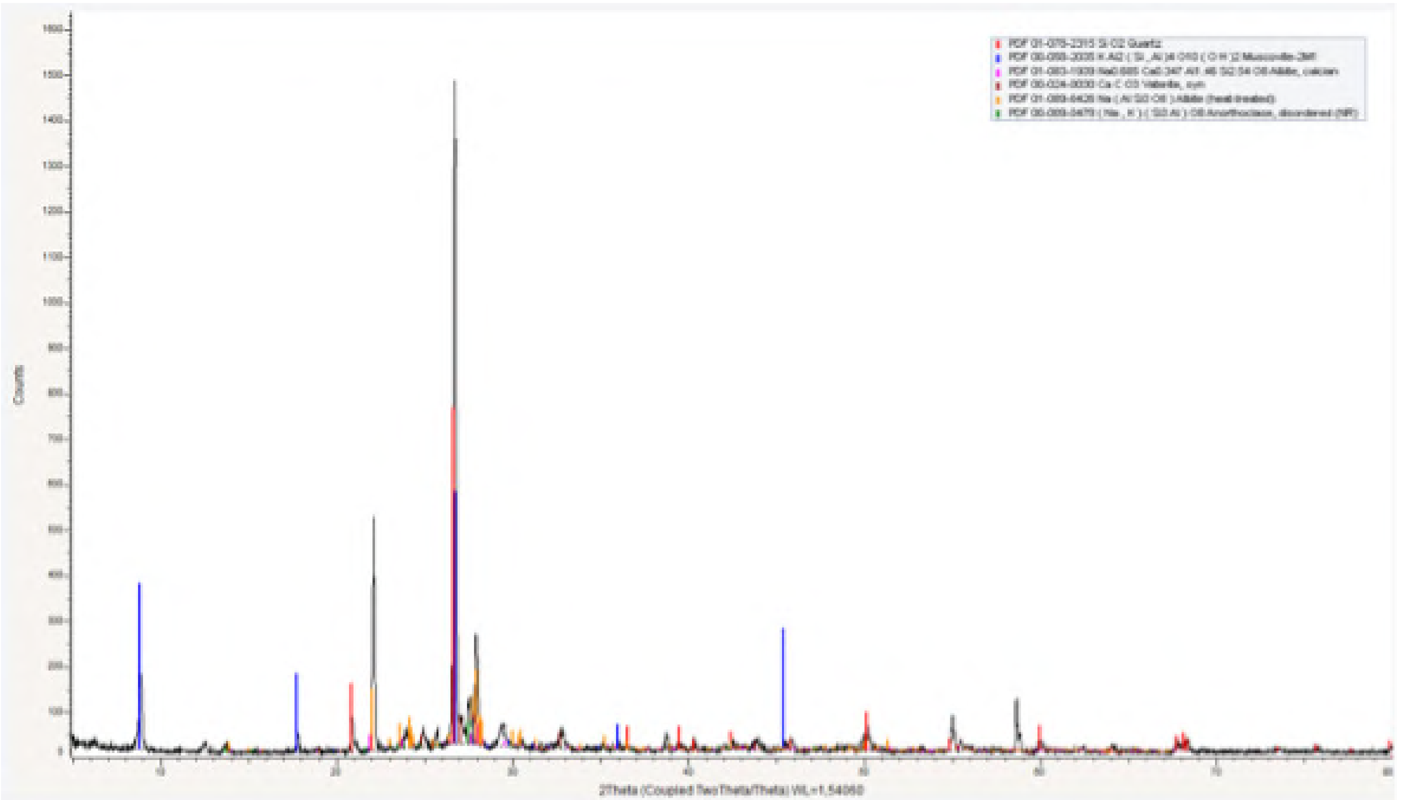


Fig. 93 – DRX diffractogram of the sample T1.1.

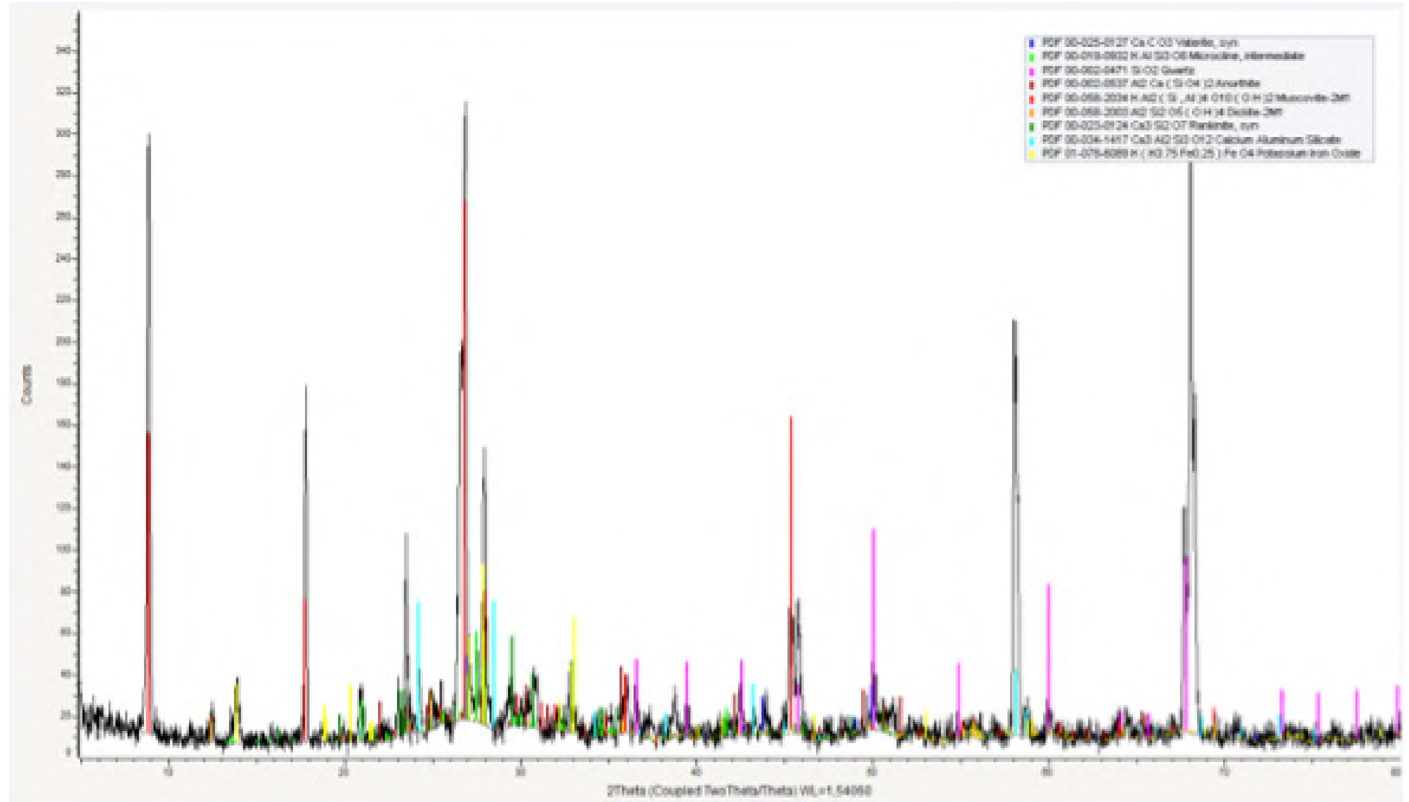


Fig. 94 – DRX diffractogram of the sample T2.1.

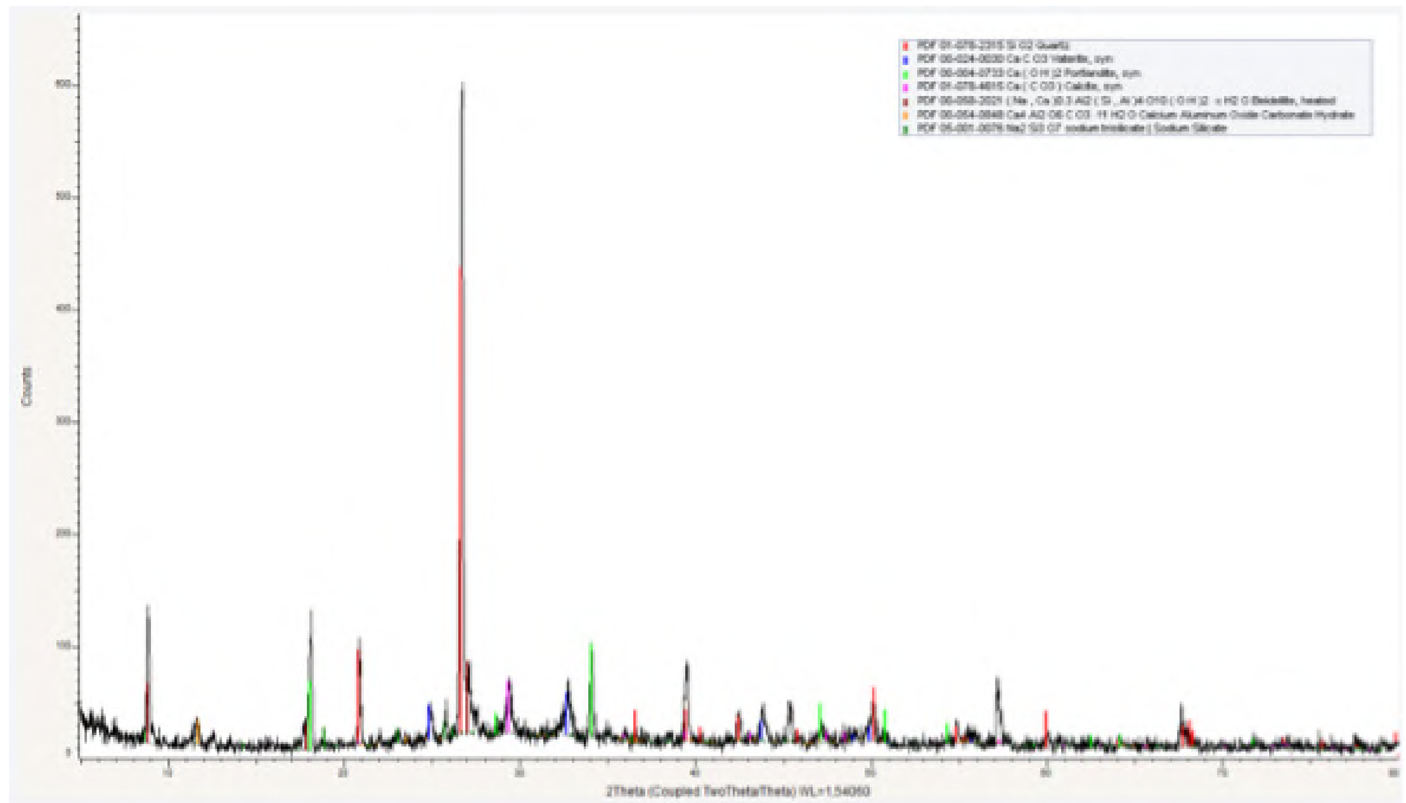


Fig. 95 – DRX diffractogram of the sample I1.

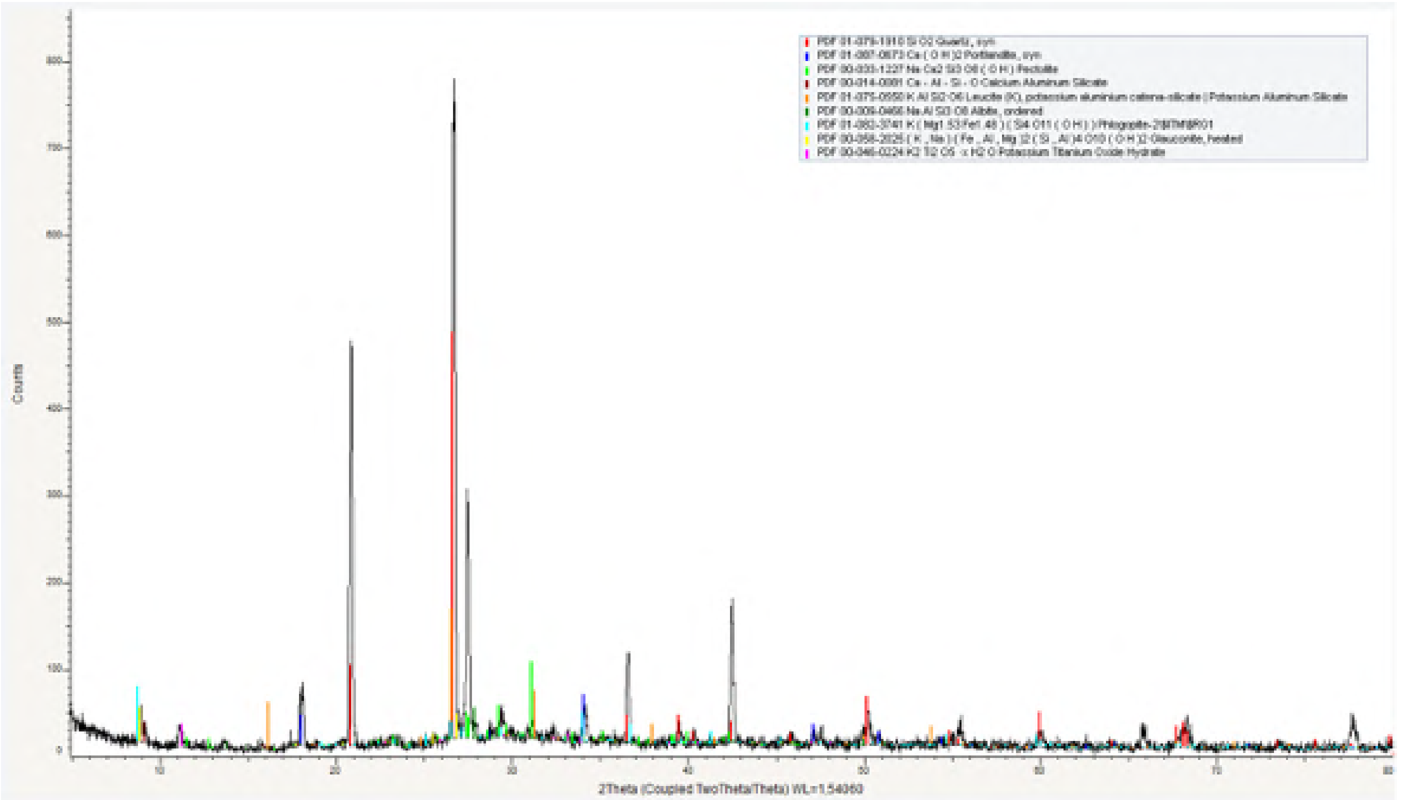


Fig. 96 – DRX diffractogram of the sample Q.

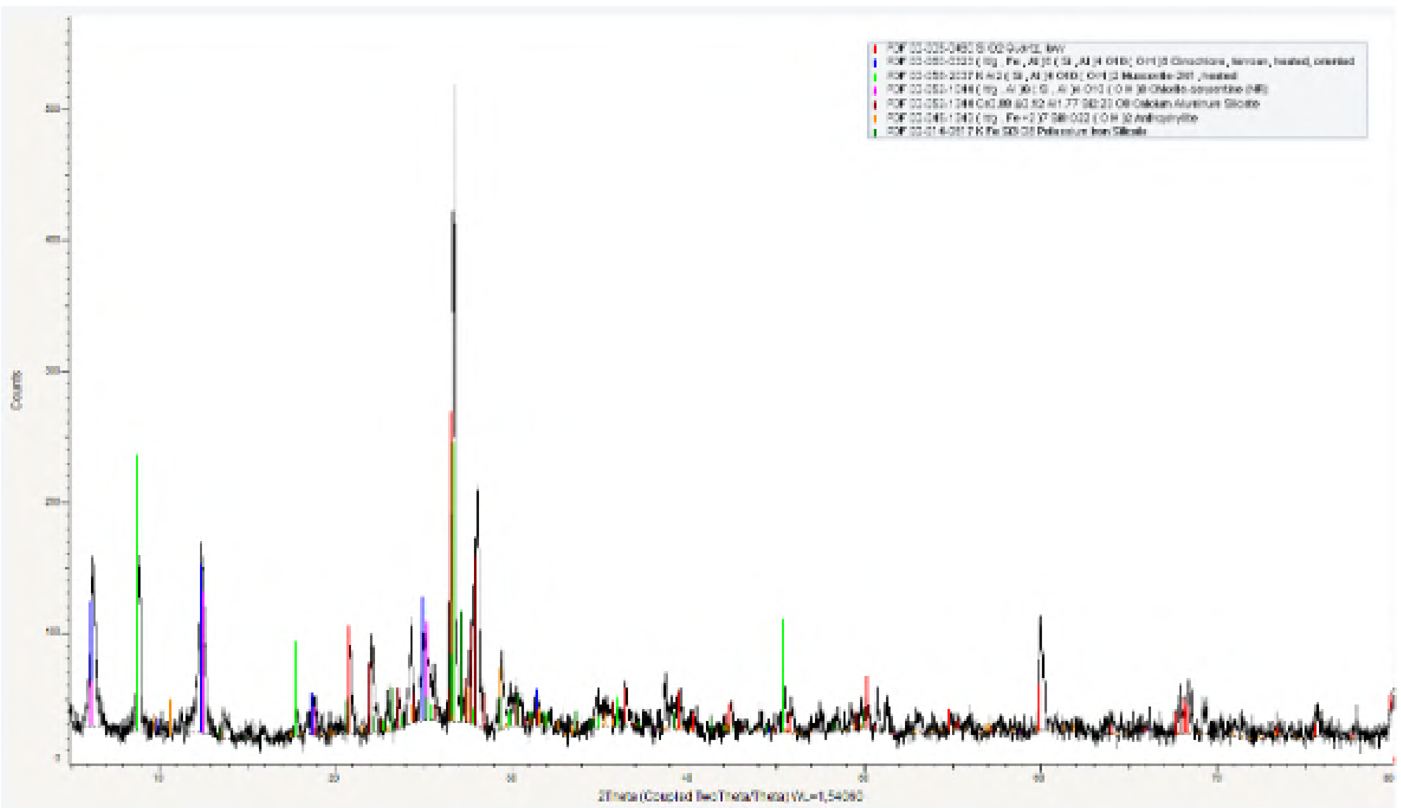


Fig. 97 – DRX diffractogram of the sample PV.

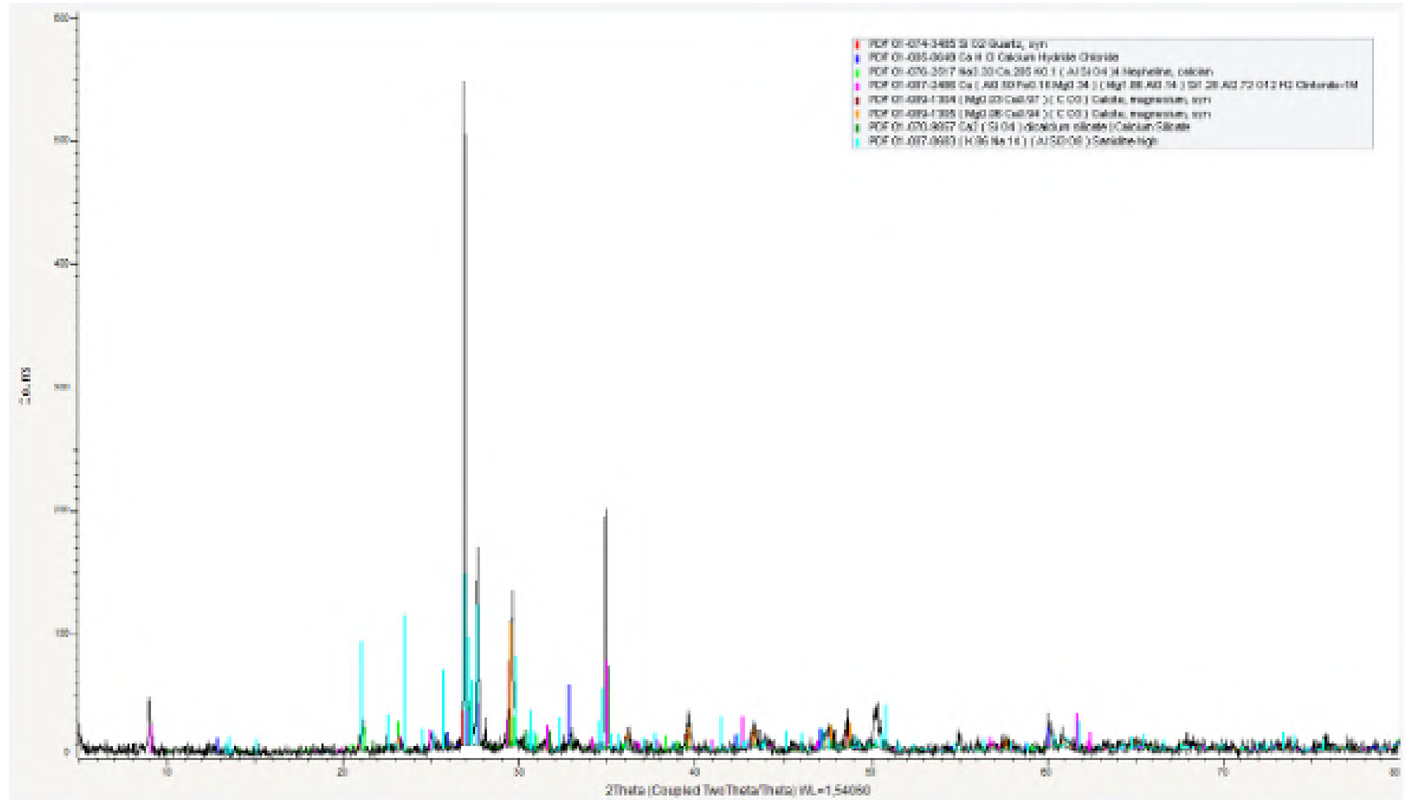


Fig. 98 – DRX diffractogram of the sample B1.

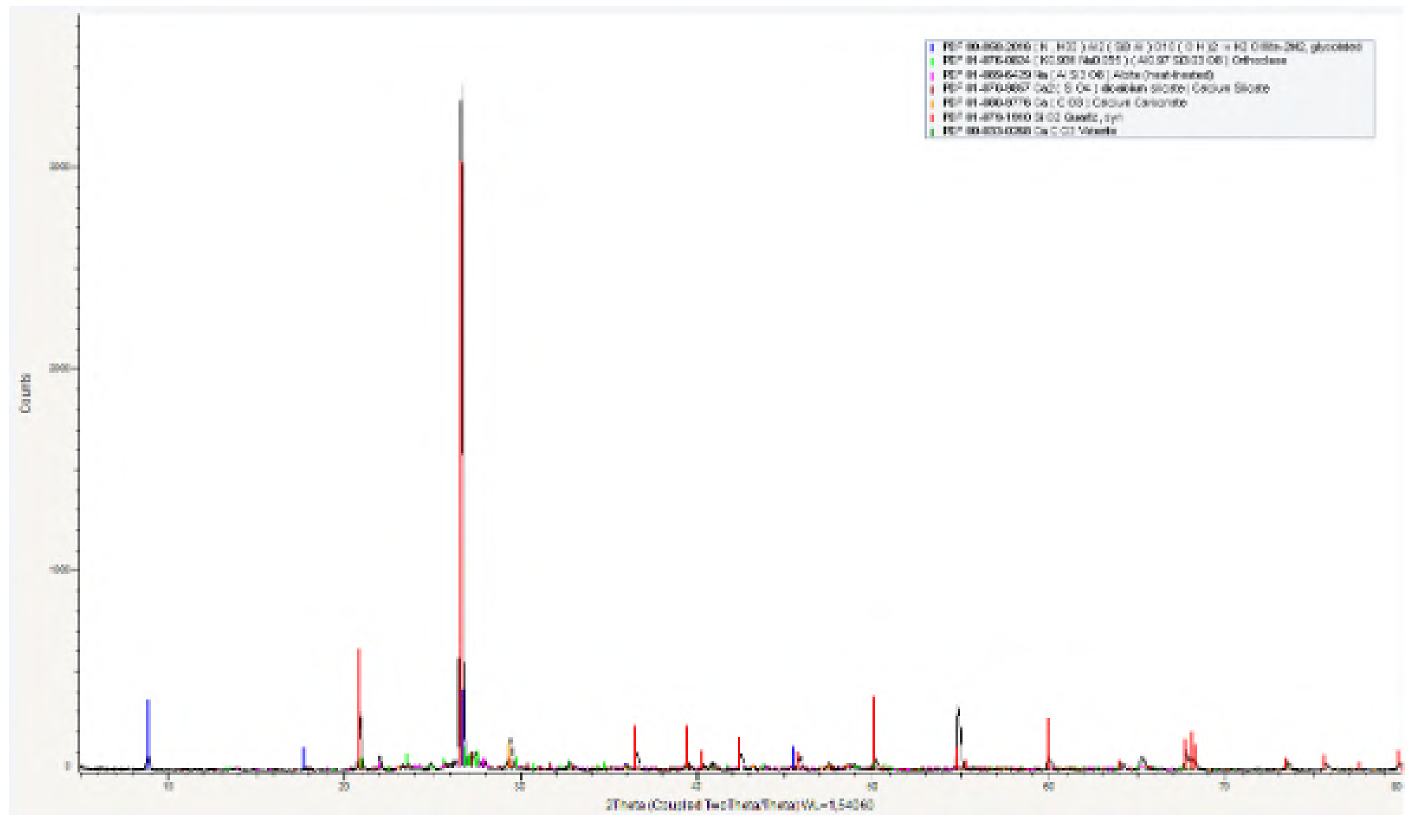


Fig. 99 – DRX diffractogram of the sample A.

Scanning Electron Microscopy

The scanning electron microscopy (SEM) allows to create images of samples by scanning their surfaces with a low-energy beam of electrons, achieving high resolutions (in the low nanometer range). The high-resolution images provide information on the surface morphology and composition of the samples. In the first analysis, images with magnification of 200x and 500x were created for all samples (Fig. 100 to Fig. 102). Additionally, images with a magnification of 1000x, 5000x, 10000x and 25000x were also obtained for the T1.1, T2.1, I1 samples (Fig. 103). All images are presented in the Annex (SEM and EDS).

The SEM analysis allowed to identify different zones of the samples, namely zones associated with aggregates, matrix and interfacial transition zones. The results show the presence of chloride (Cl and Na) in the samples T2.1 (Fig. 100b, Z2) and B1 (Fig. 101c, Z1), which is in agreement with the results of the EDS (Section 3.3.10.5) and the chloride content tests (Section 3.3.3). The samples present several impurities in the aggregates, which can be an indicator of lack of quality control in the aggregates (e.g. absence or deficient washing and/or uncontrolled origin of the aggregates). Finally, the results of this analysis do not allow to conclude on the presence of pozzolans in the composition of the concretes, which has been a common practice for many years to improve the durability of the concrete.

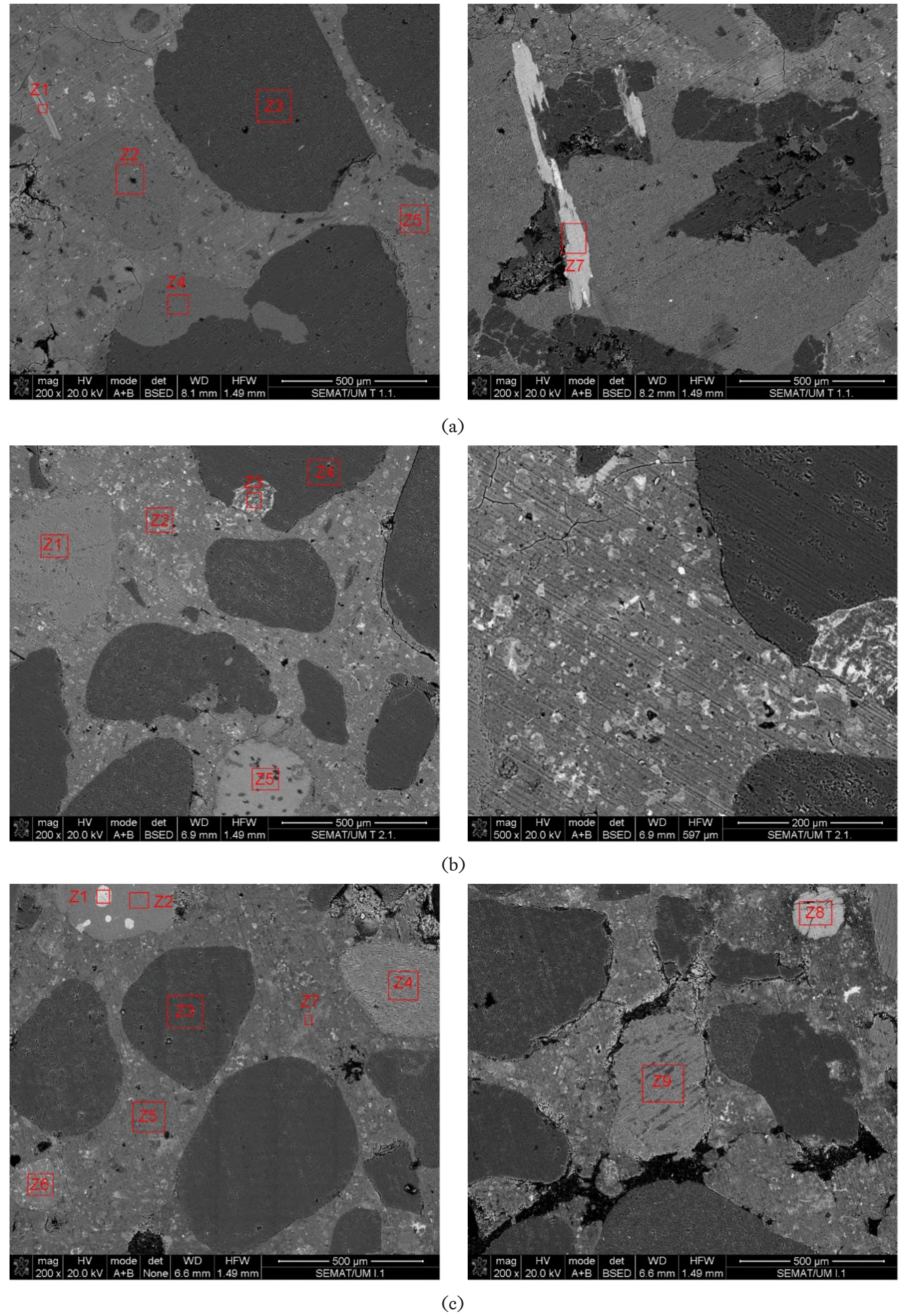
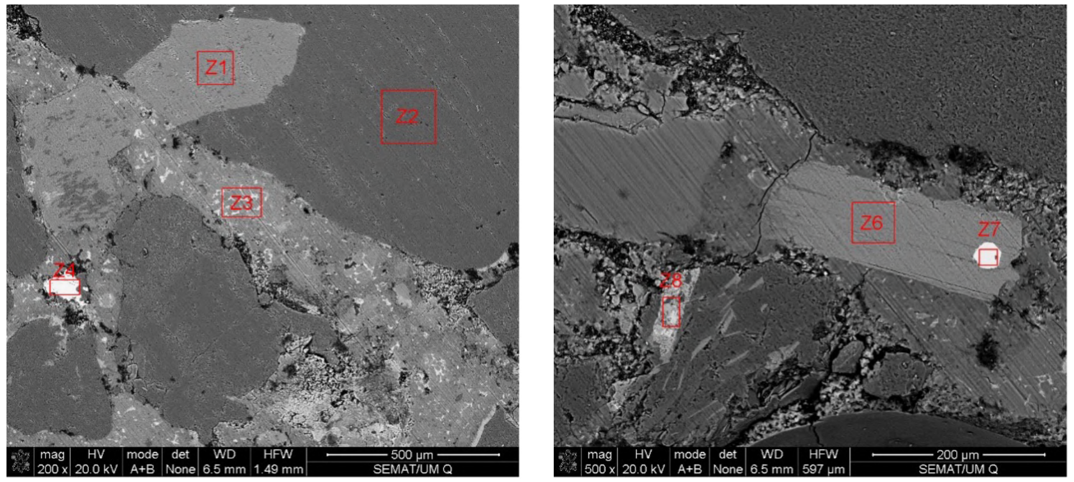
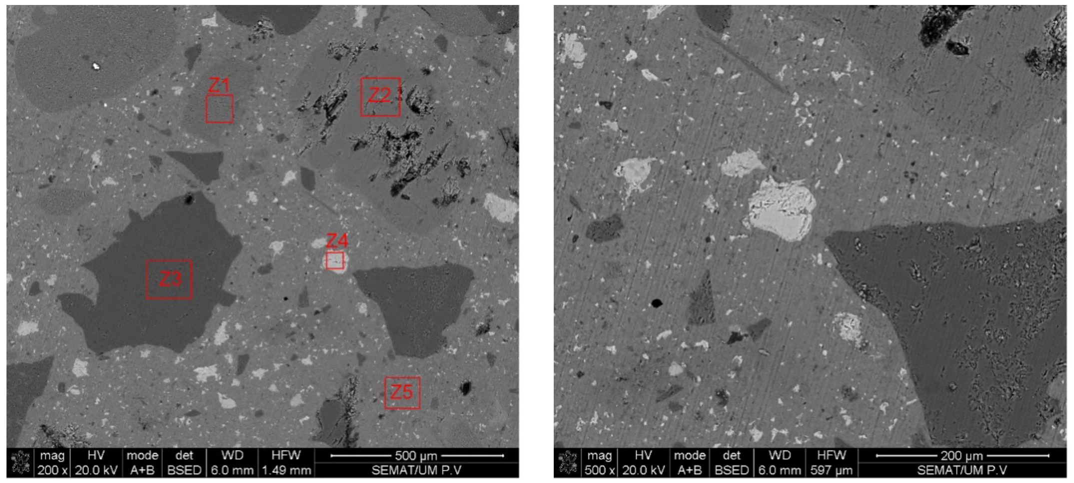


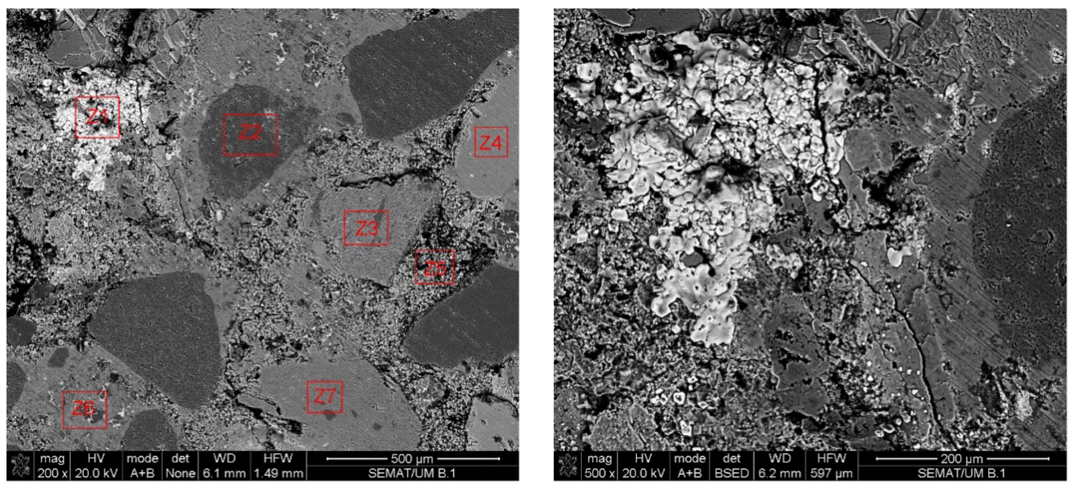
Fig. 100 – Examples of images obtained from SEM analysis (magnification: 200x and 500x): (a) T1.1 sample; (b) T2.1 sample; (c) I1 sample.



(a)



(b)



(c)

Fig. 101 – Examples of images obtained from SEM analysis (magnification: 200x and 500x): (a) Q sample; (b) PV sample; (c) B1 sample.

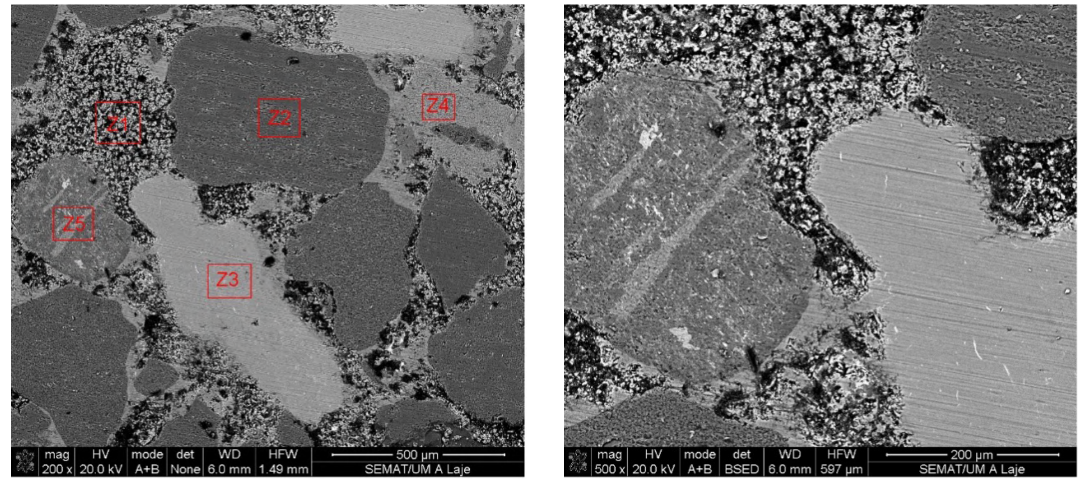
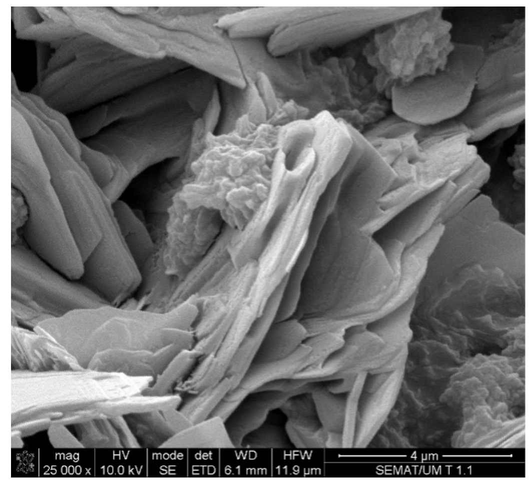
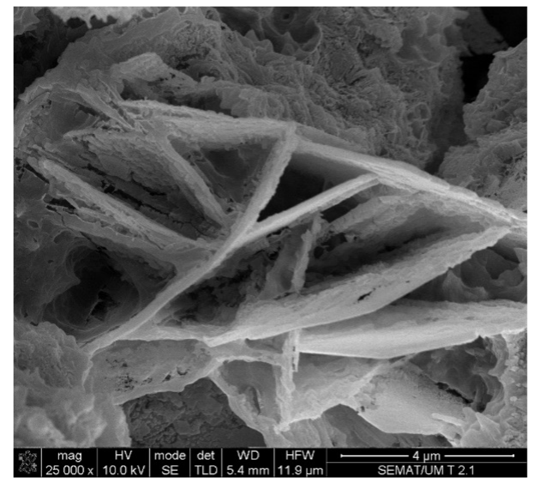


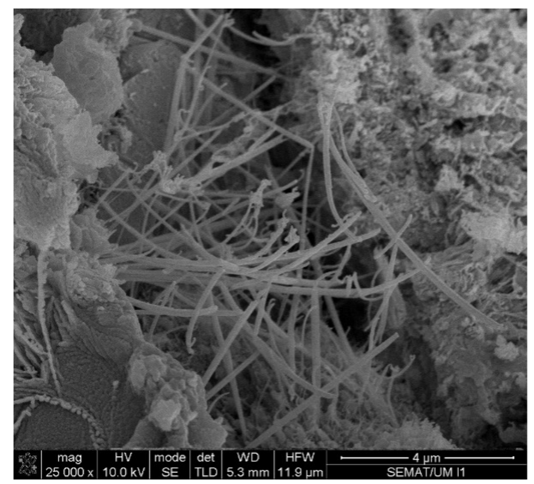
Fig. 102 – Examples of images obtained from SEM analysis (magnification: 200x and 500x) of the A sample.



(a)



(b)



(c)

Fig. 103 – Examples of images obtained from SEM analysis (magnification: 25000x): (a) T1.1 sample; (b) T2.1 sample; (c) I1 sample.

Mercury Intrusion Porosimetry Tests

The mercury intrusion porosimetry (MIP) tests were performed to evaluate the pore size distribution of the cement paste samples. Several parameters on the pore structure were obtained (see Annex). The critical pore diameter (dc) is one of the most relevant parameters obtained from the MIP tests, which corresponds to the steepest slope of the cumulative porosity curve and can be determined from the highest point of the logarithmic differential intrusion curve.

The logarithmic differential intrusion curve (Fig. 104) shows that the lowest dc is equal to 0.026 µm and is associated with the sample T1.1 (adult's tank, phase 1). The dc of the samples of phase 2.2 ranges from 0.032 µm (T2.1) to 0.077 µm (Q). It is noted that the sample I1 (phase 2.1) presents also three relevant peaks for the 10.5114 µm, 6.5834 µm and 5.714 µm pore size diameter. The sample PV (phase 2.4) presents a dc of 0.2840 µm associated with the lowest porosity (6.73%), which is in agreement with the results of the water penetration tests (Section 3.3.4). Sample B1 (phase 3) presents two relevant ranges of pore size diameter, namely 0.0263-0.0055 µm and 1.3312-0.4341 µm. Finally, sample A (phase 3) presents the highest dc, namely 3.8968 µm (sample collected from a slab with carbonated concrete and corroded rebars).

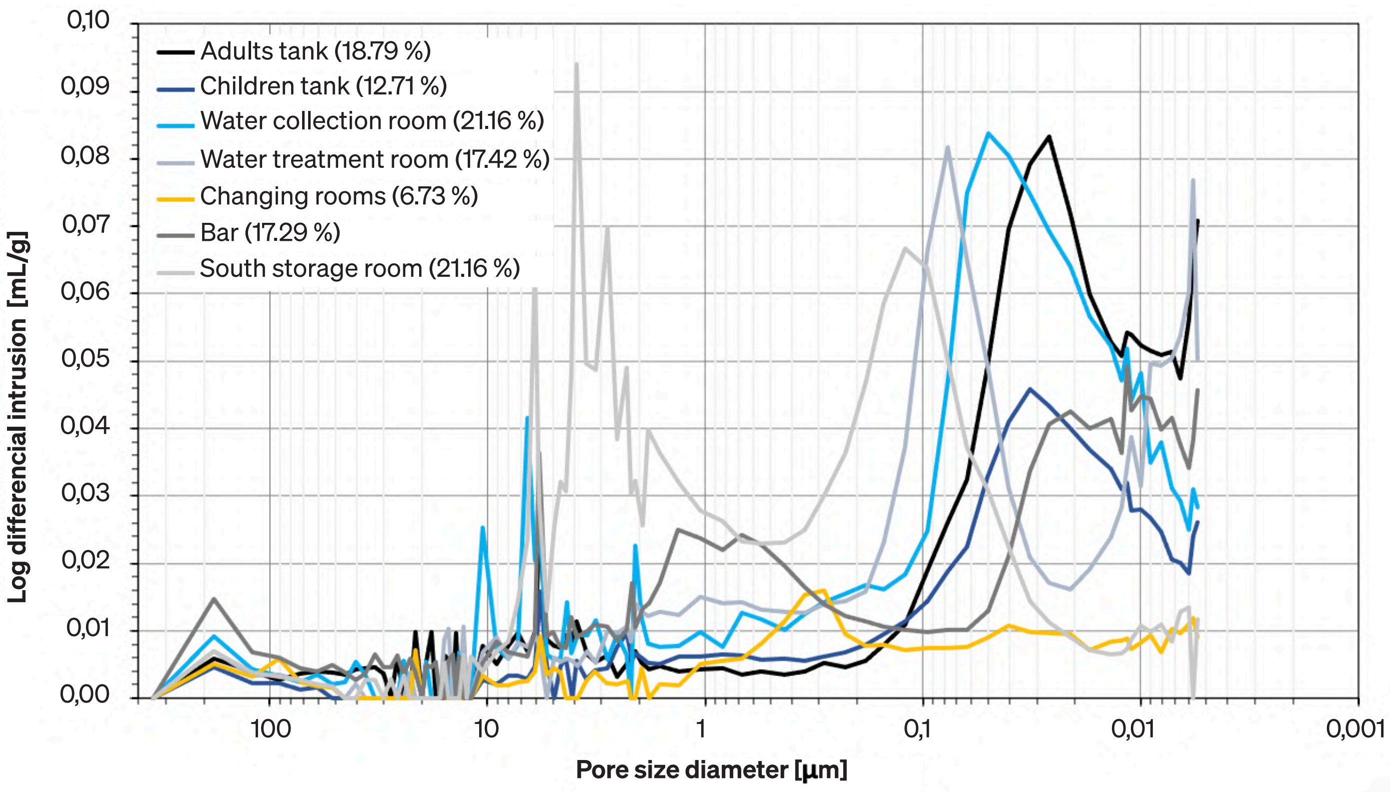


Fig. 104 – MIP results: Logarithmic differential intrusion vs. pore size diameter.

1.4 Conclusions

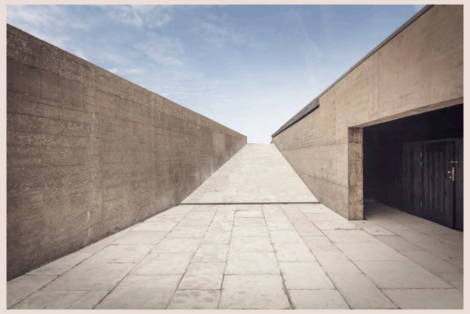
The inspection and diagnosis of the building involved the following works: (1) damage survey; (2) evaluation of the out-of-plane deformations of walls; (3) concrete carbonation testing; (4) laboratory tests to determine the mechanical properties of the concrete and steel rebars; (5) chloride content testing; (6) water penetration testing; (7) concrete testing with Schmidt hammer; (8) sonic testing; (9) color analysis based on spectrophotometry; (10) Ground Penetrating Radar (GPR) testing; (11) laboratory tests on a timber specimen; (12) laboratory tests on cement past samples.

These works allowed to conclude that the building presents moderate damage, namely several discrete cracks at the concrete walls, distributed cracking in some walls and corrosion of the steel rebars with detachment of the concrete. The most severe steel corrosion was located at the bottom surface o the slab of the South´s storage room. The tanks (Phases 1 and 2.1) are made of cyclopean concrete with large stone aggregates (see Table 2). The walls (Phases 2.2-2.4) present differences in terms of deterioration of the surfaces, color and permeability. The external surface of the tested wall of the changing rooms presented the lower water absorption (see Table 5), the highest compressive strength (estimated by the Schmidt hammer, see Table 6) and velocity of the P waves (obtained from direct sonic tests, see Table 7). The highest water absorption coefficient (1.00 kg/m².min0.5) occurs at the wall of the water treatment area (see Table 5). However, and for example, it is within the expected range for traditional cement-based renders (0.2-1.5 kg/m².min0.5). A significant chloride content was detected in the concrete of the tanks and the walls of the water collection area and bar (see Table 4), including higher the upper limit defined by the EN 206-1 (1%). The two evaluated walls (content retaining wall and the main façade's North) do not present significant out-of-plane deformations. The GPR tests allowed to estimate the connection between the upper beam and two orthogonal cantilever beams of the changing rooms (probable presence of four dowels, namely two dowels at each face, connecting the upper beam to the two orthogonal cantilever beams), and to conclude that the walls present a low percentage of steel rebars. The test for determining the tensile strength of the steel allowed to conclude that the mean yield strength (fy,0.6fu) of steel specimens of the adults' tank (Phase 1) is equal to 238 MPa (Table 3), which corresponds to the steel of class A235 (Portuguese steel class for smooth rebars of normal ductility and yield strength equal or higher than 200 MPa). The two tested rebars of the slab of the South's storage room (Phase 3) present corrosion and mean yield strength (fy,0.6fu) of 294 MPa. The tests carried out in the timber specimen at the laboratory allowed to conclude that the species of the timber seems to be riga (pinus sylvestris) and presents high quality, resistance and density, and low moisture content.

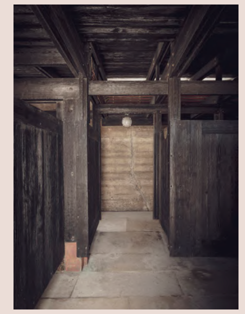
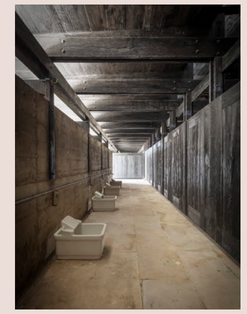
The results obtained from the laboratory tests on cement paste samples allowed to obtain detailed data of the cement pastes, such as their chemical characterization, phases and pore size. The highest critical pore, estimated from the mercury intrusion porosimetry tests, was obtained in the sample collected at the slab (bottom surface) of the South's storage room, which presents steel corrosion. These tests allowed to conclude, as opposed to the results obtained from the concrete carbonation tests with phenolphthalein on-site, that the concrete of all samples are carbonated. The sample collected from a surface previously covered with a switchboard of the water treatment area (closed area) presents low carbonation. Moreover, they allowed to validate the results obtained from the first tests, namely the presence of high chloride content in the cement paste of the children's tank and bar, which is also expected for all external surfaces of walls. It is also concluded that the physical, chemical and mechanical properties of the concrete of the building present high dispersion, which is expected since corresponds to concretes made on-site and made in different phases, with different exposures (tanks, wall without cover, closed areas) and different damage severity. However, it should be noted that the low percentage of steel rebars is a crucial aspect so that the damage associated with the corrosion (carbonated concrete and presence of chlorides) is not most severe. Finally, the presence of dilation joints at the connection between walls and slabs prevented the occurrence of damage, at these connections, associated with deformations caused by thermal actions.

APPENDIX E

Detailed tolerance for change assessment




Space	Entrance ramp and changing rooms hallway (1) (3)
Level of significance	Exceptional significance
Tolerance for change	Low tolerance
Description	Built between 1962 and 1965, both spaces are essential parts of the oriented spatial experience in which all users take part. The entrance ramp is the main access to the building, leading visitors inside through the accelerated perspective effect caused by its convergent walls. After leaving the dark atmosphere of the building's interior, it is in the changing rooms hallway that visitors experience their first contact with the exterior. The access path to the beach level goes around a high wall that prevents them from immediately seeing the ocean. During the last conservation works the precast white concrete slabs were washed and the channel drainage gratings replaced. Two localized concrete repair interventions were undertaken in the changing rooms hallway west wall. All the cracks in the concrete that did not present structural risks to the building were intentionally left open by Álvaro Siza as signs of the passage of time.
Considerations and opportunities for change	Any intervention in these spaces must be of conservation as their configuration and material are most important. The i) exposed concrete walls with horizontal formwork finish and the vi) precast white concrete slabs must be retained unaltered. The placement of foreign objects such as temporary signage totems should be avoided so as to keep the perception of the spaces unhindered.

Space	Changing rooms (2)
Level of significance	Exceptional significance
Tolerance for change	Low tolerance
Description	Built between 1962 and 1965, the changing rooms, with their dark and involving atmosphere, are an essential part of the oriented spatial experience, mediating the transition between the street level and the interior of the bathing complex. During the last conservation works all the wooden elements were cleaned and varnished. Additionally, the electrical wiring was placed inside exposed copper pipes, carefully integrated in the architectural design and in accordance to Álvaro Siza's design principles.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. The i) Baltic pine roof structure with dark stain and its copper cladding, ii) the exposed concrete walls with horizontal formwork finish, iii) the Baltic pine partition walls, iv) doors and joinery with dark stain, v) original brass fittings and vi) the precast white concrete slabs must be retained unaltered. There is some tolerance for change in form or location of the vii) ceramic wash basins and foot washes to respond to future needs. The replacement of any component should take into account the overall coherence and opt for similar models. There is some tolerance for change in form or location of viii) the exposed water and ix) electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.


Space	Collective changing room (21)
Level of significance	Moderate significance
Tolerance for change	Low tolerance
Description	Built between 1962 and 1965, the collective changing room's space was used as a storage room that was accessed by the chlorine cabinet when the Ocean Swimming Pool first opened to the public. It was only after 1972 that it took the configuration that we see today, with the addition of the wooden partition wall and benches and the marble foot wash. During the last conservation works all the wooden elements were cleaned and varnished. Additionally, the electrical wiring was placed inside exposed copper pipes, carefully integrated in the architectural design and in accordance to Álvaro Siza's design principles.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. The i) Baltic pine roof structure with dark stain and its copper cladding, ii) the exposed concrete walls with horizontal formwork finish, iii) the Baltic pine partition walls, iv) doors and joinery with dark stain, v) original brass fittings, vi) the precast white concrete slabs must be retained unaltered and vii) the original marble foot wash must be retained unaltered. There is some tolerance for change in form or location of the viii) ceramic wash basins and foot washes to respond to future needs. The replacement of any component should take into account the overall coherence and opt for similar models. There is some tolerance for change in form or location of ix) the exposed water and x) electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.


Space	Cloakroom (15)
Level of significance	High significance
Tolerance for change	Low tolerance
Description	Built between 1962 and 1965, the cloakroom is located between the changing rooms and opens towards the entrance ramp and the changing rooms hallway. Even if today it mostly supports the reception of visitors, it still features a metallic structure to support hangers. During the last conservation works all the wooden elements were cleaned and varnished. Additionally, the opening towards the entrance ramp was enlarged and a new movable counter was designed to support the reception of visitors.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. The i) Baltic pine roof structure with dark stain and its copper cladding, ii) the Baltic pine partition walls, iii) doors and joinery with dark stain, iv) original brass fittings and v) the precast white concrete slabs must be retained unaltered. There is some tolerance for change in form or location of vi) the exposed electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.

Space	Water treatment room and chlorine cabinet (18) (20)
Level of significance	Moderate significance
Tolerance for change	Moderate tolerance
Description	Built between 1962 and 1965, the water treatment room features the site's only concrete slab under copper cladding and is characterized by the strong presence of hydraulic equipment. The chlorine cabinet is located between the water treatment area and the changing rooms, featuring the chlorine tanks. During the last conservation works the plumbing system and equipment were replaced and updated.
Considerations and opportunities for change	The i) exposed concrete walls and roof slab with horizontal formwork finish, ii) the Baltic pine doors and joinery with dark stain, iii) original brass fittings and vi) the precast white concrete slabs must be retained unaltered as their configuration and material are most important. There is high tolerance for change of the iv) plumbing system which must be permanently updated to respond to the pool functioning needs.

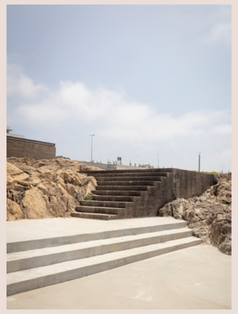
Space	South bathrooms (13)
Level of significance	High significance
Tolerance for change	Low tolerance
Description	Built between 1962 and 1965, the south bathrooms are preceded by a foot wash as they are destined to barefoot users. Their high wooden roof structure stands out from the otherwise horizontal volumes, extending to a porch over the changing rooms hallway that shelters the bathrooms' entrance. During the last conservation works all the wooden elements were cleaned and varnished. The partition walls between the showers were replaced by copper ones to improve their performance under such direct exposure to water. Additionally, the electrical wiring was placed inside exposed copper pipes, carefully integrated in the architectural design and in accordance to Álvaro Siza's design principles.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. The i) Baltic pine roof structure with dark stain and its copper cladding, ii) the exposed concrete walls with horizontal formwork finish, iii) the Baltic pine partition walls, iv) doors and joinery with dark stain, v) original brass fittings and vi) the precast white concrete slabs must be retained unaltered. There is some tolerance for change in form or location of the vii) ceramic wash basins and toilet vases to respond to future needs. The replacement of any component should take into account the overall coherence and opt for similar models. There is some tolerance for change in form or location of viii) the exposed water and ix) electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.

Space	Security room (22)
Level of significance	Moderate significance
Tolerance for change	High tolerance
Description	Built between 1970 and 1972, the security room is located under the roof garden and forms part of the building's extension towards south. It features white painted walls and an exposed concrete roof slab. During the last conservation works its roof slab and the exterior surface of its north wall were rebuilt. Additionally, the electrical wiring was placed inside exposed copper pipes, carefully integrated in the architectural design and in accordance to Álvaro Siza's design principles.
Considerations and opportunities for change	There is high tolerance for change in fabric or function as this is a technical area which should retain its role in supporting elements and functions of higher significance.

Space	Water collection room (19)
Level of significance	Some significance
Tolerance for change	High tolerance
Description	Built between 1962 and 1965, the water collection room is located beneath the coastal avenue and is accessed through the south storage room. During the last conservation works all the hydraulic and electrical infrastructures were replaced and updated, as were the metal doors.
Considerations and opportunities for change	There is high tolerance for change in form or fabric as this is a technical area which should retain its role in supporting elements and functions of higher significance.

Space	South storage rooms (24) (25)
Level of significance	Moderate significance
Tolerance for change	Moderate tolerance
Description	Built between 1970 and 1972, the south storage rooms are located under the roof garden and form part of the building's extension towards south. It features exposed concrete walls and roof slab. During the last conservation works its roof slab was rebuilt. Additionally, the electrical wiring was placed inside exposed copper pipes, carefully integrated in the architectural design and in accordance to Álvaro Siza's design principles.
Considerations and opportunities for change	The i) exposed concrete walls and roof slab with horizontal formwork finish must be retained unaltered. There is some tolerance for change in function as long as it retains its role in supporting elements and functions of higher significance. There is some tolerance for change in form or location of ii) the exposed electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.

Space	South platform (10)
Level of significance	High significance
Tolerance for change	Low tolerance
Description	Built between 1970 and 1972, this platform follows the building's extension to the south. In one of its ends, an amphitheatre was built in 1973 to clearly define the south limit of the site. During the last conservation works its continuous concrete pavement was replaced.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. Its continuous concrete pavement can be replaced if needed as long as form and fabric are maintained.



Space	Beach and access paths (8) (4)
Level of significance	Exceptional significance
Tolerance for change	Low tolerance
Description	Built between 1962 and 1965, the access paths to the swimming pools are composed of small exposed concrete platforms, staircases and walkways. Together with the beach and its rock outcrops configuration, they are an essential part of the oriented spatial experience, mediating the transition between the interior of the building and the swimming pools. During the last conservation works the suspended walkway was rebuilt.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. The i) beach and rock outcrops configuration, ii) the exposed concrete suspended walkway and iii) the exposed concrete platforms and staircases must be retained unaltered.

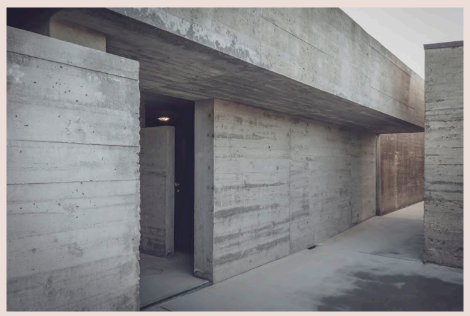
Space	Swimming pools and foot washes (6) (7) (5)
Level of significance	Exceptional significance
Tolerance for change	Low tolerance
Description	Designed in 1960, the adults swimming pool was the first part of the bathing complex to be built. It is nestled amongst the coastal rock outcrops, featuring cyclopean concrete walls only when necessary to contain the water. The children swimming pool, featuring a characteristic curve wall, and the foot washes were built between 1962 and 1965 and also seek to merge with their surrounding context following an organic design. During the last conservation works the inner side of the adults swimming pool north and south walls was rebuilt, as was the children swimming pool wall, following the replacement of the built-in plumbing. Additionally, a new technical gallery was built underneath the foot washes to accommodate the new plumbing.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. The i) swimming pool configuration amongst the surrounding rocks, ii) the cyclopean concrete walls, iii) the foot washes configuration amongst the surrounding rocks and iv) the copper showers and removable access ladders must be retained unaltered.

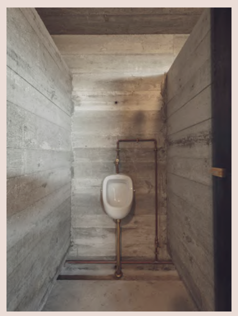
Space	West platform (11)
Level of significance	High significance
Tolerance for change	Low tolerance
Description	Built between 1962 and 1965, the west platform stands between both swimming pools and the south beach, linked by a ramp. During the last conservation works its continuous concrete pavement was replaced.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. Its continuous concrete pavement can be replaced if needed as long as form and fabric are maintained.

Space	Bar and terrace (16) (9)
Level of significance	High significance
Tolerance for change	Low tolerance
Description	Built between 1970 and 1973, the bar features a curve counter that follows the outline of the wooden roof overhang, supported by a single pillar and a cantilever beam. Its triangular shaped terrace is sheltered from the predominant winds by a wall set in a 45º angle that interrupts the sequence of parallel walls to the coastal avenue retaining wall. During the last conservation works the wooden doors and shutters were replaced, with the latter being changed from a folding mechanism to a sliding one. A new wooden partition wall was added before the wood pillar separating the curve section from the remaining counter space. Additionally, the electrical wiring was placed inside exposed copper pipes, carefully integrated in the architectural design and in accordance to Álvaro Siza's design principles. The terrace pavement was replaced, featuring built-in anchoring points for the sunshades.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. The i) Baltic pine roof structure with dark stain and its copper cladding, ii) the exposed concrete walls and curve counter with horizontal formwork finish, iii) Baltic pine doors and joinery with dark stain, iv) original brass fittings, v) the precast white concrete slabs and vi) the terrace furniture designed by Álvaro Siza must be retained unaltered. There is some tolerance for change in form or location of vii) the exposed water and viii) electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles. Its continuous concrete pavement can be replaced if needed as long as form and fabric are maintained.

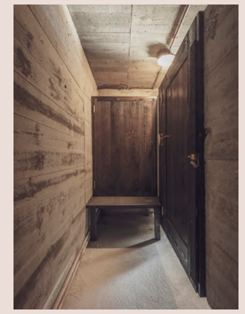
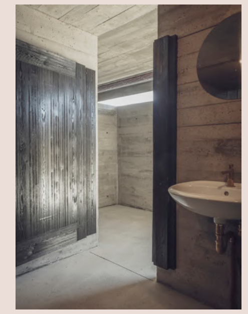
Space	Bar kitchen (17)
Level of significance	Moderate significance
Tolerance for change	High tolerance
Description	Built between 1970 and 1972, the bar kitchen is a narrow and enclosed space located between the bar and the changing rooms hallway. During the last conservation works it was entirely remodeled and saw the stainless steel that had been placed by the concessionaire removed. All infrastructures and equipment were replaced and updated. all the wood elements were cleaned and varnished. Additionally, the electrical wiring was placed inside exposed copper pipes, carefully integrated in the architectural design and in accordance to Álvaro Siza's design principles.
Considerations and opportunities for change	The i) Baltic pine roof structure with dark stain and its copper cladding, ii) the exposed concrete walls with horizontal formwork finish, iii) doors and joinery with dark stain, iv) original brass fittings and v) the precast white concrete slabs must be retained unaltered. There is high tolerance for change in form, fabric or location of the vi) kitchen equipment and appliances. There is some tolerance for change in form or location of vii) the exposed water and viii) electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.

Space	North platform (12)
Level of significance	High significance
Tolerance for change	Low tolerance
Description	Built between 2018 and 2021, the north platform extends towards the north limit of the site which ends in a triangular configuration. Even though it formed part of the original designs since 1965 it had never been built. Its purpose was to connect the existing buildings with a restaurant that was to be built further north to limit the enclosure, while also protecting it from the prevailing winds.
Considerations and opportunities for change	Any intervention in this space must be of conservation as its configuration and material are most important. Its continuous concrete pavement can be replaced if needed as long as form and fabric are maintained.





Space	North bathrooms (14)
Level of significance	Moderate significance
Tolerance for change	Moderate tolerance
Description	Built between 1970 and 1972, the north bathrooms are located under the roof garden and form part of the building's extension towards north. They are destined to the exclusive use of shoed visitors. During the last conservation works the north volume was demolished and rebuilt in the same location. Nevertheless, the north bathrooms were placed further south and its internal layout was entirely redesigned to accommodate facilities for users with impaired mobility. Even though this space was entirely rebuilt, it was designed by Álvaro Siza himself in accordance to the design principles of the original construction.
Considerations and opportunities for change	The i) exposed concrete walls and roof slab with horizontal formwork finish, ii) the Baltic pine doors and joinery with dark stain, iii) brass fittings and iv) the continuous concrete pavement must be retained unaltered.

Space	Employee's changing rooms and bathrooms (23)
Level of significance	Some significance
Tolerance for change	High tolerance
Description	Built between 2018 and 2021, the employee's changing rooms and bathrooms are located under the roof garden and form part of the building's rebuilt extension towards north. It shares its entrance with the north storage room. Even though this space was only built during the last conservation works, it was designed by Álvaro Siza himself in accordance to the design principles of the original construction.
Considerations and opportunities for change	The i) exposed concrete walls and roof slab with horizontal formwork finish, ii) the Baltic pine doors and joinery with dark stain, iii) brass fittings and iv) the continuous concrete pavement must be retained unaltered. There is some tolerance for change in form or location of the v) ceramic wash basins and toilet vases to respond to future needs. The replacement of any component should take into account the overall coherence and opt for similar models. There is some tolerance for change in form or location of vi) the exposed water and vii) electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.

Area/function	North storage room and waste management room (26) (27)
Level of significance	Some significance
Tolerance for change	High tolerance
Description	Built between 1970 and 1972, the north storage room is located under the roof garden and forms part of the building's extension towards north. During the last conservation works the north volume was demolished and rebuilt in the same location. It retained a space destined to storage, to which a waste management room was added to fulfill with the current environmental standards. Even though this space was entirely rebuilt, it was designed by Álvaro Siza himself in accordance to the design principles of the original construction.
Considerations and opportunities for change	The i) exposed concrete walls and roof slab with horizontal formwork finish, ii) the Baltic pine doors and joinery with dark stain, iii) brass fittings and iv) the continuous concrete pavement must be retained unaltered. There is some tolerance for change in function as long as it retains its role in supporting elements and functions of higher significance. There is some tolerance for change in form or location of v) the exposed electrical networks to respond to future needs. Nevertheless, only copper tubes are to be used and the visibility of new elements should be minimized, in compliance with Álvaro Siza's design principles.

APPENDIX F

Listing information

retroactividade idêntica à da convenção. No entanto, as compensações das despesas de deslocação não são objecto de retroactividade, uma vez que se destinam a compensar despesas já feitas para assegurar a prestação de trabalho.

Atendendo a que a convenção regula diversas condições de trabalho, procede-se à ressalva genérica de cláusulas contrárias a normas legais imperativas.

A extensão da convenção tem, no plano social, o efeito de uniformizar as condições mínimas de trabalho dos trabalhadores e, no plano económico, o de aproximar as condições de concorrência entre empresas do mesmo sector.

Embora a convenção tenha área nacional, a extensão das convenções colectivas nas regiões autónomas compete aos respectivos Governos Regionais, pelo que a presente extensão apenas é aplicável no território do continente.

Foi publicado o aviso relativo à presente extensão no *Boletim do Trabalho e Emprego*, 1.ª série, n.º 13, de 8 de Abril de 2011, ao qual não foi deduzida oposição por parte dos interessados.

Assim:

Manda o Governo, pela Ministra do Trabalho e da Solidariedade Social, ao abrigo do artigo 514.º e do n.º 1 do artigo 516.º do Código do Trabalho, o seguinte:

Artigo 1.º

1 — As condições de trabalho constantes do contrato colectivo entre a GROQUIFAR — Associação de Grossistas de Produtos Químicos e Farmacêuticos e a FIEQUIMETAL — Federação Intersindical das Indústrias Metalúrgica, Química, Farmacêutica, Eléctrica, Energia e Minas, publicado no *Boletim do Trabalho e Emprego*, 1.ª série, n.º 8, de 28 de Fevereiro de 2011, são estendidas:

a) Às relações de trabalho entre empregadores não filiados na associação de empregadores outorgante que nos distritos de Beja, Castelo Branco, Évora, Faro, Leiria, Lisboa, Portalegre, Santarém e Setúbal exerçam a actividade de comércio por grosso de produtos farmacêuticos e ou veterinários e trabalhadores ao seu serviço das profissões e categorias profissionais nele previstas;

b) Às relações de trabalho entre empregadores filiados na associação de empregadores outorgante que no território do continente exerçam a actividade económica referida na alínea anterior e trabalhadores ao seu serviço das profissões e categorias profissionais previstas na convenção não representados pela associação sindical outorgante.

2 — A presente extensão não se aplica às relações de trabalho em que sejam parte empregadores filiados na NORQUIFAR — Associação Nacional dos Importadores/Armazenistas e Retalhistas de Produtos Químicos e Farmacêuticos.

3 — As retribuições previstas no anexo IV, inferiores à retribuição mínima mensal garantida, apenas são objecto de extensão nas situações em que sejam superiores à retribuição mínima mensal garantida resultante de redução relacionada com o trabalhador, de acordo com o artigo 275.º do Código do Trabalho.

4 — Não são objecto de extensão as disposições contrárias a normas legais imperativas.

Artigo 2.º

1 — A presente portaria entra em vigor no 5.º dia após a sua publicação no *Diário da República*.

2 — A tabela salarial e os valores das cláusulas de conteúdo pecuniário, à excepção do n.º 5 da cláusula 29.ª e do n.º 1 da cláusula 30.ª, produzem efeitos a partir de 1 de Janeiro de 2010.

3 — Os encargos resultantes da retroactividade poderão ser satisfeitos em prestações mensais de igual valor, com início no mês seguinte ao da entrada em vigor da presente portaria, correspondendo cada prestação a dois meses de retroactividade ou fracção e até ao limite de seis.

A Ministra do Trabalho e da Solidariedade Social, *Maria Helena dos Santos André*, em 18 de Maio de 2011.

MINISTÉRIO DA CULTURA

Decreto n.º 16/2011

de 25 de Maio

O presente decreto procede à classificação como monumentos nacionais da Casa do Passal, dos Concheiros de Muge, da Igreja do Carmo, do Terreiro da Batalha do Ameixial, do antigo Convento dos Eremitas de São Paulo da Serra de Ossa ou de Jesus Cristo, incluindo a cerca, do sistema de abastecimento de águas à cidade de Braga no século XVIII, designado por «Sete Fontes», da Casa de Chá da Boa Nova e das Piscinas de Marés de Leça da Palmeira.

De acordo com os critérios e os pressupostos de classificação previstos na Lei n.º 107/2001, de 8 de Setembro, que estabelece as bases da política e do regime de protecção e valorização cultural, os bens imóveis que o Governo classifica como monumentos nacionais revestem-se de excepcional interesse nacional, pelo que se torna imperativo que se lhes proporcione especial protecção e valorização, nos termos que a lei prevê.

O valor científico, patrimonial e cultural de cada um dos bens ora classificados articula-se segundo critérios como autenticidade, originalidade, raridade, singularidade e exemplaridade, que se revelam expressivamente no modo como foram apropriados pelos cidadãos e na relevância simbólica que adquiriram como lugares das artes e da memória histórica e política.

A Casa do Passal, também denominada «Vila de São Cristóvão», foi a residência de Aristides de Sousa Mendes e encontra-se localizada na Quinta de São Cristóvão, na freguesia de Cabanas de Viriato, concelho de Carregal do Sal.

Trata-se de um palacete cuja arquitectura, de inspiração francesa, se insere no gosto das *beaux-arts* do segundo império, estilo característico dos finais do século XIX e que se destaca não só pelo eclectismo da arquitectura e pela imponência da fachada principal, mas principalmente pela memória do cônsul que a habitou e sacrificou os interesses pessoais em prol dos refugiados do holocausto.

Aristides de Sousa Mendes ocupava o lugar de cônsul de Portugal em Bordéus quando, no decorrer da Segunda Guerra Mundial, passou vistos a milhares de refugiados, permitindo-lhes fugir e sobreviver às perseguições de que eram objecto, tendo, inclusivamente, alguns desses refugiados sido albergados na Casa do Passal.

A atitude de Aristides de Sousa Mendes, que salvou várias vidas, ditou-lhe também o fim da carreira diplomática, facto que teve um custo pessoal muito elevado, e

que o deixou, em conjunto com a sua numerosa família, em péssima situação económica.

A relevância deste imóvel a nível nacional, não só em termos arquitectónicos mas também histórico-sociais, faz dele um lugar de memória, justificando-se, assim, a sua integral salvaguarda.

Os Concheiros de Muge, no concelho de Salvaterra de Magos, englobam os concheiros da Moita do Sebastião, do Cabeço da Amoreira e do Cabeço da Arruda e constituem uma das mais importantes estações arqueológicas da pré-história portuguesa, com grande projecção a nível nacional e internacional.

Devido ao seu incalculável valor científico, os Concheiros de Muge são citados em todos os manuais de pré-história da Europa e são inúmeros os trabalhos científicos realizados por académicos ou investigadores para o estudo e compreensão de muitos aspectos da vida quotidiana, dos rituais funerários e do comportamento dos nossos antepassados.

A Igreja da Nossa Senhora do Carmo, situada na Rua da Sofia, em Coimbra, é considerada um dos corolários das pesquisas arquitectónicas citadinas na linha evolutiva das primeiras edificações portuguesas de estrutura renascentista. Construída por iniciativa do bispo de Portalegre, D. Frei Amador Arrais, e concluída em 1597, a Igreja, tal como o seu claustro, encontra-se integrada no antigo Colégio do Carmo Calçado, fundado em 1542 pelo bispo do Porto, D. Frei Baltazar Limpo, e onde se encontra agora sediada a Ordem Terceira de São Francisco, e que merece destaque especial na categoria dos colégios universitários situados na Rua da Sofia.

A Igreja de Nossa Senhora do Carmo integra-se na tipologia das igrejas caixa, como uma original e consistente variação das mesmas. Apresenta uma fachada de grande simplicidade, constituída por altas pilastras dóricas sobre pedestais que a dividem em três secções, em que o pórtico ocupa toda a largura.

No interior, de nave única e cobertura em abóbada de berço aquartelada, destaca-se a capela-mor, onde se salienta o retábulo maneirista de talha dourada dos ensambladores e escultores Gaspar e Domingos Coelho e as pinturas maneiristas de Simão Rodrigues e Domingos Vieira Serrão, bem como as capelas laterais, com belos retábulos setecentistas das épocas joaninas e rococó e os retábulos em talha dourada e policromada das capelas dos flancos da nave, do século XVIII.

São ainda de realçar os azulejos da abside, seiscentistas e de fabrico lisboeta, as muitas esculturas de madeira, e o cadeiral, do coro-alto, de dois andares com 42 cadeiras dispostas em U, onde se podem ver, em oito espaldares, pinturas setecentistas da autoria de Pasquale Parente.

A batalha do Ameixial, de 1633, representa um momento fundamental para a manutenção de Portugal como país independente, inserindo-se numa forte ofensiva de Espanha sobre Portugal na reconquista do país perdido.

Ocorrida nos campos elevados do Ameixial, a cerca de 5 km a ocidente de Estremoz, esta batalha foi uma das mais violentas e esforçadas nas Guerras da Restauração, com importantes consequências tanto para Portugal como para Espanha. Para Portugal, a batalha do Ameixial foi a mais importante vitória militar da Restauração, resolvendo uma das situações mais perigosas que Portugal enfrentou durante o período de 1640 a 1668, enquanto que para Espanha a batalha contribuiu para reforçar a convicção, nomeadamente na Corte e na nobreza espanhola, de que seria praticamente impossível a submissão de Portugal pelas armas e que seria inútil o prosseguimento da luta.

Deste modo, com a batalha do Ameixial e a vitória das forças portuguesas comandadas pelo conde de Vila Flor, terminou uma das maiores ameaças à restauração da independência portuguesa.

Atento o grande valor arquitectónico e a importância artística do seu espólio, a Igreja de Santa Catarina, em Lisboa, foi classificada como monumento nacional pelo Decreto n.º 5046, publicado no *Diário do Governo*, n.º 268, de 11 de Dezembro de 1918, não se tendo, no entanto, incluído nesta medida de salvaguarda o restante conjunto edificado incluído no denominado «Convento dos Eremitas de São Paulo da Serra de Ossa» (Paulistas).

O Convento dos Eremitas da Serra de Ossa, da invocação do Santíssimo Sacramento, foi construído por esta Ordem em 1647. Os eremitas, inspirados pela figura de São Paulo, eram igualmente conhecidos por Eremitas de São Paulo ou de Jesus Cristo, razão pela qual o edifício conventual é conhecido por múltiplas designações.

Trata-se de uma construção austera, maneirista, junto à qual se ergue a Igreja de Santa Catarina. As fachadas são ritmadas por janelas idênticas, de verga recta, dispostas a espaços regulares, com janela de sacada em pedra encimada por frontão curvo no corpo principal. Conserva-se parte do claustro quadrangular com arcada de arcos redondos, um monumental corredor de acesso à zona das celas, o átrio de acesso à igreja de Santa Catarina, o espaço da antiga portaria, com azulejos do 1.º quartel do século XVIII, uma escadaria de mármore, a magnífica sacristia poligonal com estuques atribuíveis a João Grossi e dois belos lavabos, e ainda a biblioteca do exército, ocupando a antiga livraria conventual, ao modo da biblioteca do Convento de Mafra.

A importância histórica e arqueológica do que resta da antiga cerca conventual, como campo arqueológico de pesquisa do eventual segundo claustro, na ala norte e do prolongamento da ala poente do Convento, no aprofundamento do conhecimento histórico e arquitectónico do conjunto conventual e da marca da sua imponente massa arquitectónica na estrutura urbana à ilharga do Bairro Alto, justifica a integração da cerca na presente classificação.

O sistema de abastecimento de águas à cidade de Braga, designado por «Sete Fontes», foi construído em meados do século XVIII, sob a égide do arcebispo D. José de Bragança, destinado a dotar e a melhorar o abastecimento de água potável à cidade de Braga.

O sistema de abastecimento é composto pelo conjunto de condutas, galerias subterrâneas, mães de água e fontes, ainda existente, com cerca de 3500 m de extensão: cerca de 2250 m correspondem a galerias e os restantes correspondem às condutas de ligação, em manilha de pedra ou em tubo de ferro.

Subsistem 11 galerias de minas subterrâneas, algumas com braços de ramificação. As fontes mais a jusante registam na padieira da porta a data de 1744 e a fonte mais a montante a data de 1752.

Este conjunto é o testemunho de uma época (século XVIII, sob a égide do marquês de Pombal) em que se construíram, em Portugal, estruturas destinadas à melhoria de qualidade de vida dos cidadãos, representativas de um impulso ao urbanismo e à arquitectura barroca.

A concepção técnica desta obra representa, de forma material, a evolução de conceitos que se aplicaram na engenharia hidráulica e que muito contribuíram para a qualificação de infra-estruturas urbanas.

Este sistema conserva quer o papel memorial original, quer as funções para as quais foi construído. Pese embora, por volta de 1930-1940, tenham sido introduzidas, em alguns dos seus troços, tubagens de ferro para evitar perdas aquíferas e facilitar a manutenção das condutas, não foram, porém, destruídas as estruturas existentes, permitindo que o sistema permaneça em actividade nos dias de hoje.

O sistema de abastecimento de águas à cidade de Braga é, pois, especialmente valorizado pelo seu significado cultural e por manter a sua autenticidade e integridade, representando um valor cultural inestimável de interesse nacional.

A Casa de Chá da Boa Nova, na freguesia de Leça da Palmeira, foi projectada e construída na sequência de um concurso levado a cabo pela Câmara Municipal de Matosinhos, em 1956. O arquitecto Fernando Távora, vencedor desse concurso, entregou o projecto a um dos seus colaboradores, Álvaro Siza Vieira, então ainda numa fase inicial da sua carreira. Esta obra, que decorre entre 1960 e 1963, marca uma nova etapa da produção arquitectónica modernista em Portugal e é hoje objecto de amplo reconhecimento internacional.

O edifício estabelece uma notável relação formal com a paisagem e com a topografia, através de uma implantação minuciosa, que utiliza as rochas e a impressiva paisagem marítima como parte integrante do projecto e do efeito cénico. O edifício, apesar disso, assume plenamente a sua condição artificial, com paredes brancas opacas e telhados de grande expressão plástica que se dissolvem no terreno. O percurso para a Casa de Chá é pensado de modo a acentuar o acto de entrada num espaço intimista, que amplia o efeito surpresa do visitante perante a espectacularidade da paisagem, que surge subitamente a partir do interior.

A classificação da Casa de Chá da Boa Nova fundamenta-se, assim, no valor arquitectónico e paisagístico do imóvel, obra exemplar e pioneira do arquitecto Siza Vieira, reconhecida internacionalmente como um marco na arquitectura modernista.

Também as Piscinas de Marés de Leça da Palmeira são um projecto da autoria do arquitecto Siza Vieira.

Projectadas em 1961, embora apenas concluídas em 1966, as Piscinas de Marés de Leça da Palmeira constituem uma realização notável pela capacidade de integração no sítio mas sem recurso a concessões miméticas, antes assumindo frontalmente o seu carácter artificial, que o rigor das formas e o betão à vista salientam.

Os edifícios estruturam-se ao longo do muro da praia de forma linear, sem criarem rupturas volumétricas, mas convidando, pelo desenho dos percursos e pela geometria dos muros, à contemplação da paisagem marítima. A capacidade de diálogo harmonioso com a envolvente, sem deixar de se afirmar a artificialidade da obra, é uma das características principais do trabalho inicial protagonizado por Siza Vieira, que encontra nas Piscinas de Marés de Leça da Palmeira um dos melhores exemplos em Portugal.

A classificação justifica-se pelo valor arquitectónico, urbanístico e paisagístico, mas também pelo valor histórico de uma obra que é já uma referência incontornável da arquitectura modernista e que permanece em plena utilização.

As zonas especiais de protecção dos bens imóveis agora classificados serão fixadas por portaria, nos termos do disposto no artigo 43.º da Lei n.º 107/2001, de 8 de Setembro.

Assim:

Ao abrigo do disposto no n.º 1 do artigo 28.º da Lei n.º 107/2001, de 8 de Setembro, e nos termos da alínea *g)* do artigo 199.º da Constituição, o Governo decreta o seguinte:

Artigo único

Classificação

São classificados como monumento nacional os bens imóveis a seguir identificados:

a) A Casa do Passal, também denominada «Vila de São Cristóvão», sita na Quinta de São Cristóvão, na freguesia de Cabanas de Viriato, concelho de Carregal do Sal e distrito de Viseu, conforme planta constante do anexo I do presente decreto, do qual faz parte integrante;

b) Os Concheiros de Muge — Moita do Sebastião, Cabeço da Amoreira e Cabeço da Arruda, na freguesia de Muge, concelho de Salvaterra de Magos e distrito de Santarém, conforme planta constante do anexo II do presente decreto, do qual faz parte integrante;

c) A Igreja do Carmo, sita na Rua da Sofia, freguesia de Santa Cruz, concelho e distrito de Coimbra, conforme planta constante do anexo III do presente decreto, do qual faz parte integrante;

d) O Terreiro da Batalha do Ameixial, nas freguesias de Santo Estêvão, Santa Vitória e São Bento do Ameixial, concelho de Estremoz e distrito de Évora, conforme planta constante do anexo IV do presente decreto, do qual faz parte integrante;

e) O antigo Convento dos Eremitas de São Paulo da Serra de Ossa ou de Jesus Cristo (Paulistas), incluindo a cerca, sito na Calçada do Combro, freguesia de Santa Catarina, concelho e distrito de Lisboa, conforme planta constante do anexo V do presente decreto, do qual faz parte integrante;

f) O sistema de abastecimento de águas à cidade de Braga no século XVIII, designado por «Sete Fontes de São Victor», freguesia de São Victor, concelho e distrito de Braga, conforme planta constante do anexo VI do presente decreto, do qual faz parte integrante;

g) A Casa de Chá da Boa Nova, na freguesia de Leça da Palmeira, concelho de Matosinhos e distrito do Porto, conforme planta constante do anexo VII do presente decreto, do qual faz parte integrante;

h) As Piscinas de Marés de Leça da Palmeira, na freguesia de Leça da Palmeira, concelho de Matosinhos e distrito do Porto, conforme planta constante do anexo VIII do presente decreto, do qual faz parte integrante.

Visto e aprovado em Conselho de Ministros de 3 de Março de 2011. — *José Sócrates Carvalho Pinto de Sousa. — Maria Gabriela da Silveira Ferreira Canavilhas.*

Assinado em 14 de Abril de 2011.

Publique-se.

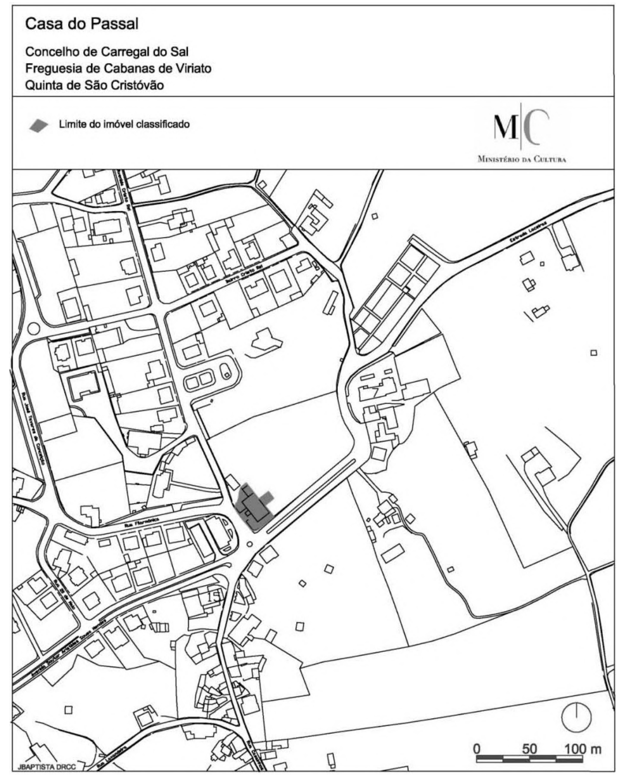
O Presidente da República, ANÍBAL CAVACO SILVA.

Referendado em 18 de Abril de 2011.

O Primeiro-Ministro, *José Sócrates Carvalho Pinto de Sousa.*

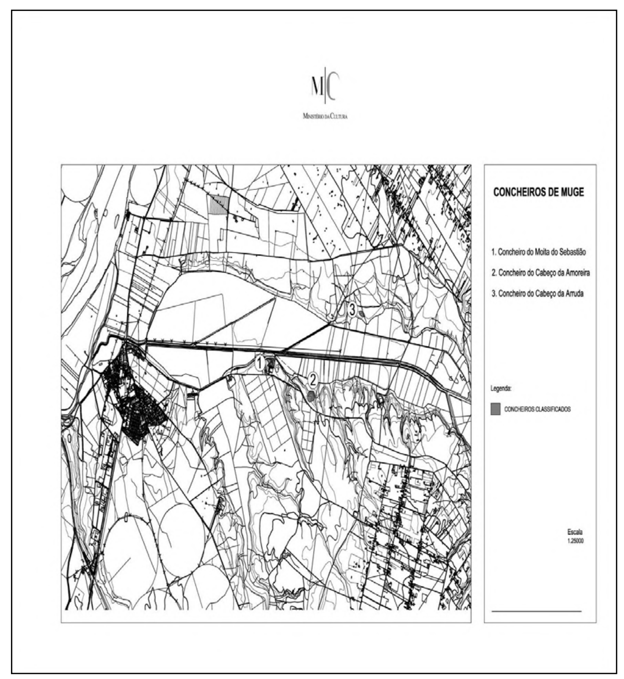
ANEXO I

[alínea *a*) do artigo único]



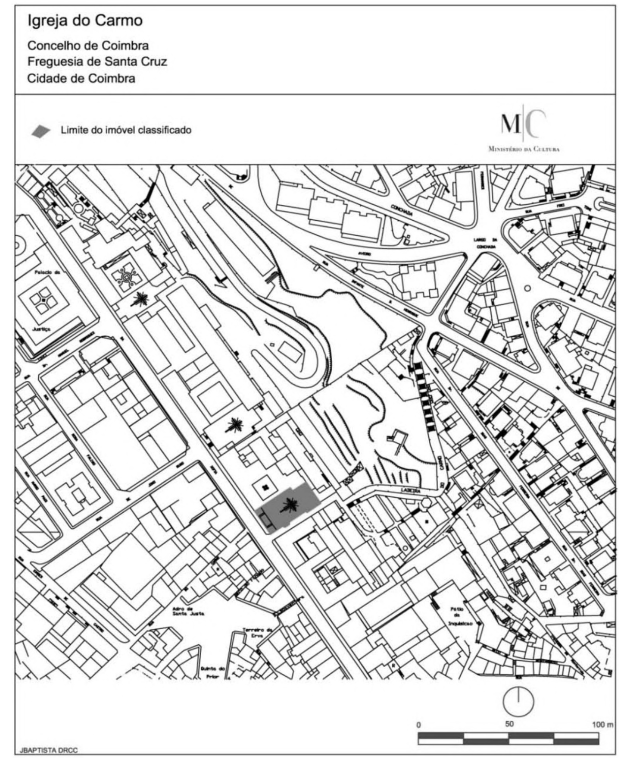
ANEXO II

[alínea *b*) do artigo único]



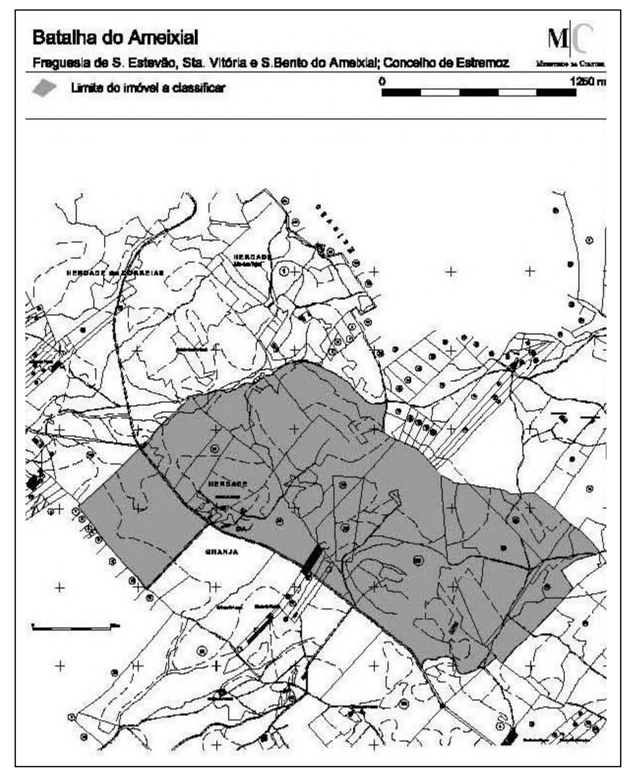
ANEXO III

[alínea *c*) do artigo único]



ANEXO IV

[alínea *d*) do artigo único]



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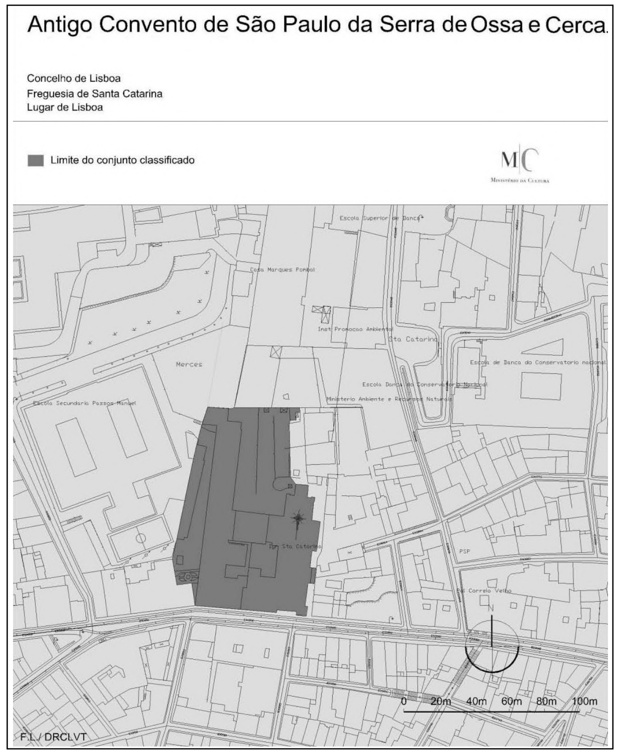
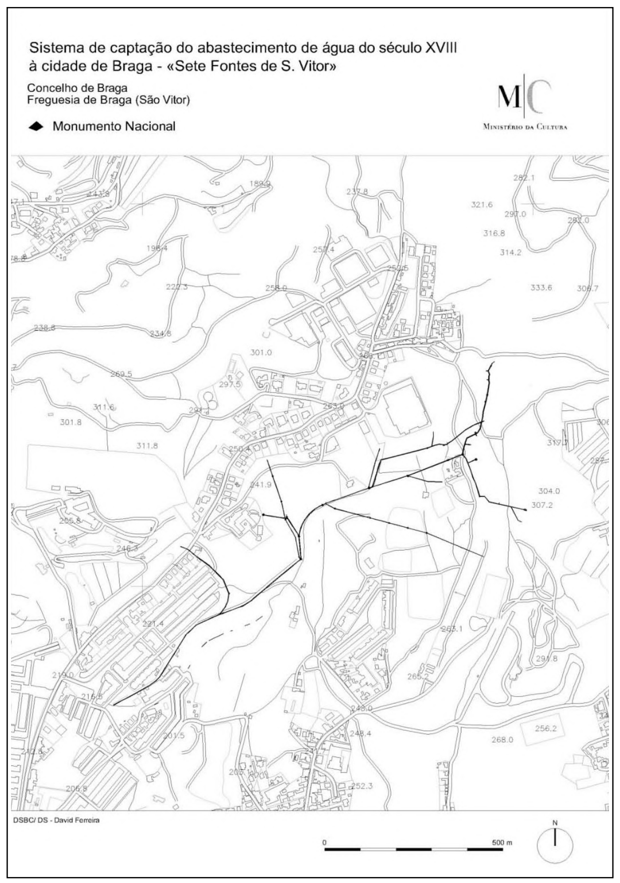
ANEXO V

[alínea *e*) do artigo único]



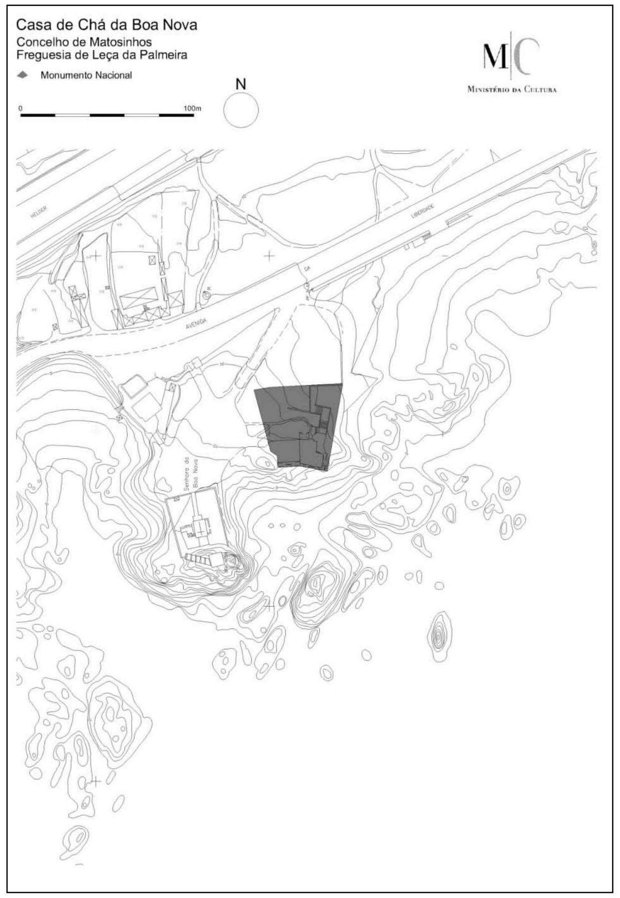
ANEXO VI

[alínea *f*) do artigo único]



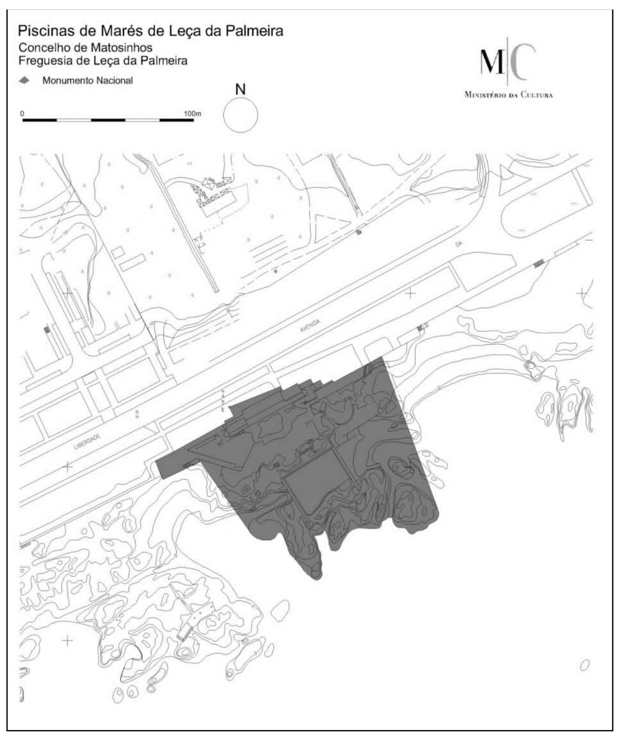
ANEXO VII

[alínea *g*) do artigo único]



ANEXO VIII

[alínea *h*) do artigo único]



APPENDIX G

Admission conditions and user regulations

OCEAN SWIMMING POOL ADMISSION CONDITIONS

(adopted by Matosinhos Sport on April 29, 2021)

Free and guided tours

Free visits during the bathing season, without the right to use the swimming pool, have a cost of 2€. Guided tours for groups (min. 5 - max. 25 participants) organized by Casa da Arquitectura are carried out in Portuguese or English with a duration of 45 to 60 minutes. The visit has a cost of 5€ and must be booked in advance through the email visitas@casadaarquitectura.pt.

Capacity and entrance control

The entry of customers into the facility and participation in activities may be suspended when the capacity Is full. In case of full capacity, Matosinhos Sport cannot allow entry to any other customer, even those who benefit from priority service.

Matosinhos Sport responsibility

The organization and operation of the Ocean Swimming Pool and the establishment of schedules and prices are responsibility of Matosinhos Sport.

Access rights

The access to the installation, services and activities of the Ocean Swimming Pool is subjected to the terms provided in the regulation.

Access admission

The right of admission to the Ocean Swimming Pool is subjected to the payment of the usage fees defined in the respective fee list (posted in a visible place).

Children access

Children under the age of 13 must be accompanied by an adult. It is mandatory to present a citizen's card or identity card to confirm their age.

Access entrance ticket

The half-day rate applies to entries from 9:00 until 14:00, or access from 14:00, until closing time.

Availability

Benefits, promotions and discounts are subject to confirmation of availability and legitimacy in order to be applied.

Cancellation

Matosinhos Sport reserves the right to cancel and/or change at any time the benefits, promotions and discounts due to its commercial policy, which the customer acknowledges and accepts.

Wristband identification

A wristband identification will be given at the entrance by the reception service. The use of the wristband, with color that shows the type of ticket purchased (half-day or full-day), is mandatory, and it must be always visible for access control and surveillance. The wristband is of personal and non-transferable nature. Breaking this rule implies the expulsion from the building and the payment of a daily entry.

Wristband use period

The customer must keep the ticket and wristband until the site is closed.

10 days access card

Card promotion with access for ten days are available. The prices for adults and children are differentiated according to their use (full day or half day).

Commercial activities access

Any commercial activity like photography, filming, events, among others, might occur upon previous request and appointment with Matosinhos Sport through the email piscinamares@matosinhosport.com.

Groups reservations

Reservations of space or groups appointments upon previous request with Matosinhos sport, through the email piscinamares@matosinhosport.com

Building closure due weather conditions

Matosinhos Sport is not responsible for the full or partial closure of the installation when there are adverse weather conditions, not granting the customer any deduction or refund on the usage fee.

OCEAN SWIMMING POOL USER REGULATIONS

(adopted by Matosinhos Sport on April 29, 2021)

Regulation purpose

The purpose of this regulation is to define the customer access to the Ocean Swimming Pool and the respective use of the installation and equipment.

Reception information

The reception must provide customer service with information on prices, usage rules, and capacity. Also, it will always display the temperature, pH and chlorine information of each pool.

Pool clothing

It is not allowed to remain inside the pool tanks with shoes or clothing not suitable for the aquatic environment.

Babies clothing

It is not allowed the entry of babies without the use of nappies appropriate to the aquatic environment.

Technical areas' permanence

The permanence of the general public in technical areas reserved for staff is prohibited.

Use of equipment

Swimming pool support elements (showers, foot washes, sanitary ware, etc.) must be handled with care.

Damages

Any damage will be charged to its author(s), under the expenses fixed by Matosinhos Sport.

Loss of objects and personal accidents

Matosinhos Sport is not responsible for damages resulting from loss or theft of objects inside the enclosure of the Ocean Swimming Pool unless found and delivered to the lost and found services of the installation.

Photograph

Users must respect privacy and image rights, refraining from photographing or filming other customers (unless authorized).

Animals

The entry of animals is prohibited (except for service animals).

Food

It is not allowed to eat, consume alcoholic beverages and smoke in all water activities zones.

Bar concession damage

Any damage, issue or conflict arising from the concession of the bar is the complete responsibility of its management. The bar must have appropriate documentation and licenses and the corresponding complaints book.

Regulation changes

This regulation may be amended by Matosinhos Sport whenever it deems convenient.

Regulation appliance

This regulation enters into force the day after its approval.

Limit control

It is forbidden to exceed the limits of the building capacity. Any person who breaches the limits will be expelled from the site with an obligation to pay an entrance fee. The use of part or all the facilities may be limited to carry out specific activities (such as construction works, maintenance, cultural or sporting events, among others). Matosinhos Sport commits to notify all customers of this limitation with due advance notice, through a message posted in a visible place, without granting any kind of deduction in the entrance fees to the customer.

Service Changes

Due to the permanent updating of sports and leisure activities, or due to changes in its commercial policy, Matosinhos Sport reserves the right at any time to add or change the services provided, as well as the equipment and activities available at the facility to safeguard the best interests of customers. These measures must be acknowledged and accepted by the customer.

Showers

It is mandatory to shower and go through the foot washes before entering the tanks.

Prohibited activities in the swimming pool

Jumping into the water is not allowed. Games or activities likely to cause danger or harm the physical integrity of people and goods, namely with balls or rackets, are not allowed.

Prohibited objects

The entry and/or use of sharp objects (bottles, knives, among others) are not allowed in the entire pool area, except at the bar.

Prohibited beach elements

It is not allowed the entry of parasols, windscreens, awnings, or other similar objects, nor beach chairs, except for mini tents for babies.

Beach elements support

The support elements for the beach, such as parasols or chairs, can be rented at the bar concessionaire.

Dock footwear

It is not allowed to use, in the dock area (the area surrounding the pool tanks), any footwear other than slippers/sandals, except in situations of emergency or professional need.

Dock behavior

In the dock area, it is not allowed to run, jump, push or have any other type of behavior that puts the physical integrity of other customers at risk.

Sound devices

The use of sound emission equipment is not allowed. From time to time, Matosinhos Sport is allowed to conduct classes or activities that uses sound and music.

Failure regulation

Failure to comply with this regulation and the practice of harmful acts may result in verbal warnings or expulsion from the premises, depending on the gravity of the case.

Exceptional cases

Exceptional cases will be judged in the first instance by the most responsible person present in the installation (the Head of Division of the Building) and then by the Board of Directors of Matosinhos Sport.

IMAGE CREDITS

Image Credits

Cover | Inês d'Orey (2021)

1. Introduction

Chapter opener | Inês d'Orey (2021)

2. Understanding the Place

Chapter opener | Inês d'Orey (2021)

Figure 2.1 | Municipal Archive of Matosinhos

Figure 2.2 | Municipal Archive of Porto

Figure 2.3 | Municipal Archive of Matosinhos

Figure 2.4 | A. Vieira (1950) Municipal Archive of Matosinhos

Figure 2.5 | Sindicato Nacional do Arquitectos (1961) *Arquitectura Popular em Portugal*. Lisboa: Sindicato Nacional dos Arquitectos

Figure 2.6 | Luiz Trigueiros (1993) *Fernando Távora*. Lisboa: Editorial Blau

Figure 2.7 | Mário Novais, 1966, Calouste Gulbenkian Foundation

Figure 2.8-2.9 | Roberto Collovà

Figure 2.10 | Foto Beleza (1947) Espólio Fotográfico Português

Figure 2.11 | Foto Beleza (1947) Municipal Archive of Matosinhos

Figure 2.12 | Álvaro Siza, Álvaro Siza fonds, Canadian Centre for Architecture

Figure 2.13 | Álvaro Siza fonds, Canadian Centre for Architecture

Figure 2.14-2.15 | (1960) Municipal Archive of Matosinhos

Figure 2.16 | A. Vieira (1961) Municipal Archive of Matosinhos

Figure 2.17 | Álvaro Siza (1961) Álvaro Siza fonds, Canadian Centre for Architecture

Figure 2.18 | Bernardo Ferrão (1960) Municipal Archive of Matosinhos

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Managing change with a living architect
OCEAN SWIMMING POOL BY ÁLVARO SIZA
CONSERVATION MANAGEMENT PLAN

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